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About This Book

This book provides reference material for various elements of Caché MVBasic: commands, functions, system variables, constants, operators, and symbols.

This book contains the following sections:

- Symbols
- Caché MultiValue Basic Commands
- Caché MultiValue Basic Functions
- Caché MultiValue Basic General Concepts

There is also a detailed Table of Contents.

Other related topics in the Caché documentation set are:

- MultiValue Basic Quick Reference
- Using the MultiValue Features of Caché
- Operational Differences between MultiValue and Caché
- Caché MultiValue Commands Reference
- Caché MultiValue Query Language (CMQL) Reference
- The Caché MultiValue Spooler

For general information, see Using InterSystems Documentation.
Symbols
Symbols Used in Caché MVBasic

A table of characters used in Caché MVBasic as operators, etc.

Table of Symbols

The following are the literal symbols used in Caché MVBasic. (This list does not include symbols indicating format conventions, which are not part of the language.) There is a separate table for symbols used in ObjectScript.

The name of each symbol is followed by its ASCII decimal code value.

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<th>Name and Usage</th>
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<td></td>
<td>White space (Tab (9) or Space (32)): One or more whitespace characters between keywords, identifiers, and variables.</td>
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<tr>
<td>&quot;</td>
<td>Double Quote (34): Used to enclose string literals. You can use &quot;&quot; to specify an empty string.</td>
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<tr>
<td>#</td>
<td>Pound (35): Not Equal To operator (inequality logical operator). For example, 3#4 returns 1 (True). Command line command specifying that the statement following it be executed as an ObjectScript command. See the Caché MultiValue Commands Reference.</td>
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<tr>
<td>#&lt;</td>
<td>Pound, Less than: Greater than or equal to operator (symbols mean not less than).</td>
</tr>
<tr>
<td>#&gt;</td>
<td>Pound, Greater than: Less than or equal to operator (symbols mean not greater than).</td>
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<td>$</td>
<td>Dollar sign (36): Permitted character in variable names.</td>
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<tr>
<td>$*</td>
<td>Dollar sign, Asterisk: A single-line comment indicator.</td>
</tr>
<tr>
<td>%</td>
<td>Percent sign (37): Permitted character in variable names.</td>
</tr>
<tr>
<td>&amp;</td>
<td>Ampersand (38): Logical AND operator.</td>
</tr>
<tr>
<td>'</td>
<td>Single Quote (39): Used to enclose string literals. You can use &quot;&quot; to specify an empty string.</td>
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<td>( )</td>
<td>Parentheses (40,41): Used to enclose a procedure or function parameter list. For example, SYSTEM(15), or OCONV(12345,&quot;D&quot;). Used to enclose a command or program option. For example, COMPILER.TERM (VT). When used with a command option, the closing parenthesis is optional; for example, COMPILER.TERM (VT). Used to nest expressions; nesting overrides the default order of operator precedence. Used to specify static array subscripts; a subscripted array has to be dimensioned using the DIM command. In CALL statement, used to specify argument passed by value.</td>
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<td>Double Asterisk: Exponentiation operator.</td>
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<td>Asterisk, Equal: Multiplication assignment operator.</td>
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<td>Plus sign (43): Addition operator.</td>
</tr>
<tr>
<td>++</td>
<td>Double Plus sign: Increment operator.</td>
</tr>
<tr>
<td>+=</td>
<td>Plus, Equal: Addition assignment (increment) operator.</td>
</tr>
<tr>
<td>,</td>
<td>Comma (44): Used to separate parameters in a function parameter list. Used to separate subscripts in a <em>static array</em>; a subscripted array has to be dimensioned using the DIM command. At the end of a line of code, a line continuation indicator. In DIM statements, used to separate multiple assignments. In PRINT or CRT statements, inserts a tab between arguments.</td>
</tr>
<tr>
<td>–</td>
<td>Minus sign (45): Unary arithmetic negative operator. Subtraction operator.</td>
</tr>
<tr>
<td>— —</td>
<td>Double Minus sign: Decrement operator.</td>
</tr>
<tr>
<td>— =</td>
<td>Minus, Equal: Subtraction assignment (decrement) operator.</td>
</tr>
<tr>
<td>→</td>
<td>Arrow (minus, greater than): Object class indicator.</td>
</tr>
<tr>
<td>.</td>
<td>Period (46): Decimal point character. Permitted character in <em>variable</em> names; cannot be first character. MV Shell <em>command stack command</em> prefix, followed by the letter A, C, D, L, U, or X, or the ? character. See the <em>Caché MultiValue Commands Reference</em>.</td>
</tr>
<tr>
<td>...</td>
<td>Three Periods: MATCH operator pattern match code.</td>
</tr>
<tr>
<td>. ?</td>
<td>Period, Question Mark: MV Shell <em>command stack command</em> to display available commands. See the <em>Caché MultiValue Commands Reference</em>.</td>
</tr>
<tr>
<td>/</td>
<td>Slash (47): Division operator. In COMMON statement, used to enclose a storage area name. For example, /sharedvars/.</td>
</tr>
<tr>
<td>//</td>
<td>Double Slash: As a prefix to a directory name, allows MultiValue to directly reference the directory. For example, to create the Windows file C:/temp/results.txt: OPEN &quot;//C:/temp&quot; TO DSCB WRITE results ON DSCB,&quot;results.txt&quot;</td>
</tr>
<tr>
<td>/=</td>
<td>Slash, Equal: Division assignment operator.</td>
</tr>
<tr>
<td>:</td>
<td>Colon (58): Label suffix. For example, LabelOne:. String <em>concatenation operator</em>. In INPUT statement, a suffix to the variable or length arguments that suppresses a line return. MV Shell prompt character.</td>
</tr>
<tr>
<td>Symbol</td>
<td>Name and Usage</td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
</tr>
<tr>
<td>:=</td>
<td><em>Colon Equals</em>: String concatenation assignment operator.</td>
</tr>
</tbody>
</table>
| ;      | *Semicolon (59)*: MV Shell MVBasic language command prefix. For example, `;print date()`. See the *Caché MultiValue Commands Reference*.  
MVBasic statement end indicator. Optional, unless the statement is followed on the same line by another MVBasic statement, or by an in-line comment.  
In INSERT and REPLACE functions, an argument separator. |
| ;!     | *Semicolon Exclamation Mark*: In-line comment indicator. |
| ;*     | *Semicolon Asterisk*: In-line comment indicator. |
| ;/     | *Semicolon Slash*: A command issued from the debug prompt that displays variable values. |
| <      | *Less than (60)*: Less than operator. |
| <=     | *Less than, Equal*: Less than or equal to operator. |
| <>     | *Less than, Greater than*: Not Equal To operator (inequality logical operator). For example, 3<>4 returns 1 (True).  
Used to enclose integers specifying the Field, Value, and Subvalue level of a dynamic array element. For example, `<1,2,2>`. |
| << ... >> | *Double less than, double greater than*: an inline prompt, used to interactively request an input value. Inline prompts can be used in MVBasic statements or MultiValue command line commands. Described in the *Caché MultiValue Commands Reference*. |
| =      | *Equal sign (61)*: Equality operator. For example, 3=4 returns 0 (False).  
Assignment operator. |
| <=     | *Equal, Less than*: Less than or equal to operator. |
| =>     | *Equal, Greater than*: Greater than or equal to operator. |
| >      | *Greater than (62)*: Greater than operator. |
| >=     | *Greater than, Equal*: Greater than or equal to operator. |
| @      | *At sign (64)*: Prefix for system variable names (for example `@RECORD`). Prefix for system variables that specify the characters used for dynamic array level delimiters (for example, `@FM`).  
The `@` function used with `PRINT`, `CRT`, or `INPUT` to position the cursor on the screen, or control display modes. For example, `PRINT @(15):"Over here!"` or `PRINT @(5):"Blinking text"`. |
| []     | *Square Brackets (91 & 93)*: Substring extract operator; brackets enclose integers specifying the substring to extract. |
| [      | *Left Square Bracket (91)*: Command line command specifying that the statement following it be executed as an ObjectScript command. See the *Caché MultiValue Commands Reference*.  
In the MultiValue ED editor, an Escape key is displayed as "[". See the *Caché MultiValue Commands Reference*. |
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name and Usage</th>
</tr>
</thead>
</table>
| \     | **Backslash (92):** Used to enclose string literals. Cannot be used in MATCH strings. You can use \ to specify an empty string.  
        In HEADING or FOOTING, inserts the current time and date. |
| ]     | **Right Square Bracket (93):** In HEADING or FOOTING, starts a new line. |
| ^     | **Caret (94):** as a prefix to a variable name, indicates a Caché global variable.  
        In HEADING or FOOTING, inserts a page number. |
| _     | **Underscore (95):** In INPUT, a suffix to the length argument that makes a line return mandatory. |
| {}    | **Curly Braces (123 & 125):** CALCULATE operation. For example: totalnums += {num}. |
Caché MultiValue Basic Commands
ABORT, ABORTE, ABORTM

Terminates program execution and returns to MVBasic shell.

ABORT [errcode [,val1[,val2]]]
ABORTE [errcode [,val1[,val2]]]
ABORTM [message]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>errcode</td>
<td>Optional — A MultiValue error code; commonly (but not always) specified as a positive integer. The error code can be specified as a literal or as an expression that resolves to a literal value. A non-numeric literal value must be specified as a quoted string.</td>
<td></td>
</tr>
<tr>
<td>val</td>
<td>Optional — A comma-separated list of one or more literal values to insert into the error message corresponding to errcode. These insert values can be specified as literals or as expressions that resolves to a literal value. A non-numeric literal value must be specified as a quoted string.</td>
<td></td>
</tr>
<tr>
<td>message</td>
<td>Optional — An expression that resolves to a literal error message text, specified as a quoted string.</td>
<td></td>
</tr>
</tbody>
</table>

Description

The ABORT statements are used to terminate program execution and return to the MVBasic shell programming prompt. If an argument is specified, they use this argument to display an error message before terminating program execution.

- ABORTE with an specified argument uses the ERRMSG file to obtain the error message to display. For a list of error codes and corresponding error messages, see Error Messages in the Caché MultiValue Commands Reference.
- ABORTM with an specified argument uses the literal message as the error message to display.
- ABORT in Caché MVBasic is functionally identical to ABORTE. Depending on the emulation setting, ABORT in other MultiValue emulations may be functionally identical to either ABORTE or ABORTM.

An abort operation resets the @LEVEL system variable to 0.

ABORT and STOP

The ABORT command terminates all program execution and returns to the programming prompt. The STOP terminates the executing routine and returns control to the calling routine.

During debugging, STOP terminates the debugging session. The debugger treats an ABORT as an error condition; the debugger performs a break operation to allow for examination of the condition causing the ABORT.

See Also

- BREAK statement
- ERRMSG statement
- STOP statement
- ObjectScript: QUIT command
ASSIGN

Assigns a value to the SYSTEM or STATUS functions.

ASSIGN value TO SYSTEM(code)
ASSIGN int TO STATUS()

Arguments

<table>
<thead>
<tr>
<th>value</th>
<th>An expression that evaluates to a value. This may be an integer value or a string value, depending on the SYSTEM() function.</th>
</tr>
</thead>
<tbody>
<tr>
<td>int</td>
<td>An expression that evaluates to an integer value. A non-integer value is truncated to an integer. A non-numeric value evaluates to 0.</td>
</tr>
<tr>
<td>code</td>
<td>An integer code specifying which SYSTEM code information to modify. For a list of codes, refer to the SYSTEM function.</td>
</tr>
</tbody>
</table>

Description

The ASSIGN statement is used either to assign an integer return value to the STATUS function, or to assign a return value to one of the SYSTEM function options. Assignments apply to the current process.

When assigning a STATUS function value, value must be a literal, variable, or arithmetic expression that resolves to a positive or negative integer. A fractional number is truncated to its integer portion. A string is truncated at the first non-numeric character. A non-numeric string resolves to the numeric value 0. If you exit and re-enter the MV Shell, the STATUS function value is reset to 0.

Most SYSTEM functions cannot be assigned a value using this command. SYSTEM(2), SYSTEM(3), and SYSTEM(7) can be assigned a value. Only a valid terminal type can be assigned to SYSTEM(7). If you exit and re-enter the MV Shell, these SYSTEM function values persist until explicitly reset.

Examples

The following example reduces the terminal's page width setting by 10 characters:

```
pwidth=SYSTEM(2);   ! The old page width
PRINT pwidth
ASSIGN pwidth-10 TO SYSTEM(2)
PRINT SYSTEM(2);   ! The new page width
```

In the following example, the first ASSIGN sets the terminal (channel 0) page width to 20. The PRINTER ON statement changes channel 0 to the current printer. The second ASSIGN sets the printer (channel 0) page width to 40. The PRINTER OFF reverts channel 0 to the terminal, which now has a page width of 40:

```
EXECUTE "TERM"
ASSIGN 20 TO SYSTEM(2)
EXECUTE "TERM"
PRINTER ON
ASSIGN 40 TO SYSTEM(2)
PRINTER OFF
EXECUTE "TERM"
```

See Also

- STATUS function
- SYSTEM function
BEGIN TRANSACTION

Begins a transaction.

BEGIN TRANSACTION

Description

The BEGIN TRANSACTION statement initiates a transaction. A transaction is a block of code beginning with BEGIN TRANSACTION and ending with END TRANSACTION. All statements within the transaction are either applied as a unit by a COMMIT statement, or rolled back as a unit by a ROLLBACK statement. Following a COMMIT or ROLLBACK, program execution continues at the END TRANSACTION statement.

Note: Caché MVBasic supports two sets of transaction statements:

- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.
- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.

These two sets of transaction statements should not be combined.

CAUTION: There is a fundamental difference in the way Caché transactions operate in comparison to most other transaction systems in the MV world. In Caché, items written to a file are immediately available both to the writing process and any other process accessing the file. If the transaction is aborted either programatically or because of some failure, then the item will be rolled back to the state prior to the start of the transaction.

Most other transaction systems in the MV world will make an item written to a file available to the process that wrote the item (in other words, if it reads the item back from the file after the write, it will be given the version that it wrote to the file), but any other process READing the item will see the version of the item as it was before a write. This is generally referred to as the isolation level. This difference may have implications for systems that wish to scan files without taking locks.

Example

The following example performs database operations within a transaction. It sets a variable x, which determines whether the transaction should be committed or rolled back.

PRINT "Before the transaction"
BEGIN TRANSACTION

IF x=0 THEN COMMIT END
ELSE ROLLBACK
PRINT "Transaction rolled back"
END
PRINT "This should not print"
END TRANSACTION
PRINT "After the transaction"

See Also

- END TRANSACTION statement
- COMMIT statement
- ROLLBACK statement
BREAK

Enables or disables keys that pause program execution.

```
BREAK [KEY] { ON | OFF }
BREAK [KEY] flag
```

Arguments

| flag | An expression that evaluates to a boolean value. 0=disable break keys. 1 (or any non-zero number)=enable break keys. |

Description

The `BREAK` statement is used to enable or disable terminal keys that can pause program execution. It can be executed using the ON or OFF keyword, or by using a boolean `flag` value. These two forms are functionally identical.

When `BREAK` is enabled (ON), the Interrupt, Suspend, and Quit keys will cause program execution to be suspended. When `BREAK` is disabled (OFF) these keys have no effect on program execution. The `BREAK` setting determines how `Ctrl-C` is handled when typed at the `INPUT` prompt.

The KEY keyword is optional and performs no function; it is provided for code compatibility only.

The MVBasic `BREAK` statement performs the same operation as the various MultiValue command line `BREAK` commands. Issuing any of these statements increments or decrements a counter. Thus multiple `BREAK OFF` statements (of any type) must be reversed by an equal number of `BREAK ON` statements.

Emulation

jBASE emulation supports an argumentless `BREAK` statement as a synonym for `EXIT`. Refer to the `EXIT` statement for details. In jBASE emulation, `BREAK` statements simply enable or disable (toggle) without maintaining a counter.

See Also

- ABORT statement
- INPUT statement
- STOP statement
- `BREAK` command in *Caché MultiValue Commands Reference*
BSCAN

Traverses the unique keys in an index, or the item ids in an inode-type file.

BSCAN keyvar [,recvar] [FROM filevar[,startkey]] [USING indexname] [RESET] [BY seq] [THEN statements] [ELSE statements]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>keyvar</td>
<td>BSCAN assigns to keyvar the key or item id returned by the BSCAN operation.</td>
</tr>
<tr>
<td>recvar</td>
<td>Optional — If you specify a recvar, BSCAN assigns the contents associated with keyvar to it. This can be the list of item ids associated with the key returned in keyvar, or the contents of the record associated with the item id returned in keyvar.</td>
</tr>
<tr>
<td>FROM filevar</td>
<td>Optional — A local variable name assigned to the MultiValue file by the OPEN statement. If you do not specify filevar, the default file, specified in the system variable @STDFIL, is used.</td>
</tr>
<tr>
<td>startkey</td>
<td>Optional — An expression that specifies the relative starting position of the scan. startkey can be an index key or item id. If the USING indexname clause is used, startkey is a value in the specified index.</td>
</tr>
<tr>
<td>USING indexname</td>
<td>Optional — The name of a secondary index associated with the file.</td>
</tr>
<tr>
<td>BY seq</td>
<td>Optional — Specifies the direction of the scan. The available seq options are “A” (ascending) and “D” (descending). The default is ascending.</td>
</tr>
</tbody>
</table>

Description

The BSCAN statement operates in 2 modes:

- **BSCAN with an indexname** steps through the unique keys in an index. The keys are returned as keyvar. It optionally returns the item id associated with keyvar as recvar.

- **BSCAN without an indexname** steps through the item ids in an inode-type file. The list of item ids is returned as keyvar. It optionally returns the contents of each keyvar item as recvar.

The BSCAN statement scans the leaf nodes of either a B-tree file (type 25) or a secondary index. The record ID returned by the scan operation is assigned to keyvar. If you specify a recvar, BSCAN assigns the contents of the keyvar record to it.

filevar specifies an open file. If you do not specify filevar, the default file is used. (For more information on default files, see the OPEN statement.) If the specified file is neither accessible nor open, BSCAN returns nothing and sets STATUS() to 3.

startkey is an expression that evaluates to a record ID of a record in the B-tree file. If the USING clause is used, startkey is a value in the specified index. startkey specifies the relative starting position of the scan.

startkey need not exactly match an existing record ID or index key. If it does not, the scan finds the next or previous record ID or value, depending on whether the scan is in ascending or descending order. For example, depending on how precisely you want to specify the starting point at or near the record ID or value SMITH, startkey can evaluate to SMITH, SMIT, SMI, SM, or S.

If you do not specify startkey, on the initial BSCAN operation, the scan starts at the beginning (leftmost slot of the leftmost leaf) or end (rightmost slot of the rightmost leaf) of the index or file, depending on the value of the seq expression. The
scan then moves in the direction specified in the BY clause. Subsequent BSCAN operations with no startkey specified will continue from the keyvar returned by the previous BSCAN.

indexname is an expression that evaluates to the name of a secondary index associated with the file.

RESET resets the internal scan pointer to the first or last key, depending on the BY seq clause value. If you do not specify seq, the scan is done in ascending order. If you specify startkey in the FROM clause, RESET is ignored.

seq is an expression that evaluates to A or D; it specifies the direction of the scan. "A", the default, specifies ascending order. "D" specifies descending order.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the BSCAN statement finds a valid index key, or item id and its associated data, the THEN clause is executed. If the scan does not find a valid index key, or if some other error occurs, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

Any file updates executed in a transaction (that is, between a BEGIN TRANSACTION statement and a COMMIT statement) are not accessible to the BSCAN statement until after the COMMIT statement has been executed.

Note: Cache supports the BSCAN statement for compatibility with legacy MultiValue systems. When retrieving keys from an index, developers should use OPENINDEX and SELECT with the ATKEY clause, because SELECT ATKEY has a simpler, more intuitive syntax and superior performance.

**STATUS Values**

The STATUS function returns the following values after the BSCAN statement is executed:

If NLS is enabled, the BSCAN statement retrieves record IDs in the order determined by the active collation locale; otherwise, BSCAN uses the default order, which is simple byte ordering that uses the standard binary value for characters; the Collate convention as specified in the NLS.LC.COLLATE file for the current locale is ignored.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The scan proceeded beyond the first or last key. keyvar and recvar are set to empty strings.</td>
</tr>
<tr>
<td>1</td>
<td>The scan returned an existing index key, or an index key that matches the key specified by startkey.</td>
</tr>
<tr>
<td>2</td>
<td>The scan returned an index key that does not match startkey. keyvar is either the next or the previous record ID in the B-tree, depending on the direction of the scan.</td>
</tr>
<tr>
<td>3</td>
<td>filevar is not open, or is not an inode-type.</td>
</tr>
<tr>
<td>4</td>
<td>indexname does not exist.</td>
</tr>
<tr>
<td>5</td>
<td>seq does not evaluate to A or D.</td>
</tr>
<tr>
<td>6</td>
<td>The index specified by indexname needs to be built.</td>
</tr>
<tr>
<td>10</td>
<td>An internal error was detected.</td>
</tr>
</tbody>
</table>

**Examples**

The following example demonstrates using BSCAN to step through the keys in an index:
0001 EXECUTE 'CREATE-FILE DATE-FILE'
0002 OPEN 'DICT','DATE-FILE' TO DICT.DATE.FILE ELSE STOP 201,'DICT DATE-FILE'
0003 WRITE 'D':@AM:1 ON DICT.DATE.FILE,'DAY.OF.WEEK'
0004 EXECUTE 'CREATE-INDEX DATE-FILE DAY.OF.WEEK'
0005 OPEN 'DATE-FILE' TO DATE.FILE ELSE STOP 201,'DATE-FILE'
0006 FOR I=1 TO 21
0007   ID=DATE()+I
0008   PARTICLE O_CONV(ID,'DWA') ON DATE.FILE,ID
0009 NEXT I
0010 LOOP
0011 BSCAN DOW,IDLIST FROM DATE.FILE USING 'DAY.OF.WEEK' ELSE EXIT
0012 CRT 'DOW=':DOW,' DATES=':IDLIST
0013 REPEAT

This returns the following output:

[421] DICT for file 'DATE-FILE' created. Type = INODE
[418] Default data section for file 'DATE-FILE' created. Type = INODE
[437] Added default record '@ID' to 'DICT DATE-FILE'.

Notice that on each iteration, **BSCAN** returns the next unique key in the index. The item ids associated with the key are returned as an @AM-delimited list in the optional **recvar** argument. If you want to process each record for the key, you need to code a loop to do so.

The following example demonstrates using **BSCAN** to retrieve the keys for a particular key:

0001 OPEN 'DATE-FILE' TO DATE.FILE ELSE STOP 201,'DATE-FILE'
0002 BSCAN DOW FROM DATE.FILE,'SUN' USING 'DAY.OF.WEEK' ELSE NULL
0003 CRT 'DOW=':DOW,' STATUS=':STATUS()
0004 BSCAN DOW FROM DATE.FILE USING 'DAY.OF.WEEK' ELSE NULL
0005 CRT 'DOW=':DOW,' STATUS=':STATUS()
0006 BSCAN DOW FROM DATE.FILE,'Z' USING 'DAY.OF.WEEK' ELSE NULL
0007 CRT 'DOW=':DOW,' STATUS=':STATUS()

This returns the following output:

DOW=SUNDAY       STATUS=2
DOW=THURSDAY     STATUS=1
DOW=           STATUS=0

On line 2 we request key SUN. There is no SUN, so **BSCAN** returns the next key SUNDAY. The **BSCAN** on line 4 doesn't specify a start key, so the next key, THURSDAY, is returned. On line 6, we request key Z. There is no Z and nothing after Z, so **BSCAN** returns status 0

In the following example **BSCAN** is used to scan the item ids of an inode-type file. In this example, we look for item id SEL in VOC. SEL does not exist, so **BSCAN** returns the next id SEARCH:

0001 OPEN 'VOC' TO VOC ELSE STOP 201,'VOC'
0002 BSCAN ID,ITEM FROM VOC,'SEL' BY 'D' ELSE NULL
0003 CRT 'ID=':ID,' ITEM=':ITEM
0004 MINE:TRY
ID=SEARCH        ITEM=V SEARCH C  2C

See Also

- **OPEN** statement
- **OPENINDEX** statement
- **SELECT ATKEY** statement
- **STATUS** function
CALL

Transfers control to an external subroutine.

CALL routine[(arglist)]

Arguments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>routine</td>
<td>Name of the external subroutine to call.</td>
</tr>
<tr>
<td>arglist</td>
<td>Optional — Comma-delimited list of arguments to pass to the external subroutine. The number of arguments specified must match the number of argument defined for the subroutine. Specify the MAT keyword before an array argument.</td>
</tr>
</tbody>
</table>

Description

The CALL statement can be used to call an external subroutine and to optionally pass arguments to that subroutine. The external subroutine must have been compiled and cataloged. You can use the RETURN statement within the external subroutine to return control to the next statement following the CALL statement.

Note: The RETURN statement will first return from internal GOSUB subroutines and then return from the external SUBROUTINE when the GOSUB stack is exhausted.

You can use routine to specify the external subroutine either directly or indirectly:

• The routine argument can specify the exact name under which the subroutine was cataloged.

• The routine argument can specify the name of a variable that contains the name of the subroutine. A variable of this type is prefaced with the @ symbol. A variable name can be a local variable, or an element of an array.

    If the routine name begins with an asterisk (*), CALL first looks it up as a local routine. If not found, CALL looks it up as a global routine. If still not found, CALL generates an error. Note that *routine processing is different in UniData emulation, as described below.

The argument list can contain any combination of regular variables and array variables. An array variable must be dimensioned in the calling program using the DIM statement. Caché dimensionless arrays can also be passed to the subroutine as arguments, providing they are DIMensioned using DIM var().

In arglist, an array variable name must be preceded by the MAT keyword. The following is an argument list that specifies a literal, a regular variable, and an array variable:

CALL MySub(123, myvar, MAT myarray)

By default, all arglist arguments are passed by reference. If the subroutine changes the value of an argument passed by reference, this value is also changed in the calling program. You can specify that an argument is to be passed by value by enclosing the argument name in parentheses (which changes the variable in to an expression; expressions are always passed by value). If the subroutine changes the value of an argument passed by value, the value of this argument in the calling program remains unchanged.

You can also use the COMMON statement to make specified variables available to all external subroutines. You should avoid calling SUBROUTINEs using a variable that is declared in COMMON as a subroutine argument as you will have two references to the same variable in the subroutine – the original COMMON reference, and the subroutine parameter.

Note: An array may be dimensioned differently in the subroutine than it is in the calling program, but that the number of dimensioned elements should remain the same. Hence a variable A declared as DIM A(10) may be declared as A(5,2) in the subroutine.
CALL works on only a single value at a time. If you specify a CALL with a multivalue argument, Caché MVBasic invokes CALL repeatedly, once for each value in the multivalue argument. The called external subroutine can only return single-valued arguments.

**CALL, ENTER, SUBR, and GOSUB**

The CALL statement is used to call an external subroutine with parameter passing and return. If you do not need to pass parameters or return to the calling program, you can use ENTER to call an external subroutine.

The SUBR function is used to call an external subroutine that returns a value. The GOSUB statement is used to call an internal subroutine.

**Examples**

The following example uses CALL to pass arguments by reference:

```vbnet
Main
    x="Burma"
y="Myanmar"
    PRINT x       ! Returns "Burma"
    CALL MapSub(x,y)
    PRINT x       ! Returns "Myanmar"
MapSub(name,newname)
    PRINT name    ! Returns "Burma"
    name=newname
    PRINT name    ! Returns "Myanmar"
    RETURN
```

The following example uses CALL to pass an argument by value by using parentheses around the argument:

```vbnet
Main
    x="Burma"
y="Myanmar"
    PRINT x       ! Returns "Burma"
    CALL MapSub((x),y)
    PRINT x       ! Returns "Burma"
MapSub(name,newname)
    PRINT name    ! Returns "Burma"
    name=newname
    PRINT name    ! Returns "Myanmar"
    RETURN
```

**Emulation**

In UniData and UDPICK emulations, a routine name with an initial character of * is handled as a global routine name. CALL removes the leading * and then looks up the resulting routine name as a global routine. If the runtime environment is not UniData emulation, a normal lookup is done on a routine name with a leading * character.

The use of $OPTIONS UNIDATA in the MVBasic source file does not activate this behavior. The handling of names with leading * is determined by the user setting in the command language at runtime. Therefore, to activate this behavior, the CEMU command must set UniData emulation before running a program that calls a routine name with a leading *.

**See Also**

- ENTER statement
- COMMON statement
- RETURN statement
- SUBROUTINE statement
- END statement
- DIM statement
- GOSUB statement
- SUBR function
SELECTS one of several statements based on the value of expressions.

BEGIN CASE
  CASE expression1
    statement
  CASE expression2
    statement . . .
END CASE

**Arguments**

| expression | A value, variable, or expression that evaluates to a boolean value: FALSE = 0, TRUE=1 or any numeric value other than 0. |
| statement  | One or more MVBasic statements to execute if the corresponding expression evaluates to TRUE. |

**Description**

The **CASE** statement tests each case in the order specified, and executes the statement(s) associated with the first expression that evaluates to true (a numeric value other than 0). An unlimited number of **CASE** statements can be specified within the **BEGIN CASE** ... **END CASE** clause. At most, only one **CASE** statement is taken — the first case that evaluates to a true value. Matching stops when the first expression that evaluates to true is encountered.

If no **CASE** expression evaluates to true, execution continues with the first statement after the **END CASE** statement.

You can specify a default case by specifying an expression that always evaluates to true (1). Typically, the literal integer value 1 is used as the expression in the last **CASE** clause: **CASE 1**. The statements associated with this clause will be executed if all the other **CASE** clauses evaluate to false (0).

You cannot use a **GOTO** statement to transfer execution within a **CASE** statement.

**CASE** statements can be nested. You can use a **GOTO** statement to transfer execution from a **CASE** clause to a nested a **CASE** statement.

A placeholder **CASE** block, consisting of just the **BEGIN CASE** and **END CASE** statements, is supported.

**Arguments**

**expression**

**CASE** evaluates expression to a boolean value. If true, the case is taken and its statements executed. If false, the case is skipped over, and the next **CASE** expression is evaluated. **CASE** expressions are evaluated in the order specified; therefore, an error in an expression (for example, a divide-by-zero error: **CASE var/0**) is not detected if a prior expression is taken.

**statement**

One or more statements executed if expression evaluates to true. If expression does not evaluate to true, statement is not parsed.

**Examples**

The following example takes a user input and executes one of the specified cases based on length of the input string. The final case (**CASE 1**) is always true. This provides a case that is always taken if all of the previous cases did not evaluate to true:
INPUT myword
BEGIN CASE
  CASE 5 > LEN(myword)
    CRT "short"
    CRT "word"
  CASE 5 < LEN(myword)
    CRT "long"
    CRT "word"
  CASE 1
    CRT "five letter"
    CRT "word"
  END CASE
CRT "all done"

The following example shows nested CASE statements. It shows how a GOTO can be used to transfer execution to a nested CASE statement:

INPUT myword
BEGIN CASE
  CASE 5 > LEN(myword)
    CRT "short word"
  Atest:
    BEGIN CASE
      CASE 1 = COUNT(myword,"A")
        CRT "contains one A"
      CASE 1 < COUNT(myword,"A")
        CRT "contains more than one A"
      CASE 1
        CRT "contains no A"
      END CASE
  CASE 5 < LEN(myword)
    CRT "long word"
    GOTO Atest:
  CASE 1
    CRT "five letter word"
    GOTO Atest:
  END CASE

See Also

- IF...THEN...ELSE statement
CATCH

Identifies a block of code to execute when an exception occurs.

```
TRY
  statements
CATCH [exceptionvar]
  statements
END TRY
```

Arguments

<table>
<thead>
<tr>
<th>exceptionvar</th>
<th>Optional — An exception variable. Specified as a local variable, with or without subscripts, that receives a Caché Object reference (oref).</th>
</tr>
</thead>
</table>

Description

The CATCH statement defines an exception handler, one or more statements to execute when an exception occurs in the code following a TRY statement. The CATCH statement is followed by one or more exception handling code statements. The CATCH block must immediately follow its TRY, and the paired TRY and CATCH are terminated by an END TRY statement.

The CATCH statement has two forms:

- Without an argument
- With an argument

CATCH without an Argument

Argumentless CATCH is invoked when an exception occurs in the TRY block. This executes the series of statements between CATCH and END TRY.

CATCH with an Argument

CATCH exceptionvar is invoked when an exception occurs in the TRY block. This exception passes exceptionvar to the CATCH block. This exception can either be explicitly invoked by a THROW statement, or issued by the system runtime environment in the event of a system exception. The exceptionvar Caché Object reference (oref) provides properties that contain information about the exception, such as the Name of the error and the Location where it occurred. The user-written CATCH exception handler code can use this information to analyze the exception.

Arguments

exceptionvar

A local variable, used to receive the exception object reference from the THROW statement or from the system runtime environment in the event of a system exception. When a system exception occurs, exceptionvar receives a reference to an object of type %Exception.SystemException. For further details, refer to the %Exception.AbstractException class in the InterSystems Class Reference.

Examples

The following example shows a CATCH invoked by a runtime exception. The myvar argument receives a system-generated exception object:
TRY
  PRINT "about to divide by zero"
  a=7/0
  PRINT "this should not display"
CATCH myvar
  PRINT "this is the exception handler"
  PRINT :myvar->Name,"Error Name"
  PRINT :myvar->Code,"Error Code Number"
  PRINT :myvar->Location,"Error Location"
END TRY
PRINT "this is where the code falls through"

See Also

- THROW statement
- TRY statement
CHAIN

Executes a MultiValue command from a program, exiting the program.

**Arguments**

| **command** | A MultiValue command specified as a quoted string. |

**Description**

The **CHAIN** command executes the specified Caché MultiValue command, but does not return execution to the MVBasic program. Commonly, **CHAIN** is used with the MultiValue **RUN** command to “chain” execution from one program to another. It initially searches the VOC for the **command**; if the **command** is not found in the VOC, it searches the global catalog. For lookup details, refer to **CATALOG** in the Caché MultiValue Commands Reference.

**CHAIN** does not create a new execution environment. Therefore any select lists that were active when **CHAIN** was invoked are retained as the active select lists of the invoked **command**.

**CHAIN** cannot pass values to **command**. Because **CHAIN** does not return to the invoking program, it cannot pass a return value from **command**.

**EXECUTE, PERFORM, and CHAIN**

The **EXECUTE** command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement in the invoking program. **EXECUTE** creates a new execution environment; select lists that were active when **EXECUTE** was invoked are not retained by its invoked MultiValue commands. **EXECUTE** can explicitly pass values to the MultiValue command(s) and return values from the MultiValue command(s).

The **PERFORM** command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement in the invoking program. **PERFORM** cannot pass or return values.

The **CHAIN** command executes a single MultiValue command from within MVBasic. It does not return execution to the invoking program. **CHAIN** cannot pass values.

**Examples**

The following example issues the MultiValue **RUN** command, to initiate execution of the **bignumprog** MVBasic program:

```mvbasic
IF x>100
   THEN
      CHAIN "RUN bignumprog"
   END
ELSE
   PRINT "continuing execution"
END
```

**Emulation**

In jBASE emulation, **CHAIN** does not pass the default select list (select list 0) to the invoked program.

In UniData and UDPICT emulations, a **command** name with an initial character of * is handled as a global name. **CHAIN** removes the leading * and then looks up the resulting command name in the global catalog in SYS.MV, rather than looking up in the VOC. If the runtime environment is not a UniData emulation, a normal VOC lookup is done on the *command name.
See Also

- EXECUTE statement
- PERFORM statement
- ObjectScript: XECUTE command
CHANGE

Replaces all instances of a substring in a variable.

```
CHANGE oldstring TO newstring IN variable
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oldstring</td>
<td>The substring to be replaced. An expression that resolves to a valid string or numeric.</td>
</tr>
<tr>
<td>newstring</td>
<td>The replacement substring. An expression that resolves to a valid string or numeric. To delete <code>oldstring</code>, specify the empty string (&quot;&quot;).</td>
</tr>
<tr>
<td>variable</td>
<td>An existing variable containing a string value. <code>variable</code> may be a dynamic array. <code>variable</code> accepts a single dynamic array reference (A&lt;i&gt;), a single substring reference (A&lt;s,l&gt;), or a substring reference nested inside a dynamic array reference (A&lt;i&gt;[s,l]).</td>
</tr>
</tbody>
</table>

**Description**

The `CHANGE` statement edits the value of `variable` by replacing all instances of `oldstring` with `newstring`. The `oldstring` and `newstring` values may be of different lengths. Matching of strings is case-sensitive. If `oldstring` is not present in the variable, no operation is performed.

The values of `oldstring` and `newstring` can be a string or a numeric. If numeric, the value is converted to canonical form (plus sign, leading and trailing zeros removed) before performing the string replacement.

To remove all instances of `oldstring` from `variable`, specify the null string (""") as the `newstring` value. The null string (""") cannot be used as the `oldstring` value.

`CHANGE` and `SWAP` both perform string substitution, and are functionally identical. `CONVERT` performs character-for-character substitution.

**Examples**

In following example, `CHANGE` replaces every instance of "?" with "[PLEASE CHECK]" in global variable ^mytest:

```
"mytest="Jones":@VM:"?":@VM:"? Water St.":@VM:"Springfield":@VM:"?"
CHANGE "?" TO "[PLEASE CHECK]" IN "mytest
PRINT "mytest
```

**See Also**

- `CONVERT` statement
- `SWAP` statement
- `CONVERT` function
- `CHANGE` function
- `Strings`
CLEAR

Resets variables not assigned to a common storage area.

Arguments
The CLEAR statement takes no arguments.

Description
The CLEAR statement clears (sets to 0) all local variables that are not assigned to a common storage area. Variables in a named common storage area or in the unnamed common storage area are unaffected.

Because CLEAR sets to 0 both assigned and unassigned variables, it can be usefully invoked at the beginning of a program to prevent problems caused by unassigned variables.

You can use the COMMON statement to assign variables to a common storage area. You can use the CLEAR COMMON statement to clear (reset to 0) all local variables that are assigned to a named common storage area or to the unnamed common storage area.

See Also
• COMMON statement
• CLEARCOMMON statement
CLEARCOM (CLEARCOMMON)

Resets variables assigned to a common storage area.

```
CLEARCOM [/store/]
CLEARCOMMON [/store/]
CLEAR COM [/store/]
CLEAR COMMON [/store/]
```

### Arguments

<table>
<thead>
<tr>
<th>store</th>
<th>Optional — A named common storage area for a group of variables. If specified, this name is enclosed with slashes (/). The default is the unnamed common area.</th>
</tr>
</thead>
</table>

### Description

The `CLEARCOMMON` statement resets all of the variables stored in the common storage area, assigning them the value “0”. The `COMMON` statement allows you to assign a list of local variables to a common storage area. These variables do not have to be defined to be listed in a common storage area.

The `COMMON` statement can define a `store` name for a named common storage area. If `COMMON` omits `store`, the named variables are stored in the unnamed common storage area. `CLEARCOMMON` can reset the variables in a named common storage area, or omit `store` and reset the variables in the unnamed common storage area.

`CLEARCOM`, `CLEARCOMMON`, `CLEAR COM`, and `CLEAR COMMON` are all equivalent syntactical forms for this statement.

You can use the `CLEAR` statement to clear (reset to 0) all local variables that are not assigned to a common storage area.

### See Also

- CLEAR statement
- COMMON statement
CLEARDATA

Clears all data stored by the DATA statement.

Arguments

None.

Description

The CLEARDATA statement flushes (clears) all remaining data stored in the input stack by the DATA statement. Following CLEARDATA, the INPUT statement issues a user prompt, rather than automatically receiving data stored by the DATA statement.

Examples

The following example illustrates the use of the CLEARDATA statement:

```
DATA "New York","Chicago","","Annapolis"
FOR x=1 TO 4
   INPUT cityname
   IF cityname=""
      THEN CLEARDATA
      PROMPT "Missing name: 
      INPUT cityname
   ELSE
      PRINT cityname
   NEXT
```

See Also

- DATA statement
- INPUT statement
CLEARFILE

Deletes all records from a MultiValue file.

```
CLEARFILE filevar [SETTING var] [ON ERROR statements] [LOCKED statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>A file variable name used to refer to a MultiValue file. This <code>filevar</code> value is supplied by the <code>OPEN</code> statement.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable <code>var</code> to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The `CLEARFILE` statement is used to delete all data from a MultiValue file. It does not delete the file itself. `CLEARFILE` takes the file identifier `filevar`, defined by the `OPEN` statement.

**CAUTION:** `CLEARFILE` can delete large quantities of data. This data may be accessed by multiple processes.

To delete individual data records, use the `DELETE` statement.

You can optionally specify a LOCKED clause, which is executed if `CLEARFILE` could not delete all records due to lock contention. The `statements` argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause. If the data deletion fails (for example, the file could not be accessed), the ON ERROR clause is executed. The `statements` argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

**See Also**

- `OPEN` statement
- `DELETE` statement
- `STATUS` statement
- `STATUS` function
CLEARINPUT

Clears input data from the type-ahead buffer.

Arguments
None.

Description
The CLEARINPUT statement deletes (clears) any user input data stored in the type-ahead buffer. This affects the INPUTIF statement, which receives user input from the type-ahead buffer. CLEARINPUT has no effect on the INPUT statement, which does not use a type-ahead buffer.

The CLEARINPUT and INPUTCLEAR statements are functionally identical. CLEARINPUT is supported for compatibility with UniData systems.

See Also
- INPUTIF statement
- INPUTCLEAR statement
CLEARSELECT

Resets active select lists.

CLEARSELECT [selectlist]
CLEARSELECT ALL

Arguments

| selectlist | Optional — An identifier assigned to an active select list, specified as an integer from 0 through 10 (inclusive), or a named select list variable. If omitted, select list 0 is cleared. |

Description

The CLEARSELECT statement resets an active select list. It has three syntactical forms:

- CLEARSELECT selectlist resets the specified select list.
- CLEARSELECT resets select list 0.
- CLEARSELECT ALL resets all active numbered select lists. It has no effect on named select lists.

Emulation

By default, SELECT uses select list 0 as the default select list for both internal and external use. Reality, D3, R83, POWER95, MVBase, and IN2 systems use two distinct default select lists, one internal and one external. This behavior can be set using OPTIONS PICK.SELECT. When this option is set, the default external select list is 0, and the default internal select list is 10.

See Also

- SELECT statement
CLOSE

Closes a MultiValue file.

CLOSE filevar [ON ERROR statements]

Arguments

| filevar | A file variable name used to refer to a MultiValue file. This filevar is supplied by the OPEN statement. |

Description

The CLOSE statement is used to close a MultiValue file. It takes the file identifier filevar, defined by the OPEN statement.

If multiple OPEN statements have been issued for the same MultiValue file:

- If the process has issued multiple OPEN statements specifying different filevar variables, you must issue a CLOSE for each filevar.
- If the process has issued multiple OPEN statements specifying the same filevar, a single CLOSE for this filevar closes the MultiValue file.
- If multiple processes have issued an OPEN statement for the same MultiValue file, you must issue a CLOSE for the filevar in each process, even if the processes specified the same filevar variable.

You can optionally specify an ON ERROR clause. If file close fails, the ON ERROR clause is executed. This may occur if filevar does not refer to an existing file, or if the filevar file has already been closed. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

Alternatively, you can use the STATUS function to determine the status of the file close operation, as follows: 0=success; -1=file does not exist or has already been closed.

See Also

- OPEN statement
- STATUS function
CLOSESEQ

Closes a file opened for sequential access.

`CLOSESEQ filevar [ON ERROR statements]`

**Arguments**

| filevar | A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from `OPENSEQ`. |

**Description**

The `CLOSESEQ` statement is used to close a file that has been opened for sequential access using `OPENSEQ`. A file opened for sequential access is exclusively held by the process that opened it. Issuing a `CLOSESEQ` allows that file to be accessed by other processes.

You can use the `STATUS` function to determine the status of the close operation, as follows: 0=close successful; -1=close failed either because file variable not defined or file has already been closed.

You can optionally specify an ON ERROR clause. If file close fails, the ON ERROR clause is executed. This may occur if the file is already closed. The `statements` argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

**See Also**

- `OPENSEQ` statement
- `STATUS` function
COMMIT

Commits all changes made during the current transaction.

| COMMIT [TRANSACTION | WORK] [THEN statements] [ELSE statements] |

Description

The COMMIT statement ends the current transaction initiated by a BEGIN TRANSACTION statement. All file changes issued during the transaction are committed, and cannot be subsequently reverted.

The COMMIT must be specified between the BEGIN TRANSACTION and END TRANSACTION statements. Following a COMMIT, program execution skips to the line of code following the END TRANSACTION statement.

The TRANSACTION or WORK keywords are optional and provides no functionality. They are provided solely for compatibility with other MultiValue vendor products.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the transaction commit is successful, the THEN clause is executed. If the transaction commit fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

To revert the changes made during the current transaction, issue a ROLLBACK statement, rather than a COMMIT statement.

After the transaction is closed, program execution continues at the END TRANSACTION statement.

Note: Caché MVBasic supports two sets of transaction statements:
- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.
- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.

These two sets of transaction statements should not be combined.

Please refer to the documentation for BEGIN TRANSACTION for notes on important differences regarding the isolation level of transactions within Caché vs the that generally found in MV systems.

Locks and Transactions

File locks and record locks that were taken out during a transaction are released at the end of a transaction. If there are nested transactions, the release of locks taken out during the inner transactions is delayed until the completion of the outermost transaction. This release of locks is part of a successful COMMIT or ROLLBACK operation. Locks are described in the LOCK statement.

Example

The following example performs database operations within a transaction. It sets a variable x, which determines whether the transaction should be committed or rolled back.
PRINT "Before the transaction"
BEGIN TRANSACTION
.
.
IF x=0
  THEN COMMIT
  THEN PRINT "Commit successful"
  ELSE PRINT "Commit failed"
END
ELSE ROLLBACK
END
PRINT "This should not print"
END TRANSACTION
PRINT "Transaction resolved"

See Also

- BEGIN TRANSACTION statement
- END TRANSACTION statement
- ROLLBACK statement
COM (COMMON)

Lists variables available to external subroutines.

```
COM [/store/] var [,var2] [. . .]
COMMON [/store/] var [,var2] [. . .]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>store</code></td>
<td>Optional — A named storage area for the listed variables. If specified, this name is enclosed with slashes (/).</td>
</tr>
<tr>
<td><code>var</code></td>
<td>A variable or a comma-separated list of multiple variables.</td>
</tr>
</tbody>
</table>

**Description**

The `COMMON` statement allows you to specify list of local variables that are placed in a common storage area available to external subroutines. You can specify one variable or a comma-separated list of variables. These variables do not have to be defined to be listed as common. A variable placed in a common storage area may contain a literal value or an object reference.

You can use `store` to specify a named common storage area, or omit this argument and store the listed variables in the unnamed common storage area. A `store` name can be of any length, but it is suggested that it be unique within its first 27 characters.

You specify a `COMMON` statement in both the calling program and each called subroutine that uses the variables. The corresponding variables in an external subroutine do not have to have the same names; they correspond by being in the same sequence. Thus the first variable in the main program's `COMMON` statement corresponds with the first variable in the external subroutine's `COMMON` statement, the second with the second, and so forth.

Specifying an array in a `COMMON` statement dimensions that array; it cannot be subsequently dimensioned using a `DIM` statement. Attempting to do so results in a compile error.

**Note:** Arrays dimensioned in COMMON areas in one program do not need to be dimensioned in the same way in the definition of the same COMMON area in another program. However, the number of elements defined should be the same in both cases. It is best practice to define COMMON areas via a single INCLUDE file in order to avoid using different definitions in different programs.

You can use the `CLEARCOMMON` statement to reset all of the variables in held in a common storage area.

**Emulation**

The `COMMON` initialization of array variables for Caché MVBasic is UNASSIGNED, for both named and unnamed common storage areas. Other supported MultiValue emulations provide differing initialization for array variables in named and unnamed common storage areas. Scalar variables are always initialized as UNASSIGNED in all emulations.

**Examples**

The following example initializes an array variable in the unnamed common storage area, then tests whether the variable is assigned. In native Caché MVBasic the result will always be unassigned; other MultiValue emulations return other results.

```
COMMON c(3)
IF ASSIGNED(c(3)) THEN PRINT c(3)
ELSE PRINT "Unassigned for unnamed storage"
```

The following example initializes an array variable in a named common storage area, then tests whether the variable is assigned. In native Caché MVBasic the result will always be unassigned; other MultiValue emulations return other results.
COMMON /ABC/ y(2)
IF ASSIGNED(y(2)) THEN PRINT y(2)
ELSE PRINT "Unassigned for named storage"

See Also

- CALL statement
- CLEARCOMMON statement
- DIM statement
- SUBROUTINE statement
- ASSIGNED function
- UNASSIGNED function
CONTINUE

Jumps to FOR or LOOP statements and re-executes test and loop.

**Arguments**

The CONTINUE statement does not have any arguments.

**Description**

The CONTINUE statement is used within the code block of a FOR...NEXT or LOOP...REPEAT statement. CONTINUE causes execution to immediately jump back to the FOR or LOOP keyword, starting a new iteration of the loop. The FOR or LOOP statement evaluates its test condition, and, based on that evaluation, may re-execute the code block loop.

**Example**

The following example illustrates the use of the CONTINUE statement:

```basic
FOR i=1 TO 10
  PRINT i
  IF i=5 THEN CONTINUE
  ELSE PRINT "not five"
NEXT
PRINT "all done"
```

**See Also**

- FOR...NEXT statement
- LOOP...REPEAT statement
- EXIT statement
- GOTO statement
CONVERT

Replaces single characters in a string.

CONVERT charsout TO charsin IN string

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>charsout</td>
<td>One or more characters to be replaced. Any expression that resolves to a valid string or numeric.</td>
</tr>
<tr>
<td>charsin</td>
<td>The character or characters to be inserted in place of the corresponding characters in charsout. Any expression that resolves to a valid string or numeric.</td>
</tr>
<tr>
<td>string</td>
<td>The string in which character substitutions are made. An expression that resolves to a valid string. string may be a dynamic array. string accepts a single dynamic array reference (A&lt;i&gt;), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A&lt;i&gt;[s,l]).</td>
</tr>
</tbody>
</table>

Description

The CONVERT statement edits the value of string by replacing all instances of single characters in charsout with single characters from charsin. CONVERT performs a character-for-character substitution. Matching of characters is case-sensitive.

CONVERT can be used as follows:

- To remove all instances of a character from a string, specify the character to be removed in charsout and a null string in charsin. For example, to remove the # character from mystring: CONVERT "#" TO "" IN mystring
- To replace all instances of a character in a string with another character, specify the character to be replaced in charsout and the replacement character in charsin. For example, to replace all instances of the # character with the * character in mystring: CONVERT "#" TO "*" IN mystring
- To replace all instances of a list of single characters with corresponding other single characters, specify those characters to be replaced in charsout and the corresponding replacement characters in charsin. For example, to replace all instances in mystring of the each lowercase letter a, b, c, and d with the corresponding uppercase letter: CONVERT "abcd" TO "ABCD" IN mystring
- To both replace some single characters and remove others, specify those characters to be replaced or removed in charsout. First specify those to be replaced, then those to be removed. Specify the corresponding replacement characters in charsin, and nothing for the characters to be removed. For example, to replace all instances of + with &, and to remove all instances of # in mystring: CONVERT "+#" TO \\&" IN mystring

The value of charsout and charsin can be a string or a numeric. If numeric, the value is converted to canonical form (plus sign, leading and trailing zeros removed) before performing the CONVERT operation.

If charsout contains more characters than charsin, the unpaired characters are deleted from string. If charsin contains more characters than charsout, the unpaired characters are ignored and have no effect.

Note: CONVERT performs single character one-for-one substitution for all instances in a string. The CHANGE function performs substring replacement, and can specify how many instances to replace and where to begin replacement.

The CONVERT statement and the CONVERT function perform the same operation, with the following difference: the CONVERT statement changes the supplied string; the CONVERT function returns a new string with the specified changes and leaves the supplied string unchanged.
Examples
The following example illustrates use of the CONVERT statement in converting a string to a dynamic array by replacing the # character with a Value Mark level delimiter character:

```
cities="New York#Chicago#Boston#Los Angeles"
CONVERT "#" TO CHAR(253) IN cities
PRINT cities
```

See Also
- CONVERT function
- CHANGE function
- SWAP statement
- Strings
**CREATE**

Creates a file for sequential access.

```
CREATE filevar [THEN statements][ELSE statements]
```

### Arguments

| filevar | A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ. |

### Description

The **CREATE** statement is used to create a file for sequential access. To create a file, you must first issue an **OPENSEQ** statement, giving the fully-qualified pathname for the file you wish to create. Because the file does not yet exist, the **OPENSEQ** appears to fail, taking its ELSE clause and setting the value returned by the **STATUS** function to -1. However, the **OPENSEQ** sets its filevar to an identifier for the specified file pathname. You then supply this filevar to **CREATE** to create a new file.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file creation is successful, the THEN clause is executed. If file creation fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

The **CREATE** statement is:

- Optional if the first operation you perform on the new file is to issue a **Writeseq**. If you issue an **OPENSEQ** and then issue a **WRITESEQ**, this first write operation automatically creates the file.
- Mandatory if the first operation you perform on the new file is to issue a **WRITEBLK**. The **CREATE** creates the file, and then you may issue a **WRITEBLK** to write to the file.

You can use the **STATUS** function to determine the status of the file creation operation. A successful file creation returns a status of 0. A failed file creation returns a status of -1, for any of the following reasons:

- The directory specified in **OPENSEQ** does not exist. **CREATE** can create a file, but not the directory to contain the file. You can create the directory after issuing an **OPENSEQ** and then use the filevar returned by **OPENSEQ** to create the file.
- The file already exists.
- The specified filevar is invalid.

After creating a file, you can use the **STATUS** statement to obtain file status information. The file is open for read and write operations. You can use **CLOSESEQ** to release an open file, making it available to other processes.

### Examples

The following example creates a new sequential file on a Windows system:
OPENSEQ "C:/myfiles/test1" TO mytest
  IF STATUS()=0
  THEN PRINT "File already exists"
  END
ELSE PRINT STATUS(); ! returns -1
  CREATE mytest
  IF STATUS()=0
  THEN PRINT "File created"
  ELSE PRINT "File create failed"
END

See Also

• OPENSEQ statement
• CLOSESEQ statement
• WRITEBLK statement
• WRITESEQ statement
• STATUS statement
• STATUS function
CRT

Displays on the terminal screen.

```markdown
CRT [text]
CRT text [format]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>text</td>
<td>Optional — Any MVBasic expression that resolves to a quoted string or a numeric. You can specify a single expression or a series of expressions separated by either commas (,) or colons (:). A comma inserts a tab spacing between the two strings. A colon concatenates the two strings. If text is omitted, a blank line is returned.</td>
</tr>
<tr>
<td>format</td>
<td>Optional — A code specifying how to handle text, specified as a quoted string. This format is applied to the text that immediately precedes it. Whitespace characters may be inserted between text and format.</td>
</tr>
</tbody>
</table>

**Description**

**CRT** displays one or more text items on the terminal screen. This text can consist of any number of text strings separated by commas or colons. Any text may be followed by an optional format. This format applies only to the text string that immediately precedes it.

**CRT** does not send its output to an open PRINTER channel, which allows **CRT** to be executed without using PRINTER OFF and PRINTER ON.

A text can consist of a single string or numeric expression, or a series of expressions alternating with separator characters. If no text is specified, **CRT** returns a blank line.

The following separators are supported:

- A comma (,) used as a separator character inserts a predefined tab between to items. By default, tabs are set at ten column intervals. You can specify a comma before the first expression to indent that expression. You cannot specify a comma after the last expression; this results in a syntax error. You can specify a series of commas to specify multiple tabs; an odd number of commas increments the number of tabs. Thus, one or two commas (exp, exp or exp,, exp) equals one tab, three or four commas (exp,,, exp or exp,,,, exp) equals two tabs, and so forth.
- A colon (:) used as a separator character concatenates two items. Specifying a colon before the first expression has no effect. Specifying a colon after the last expression enables concatenation of the results of two commands. By default, a CRT statement ends by issuing a linefeed and carriage return. However, if you end the CRT argument with a colon, CRT does not issue the linefeed and carriage return. This enables you to concatenate the output of the next statement to the CRT output.

The **DISPLAY** and **CRT** commands are identical. The **PRINT** command is similar to **CRT**, but provides additional functionality.

**Formatting**

The optional format argument specifies how to handle text. **CRT** supports three types of format arguments:

- @ function formatting
- implicit formatting, using FMT function codes
- implicit conversion, using OCONV function codes
You can use an @ function with positive arguments to specify the column position and/or line position at which to print. For example, CRT @(15):"Over here!" prints the literal string starting at column 16. You can also use the @ function with negative arguments to change screen display modes. For example, CRT @(-1):"Over here!" clears the screen, then prints the literal string at line 1, column 1.

You can use the optional format argument to specify display width, justification, fill characters, and zero filling or rounding for decimal digits. This is known as “implicit formatting” because it is equivalent to inserting a FMT function as one of the CRT arguments. For further details on the available format codes, refer to the FMT function.

You can disable implicit formatting by specifying $OPTIONS NO.IMPLICIT.FMT. Specifying this option prevents the evaluation of the format argument in CRT, PRINT, or DISPLAY. It has no effect on the explicit use of the FMT function.

Implicit conversion performs many of the OCONV function conversions by specifying the conversion code as the format argument. For example, both of the following perform date conversion from internal to display format:

```
CRT 14100 "D";               ! "08 AUG 2006"
CRT OCONV(14100,"D");       ! "08 AUG 2006"
```

For further details on the available format conversion codes, refer to the OCONV function.

**Examples**

The following examples illustrate the use of the CRT command:

```
CRT "hello","world":!*"
returns:

hello    world!
```

**See Also**

- DISPLAY statement
- PRINT statement
- @ function
- FMT function
- SPACE function
**DATA**

Provides user input data.

```
DATA exp [,exp2][,. . .]
```

**Arguments**

| exp          | An expression to use as user input data. It can be a literal or a defined variable. You can specify a comma-separated list of multiple expressions. |

**Description**

The **DATA** statement defines one or more input values on an input stack for future use. A **DATA** value is taken from the input stack by the next **INPUT** statement, rather than pausing program execution for user input.

You can specify a comma-separated list of **DATA** values; these are used successively by multiple invocations of the **INPUT** statement.

A **DATA** value of the empty string (**DATA ""**) is treated as an actual data value: If the optional length parameter of a subsequent **INPUT** statement is set to -1, **INPUT** sets `variable` to 1 (indicating that there is input available). If the **INPUT** statement has a **THEN** clause, **INPUT** executes the statements associated with **THEN** clause as if the user had entered data from the keyboard.

You can use **CLEARDATA** to flush all remaining data stored by a **DATA** statement.

You cannot use **DATA** to supply a character to the **KEYIN** function.

**See Also**

- **INPUT** statement
- **CLEARDATA** statement
DEBUG

Interrupts program execution to enter debug mode.

Arguments

None.

Description

The DEBUG statement interrupts program execution by issuing a break to another stack level and issues a prompt. From this point you can issue debug commands, including returning to the execution of the interrupted program.

By default, a command issued at the debug prompt is an ObjectScript command. To issue a Caché MVBasic statement at the debug prompt, you must prefix a semicolon to the command. This is shown in the following terminal example:

```
USER:;myvar="ABC"
USER:;DEBUG
<BREAK>+1^MV BASIC1048.mvi
Source Id: File: Line:0
USER 7d1>WRITE "my variable=",myvar
my variable=ABC
USER 7d1>;CRT "my variable",myvar
my variable    ABC
USER 7d1>
```

The ;/ Statement

At the debug prompt, you can use the ;/ statement to display the contents of a variable. The variable may be subscripted. The syntax is as follows:

```
;/varname
```

The ;/ statement returns varname=value. It can be used to display the value of a local variable, an array dimensioned with DIM, a variable defined using EQUATE, or a variable defined in a COMMON statement.

The ;/ statement can return COMMON variables that are defined in different accounts (namespaces).

See Also

- ; (semicolon) command in the MultiValue Commands Reference
**DEFFUN**

Declares a user-defined function

```plaintext
DEFFUN name [(args)] [CALLING routine]
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The name of an existing user-defined function. This cannot be the name of any existing system-provided (built-in) function. Name validation is performed on name.</td>
</tr>
<tr>
<td>args</td>
<td>Optional — An argument, or comma-separated list of arguments for the function. Arguments can be subscripted. If one or more arguments are specified, the enclosing parentheses are mandatory.</td>
</tr>
<tr>
<td>CALLING routine</td>
<td>Optional — Used to map an identifier to a valid name. Either an identifier, or a quoted string literal that begins with the asterisk (*) character. No name validation is performed on routine.</td>
</tr>
</tbody>
</table>

### Description

The `DEFFUN` statement allows you to declare an existing user-defined function, placing it in the function lookup table. This operation only declares the function's name and argument list. Prior to invoking `DEFFUN`, the function must have been defined, using the `FUNCTION` statement.

The CALLING clause is commonly used to map an invalid function name (routine) to a valid user-defined function name (name). User-defined function names cannot begin with a punctuation character (except %); built-in function names often begin with a punctuation character. You can use a CALLING clause to map one to the other. In the optional CALLING clause, the routine name can be a quoted string literal function name beginning with an asterisk (*), as follows:

```plaintext
DEFFUN foo(x,y,z) CALLING "*foo"
```

In this example, `DEFFUN` allows calls to appear in expressions using the ordinary identifier `foo`, while the name `*foo` is passed to the runtime execution. The leading asterisk specifies how to look up this function name. In Caché MultiValue and most emulations, the asterisk is both part of the function name and an indicator specifying how to look up this function. In UniData emulation, the asterisk is removed from the function name and serves only as a lookup indicator. For further details, refer to the CALL statement.

### Examples

The following example illustrates the use of the `DEFFUN` statement:

```plaintext
DEFFUN cuberoot(mynum,precision)
CRT cuberoot(mynum,precision)
```

### See Also

- CALL statement
- FUNCTION statement
**DEL**

Deletes an element from a dynamic array.

```
DEL dynarray <f[,v[,s]]>
```

**Arguments**

<table>
<thead>
<tr>
<th>dynarray</th>
<th>Any valid dynamic array.</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>An integer specifying the Field (attribute) level of the dynamic array on which to perform the deletion. Fields/Attributes are counted from 1.</td>
</tr>
<tr>
<td>v</td>
<td>Optional — An integer specifying the Value level of the dynamic array on which to perform the deletion. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td>s</td>
<td>Optional — An integer specifying the Subvalue level of the dynamic array on which to perform the deletion. Subvalues are counted from 1 within a Value.</td>
</tr>
</tbody>
</table>

**Description**

The **DEL** statement deletes one element from a dynamic array. It deletes both the data and the dynamic array delimiter. Which element to delete is specified by the `f`, `v`, and `s` integers. The enclosing angle brackets are mandatory. For example, if `f`=2 and `v`=3, this means delete the third value from the second field. If `f`=2 and `v` is not specified, this means to delete the entire second field.

The **DEL** statement and the **DELETE** function perform the same operation, with the following difference: **DEL** changes the supplied dynamic array; **DELETE** creates a new dynamic array with the specified change and leaves the supplied dynamic array unchanged.

**Examples**

The following example uses the **DEL** statement to delete the second value from the first field of a dynamic array:

```cache
cities="New York":@VM:"London":@VM: "Chicago":@VM:"Boston":@VM: "Los Angeles"
PRINT cities ! Returns: "New YorkýLondonýChicagoýBostonýLos Angeles"
DEL cities <1,2>
PRINT cities    ! Returns: "New YorkýChicagoýBostonýLos Angeles"
```

**See Also**

- **COUNTS** function
- **DELETE** function
- **EXTRACT** function
- Dynamic Arrays
DELETE, DELETEU

Deletes a record from a MultiValue file.

```
DELETE filevar,recID
  [SETTING var]  [LOCKED statements]  [ON ERROR statements]  [THEN statements]  [ELSE statements]

DELETEU filevar,recID
  [SETTING var]  [LOCKED statements]  [ON ERROR statements]  [THEN statements]  [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>filevar</th>
<th>A local variable used as the file identifier of an open MultiValue file. This variable is set by the OPEN statement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>recID</td>
<td>The record ID of the record to be deleted.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The DELETE statement deletes a record from a MultiValue file. The DELETEU statement performs the same operation, but does not release an existing update lock if one was established.

You must use the OPEN statement to open a file before issuing either of these DELETE statements.

You can optionally specify a LOCKED clause, which is executed if DELETE or DELETEU could not delete the specified record due to lock contention. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause. If record delete fails, the ON ERROR clause is executed. This may occur if the filevar file has already been closed. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the record delete is successful, the THEN clause is executed. If record delete is attempted but fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

DELETE completes successfully if the recID refers to a non-existent record.

**Examples**

The following example illustrates the use of the DELETE statement:

```
OPEN "Myfile.Test" TO myfile
DELETE myfile,myrec ON ERROR PRINT "no delete"
```
See Also

- OPEN statement
- READ statement
- WRITE statement
- CLEARFILE statement
- STATUS function
DELETELIST

Deletes a saved select list.

```
DELETELIST listname
```

**Arguments**

| listname | A name assigned to a saved select list. |

**Description**

The **DELETELIST** statement deletes a saved select list. The select list was saved using **WRITELIST**.

The `listname` select list is saved in the `&SAVEDLISTS&` file. Caché stores this file using the `^SAVEDLISTS` global.

**See Also**

- **WRITELIST** statement
DELETESEQ

Deletes a sequential file.

```
DELETESEQ filename [SETTING setvar] [LOCKED statements] [ON ERROR statements] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filename</td>
<td>The file to be deleted. A fully-qualified Windows or UNIX® file pathname, specified as a quoted string. For two-part versions of this argument, see the Emulation section below.</td>
</tr>
<tr>
<td>SETTING setvar</td>
<td>A variable used to hold the system return code. Because this comes from the underlying operating system, values are platform-dependent. However, all supported platforms return 0 for successful completion. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause.</td>
</tr>
</tbody>
</table>

**Description**

The DELETESEQ statement is used to delete a sequential access file.

The filename must be a fully-qualified pathname. The directories specified in filename must exist for a file delete to be successful. File names are not case-sensitive.

You can optionally specify a LOCKED clause, which is executed if DELETESEQ could not delete the specified sequential access file due to lock contention. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause, which is executed if the file is located but could not be deleted. If no ON ERROR clause is present, the ELSE clause is taken for this type of error condition. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file delete is successful, the THEN clause is executed. If file delete fails (for example, the file does not exist), the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the STATUS function to determine the status of the sequential file delete operation, as follows: 0=success; 1=file does not exist; 2=path does not exist; 3=access denied; 4=the file is a directory; 5=the file is locked by another MV process; 6=the file is in use; -1=unexpected error; -2=delete failed for platform-dependent reason, see setvar for further explanation.

**File Locking**

Issuing OPENSEQ gives a process exclusive access to the specified file. An OPENSEQ locks the file against a DELETESEQ issued by any other process. This lock persists until the process that opened the file releases the lock, by issuing a CLOSE, a CLOSESEQ, or a RELEASE statement.
Emulation

For jBASE emulation, the *filename* argument can be specified with a two-part *path, filename* syntax. When executed, the two parts are concatenated together, with a delimiter added to the end of *path*, when necessary. For example, `DELETESEQ 'c:\temp\', 'mytest.txt'` or `DELETESEQ 'c:\temp', 'mytest.txt'`.

For other emulation modes, the *filename* argument can be specified with a two-part *file, itemID* syntax. The *file* part is a dir-type file defined in the VOC master dictionary, and the *itemID* part is an operating system file within that directory.

See Also

- CREATE statement
- OPENSEQ statement
- READSEQ statement
- WRITESEQ statement
- FLUSH statement
- NOBUF statement
- CLOSESEQ statement
- RELEASE statement
- STATUS statement
- FILEINFO function
- STATUS function
- @FILENAME system variable
DIM (DIMENSION)

Dimensions an array of variables.

```
DIM array([rows[,columns]])[,array2([rows[,columns]])][,...]
DIMENSION array([rows[,columns]])[,array2([rows[,columns]])][,...]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>array</strong></td>
<td>Name of an array. Follows standard variable naming conventions. Can be a single array or a comma-separated list of arrays.</td>
</tr>
<tr>
<td><strong>rows</strong></td>
<td>Optional — A positive, non-zero integer specifying the number of array elements to dimension for a one-dimensional (vector) array, or the number of rows to dimension for a two-dimensional array. Maximum value is 65535. A value less than 1 or greater than 65535 results in an &lt;ARRAY DIMENSION&gt; error.</td>
</tr>
<tr>
<td><strong>columns</strong></td>
<td>Optional — For two-dimensional (matrix) arrays, a positive, non-zero integer specifying the number of columns per row. Can only be used in conjunction with the <strong>rows</strong> argument. Maximum value is 65535. A value less than 1 or greater than 65535 results in an &lt;ARRAY DIMENSION&gt; error.</td>
</tr>
</tbody>
</table>

**Description**

The **DIMENSION** and **DIM** keywords are synonyms.

The **DIM** statement can be used in two ways: explicitly, to dimension a one-dimensional or two-dimensional array, or implicitly to dimension a multidimensional array.

- Most MultiValue systems require you to explicitly dimension the **rows** and **columns** of a static array. These values specify the maximum number of elements that can be defined for that array. An explicitly dimensioned array is limited to two subscripts. It can be either one-dimensional, representing a vector array, or two-dimensional, representing the rows and columns of a matrix array. A one-dimensional array can be dimensioned either as a vector array: **DIM arrayname(n)** or a matrix array with a column dimension of 1: **DIM arrayname(n,1)**.

- Caché MVBasic also allows you to dimension arrays of an arbitrary number of dimensions. This allows MVBasic to support the multidimensional arrays used in Caché. You specify a multidimensional array using a **DIM** statement with empty parentheses: **DIM arrayname()**. This declares **arrayname** as a dimensioned array, but the number of dimensions and number of elements in each dimension may be expanded dynamically at runtime.

If a subroutine or function uses a static array (for example, **DIM myarray(2)**), the static array must be dimensioned within the subroutine or function. However, if a subroutine or function uses an array of unspecified dimensions (for example, **DIM myarray()**), you may specify the **DIM** either within or outside the subroutine or function.

The subscripts of a dimensioned array can be specified using named variables, as well as numeric indices. Variables whose names begin with a % are known as public arrays and their values are preserved across SUBROUTINE calls in a similar manner to COMMON arrays. Variables whose names begin with ^ are known as globals and their values are stored on disk automatically. Variables with normal naming conventions are known as local arrays and their value is lost when the program terminates, as with any other variable.

To clear data from an implicitly dimensioned array, use $kill. This clears any values that have been assigned.
Note: When executing a DIM statement from the MVBasic command shell, you must assign and use the array elements within the same command line. For example:

```vbnet
USER:;DIM x(),y() ;x(1)="fred" ;y(2)="betty" ;CRT x(1),y(2)
```

Attempting to reference a dimensioned array in a subsequent command line results in a MVBasic syntax error.

You cannot DIM the same array twice in a DIM statement. You cannot DIM an array that has already been declared using the COMMON statement. Attempting to do so results in a compile error.

You can use the EXISTS function or the $DATA function to determine if a variable or array node has been defined.

All uninitialized variables are treated as zero-length strings (""").

### Using Dimensioned Arrays

You can use the INMAT function to return the defined dimensions of a static array.

### Emulation

IN2, INFORMATION, PIOpen, Prime, UniData, and UniVerse respond to an undimensioned array element by issuing a runtime <UNDEFINED> error. Other emulations respond to an undimensioned array element by issuing a compile-time syntax error.

### Examples

The following examples illustrate the use of the DIM statement:

```
! Dimensions a one-dimensional array with 10 elements.
DIM MyVector(10)

! Dimensions a two-dimensional matrix array
! with 10 rows and 10 columns.
DIM MyMatrix(10,5)

! Dimensions a two-dimensional array using local variables
DIM MyMatrix(myrows,mycols)

! Dimension a local array of arbitrary size and subscript type.
DIM MyLocal()
    MyLocal(88) = "88"
    MyLocal(88,"The") = "The 88"
    MyLocal("Hello") = "World!"
```

### Notes

Caché MVBasic does not require the dimension of arrays to be specified, and therefore does not implement the ReDim Statement.

### See Also

- COMMON statement
- MAT statement
- MATBUILD statement
- MATPARSE statement
- MATREAD statement
- MATWRITE statement
- $DATA function
- EXISTS function
• INMAT function
• Variables
DISPLAY

Displays on the terminal screen.

```
DISPLAY [text]
DISPLAY text [format]
```

**Arguments**

<table>
<thead>
<tr>
<th>text</th>
<th>Optional — Any MVBasic expression that resolves to a quoted string or a numeric. You can specify a single expression or a series of expressions separated by either commas (,) or colons (:). A comma inserts a tab spacing between the two strings. A colon concatenates the two strings. If text is omitted, a blank line is returned.</th>
</tr>
</thead>
<tbody>
<tr>
<td>format</td>
<td>Optional — A code specifying how to handle text, specified as a quoted string. This format is applied to the text that immediately precedes it. Whitespace characters may be inserted between text and format.</td>
</tr>
</tbody>
</table>

**Description**

**DISPLAY** is identical in function to the **CRT** statement. Please refer to the **CRT** statement for further information.

**See Also**

- CRT statement
- PRINT statement
- FMT function
**ECHO**

Suppresses user input display on the screen.

```
ECHO {OFF | ON}
ECHO {expression}
```

**Arguments**

| expression | A MVBasic expression that resolves to a boolean value, either 0 (off) or 1 (on). You can also specify these values using the keywords OFF and ON. The default is 1. |

**Description**

The `ECHO` statement suppresses or allows the display of input characters on the terminal screen. If set to OFF, or 0, echoing of user input on the terminal screen is suppressed. If set to ON, or 1, user input is echoed on the terminal screen. One common use for `ECHO` is when entering a password, using the `INPUT` statement. `ECHO OFF` suppresses display of the input password; the password is written to the `INPUT` variable.

The `ECHO` statement suppresses screen display of user input. The `HUSH` statement suppresses All screen display.

**Examples**

The following example illustrates the use of the `ECHO` statement:

```
PRINT "Type your username"
INPUT uname
ECHO OFF
PRINT "Type your password"
INPUT pword
ECHO ON
```

**See Also**

- `HUSH` statement
- `CRT` statement
- `PRINT` statement
- `INPUT` statement
**END**

Terminates a block of code or a program.

**Arguments**

None.

**Description**

The `END` statement has three uses:

- As a clause terminator
- As a statement terminator
- As a routine terminator

**Clause Terminator**

When used as a clause terminator, the `END` keyword terminates execution of a block of code.

`END` is used as part of an `IF...THEN` statement, where it terminates execution of the block of code for the current clause of the `IF...THEN` statement.

`END` is used as part of a multiline `LOCKED` clause, `ON ERROR` clause, `THEN` clause, or `ELSE` clause, where it terminates execution of the block of code.

Block code clauses have specific line break requirements:

- Each block code statement must appear on its own line.
- The `LOCKED`, `ON ERROR`, `THEN`, or `ELSE` keyword cannot precede a block code statement on the same line.
- The `END` keyword can appear on its own line, or can appear at the end of the final block code statement line. The code line `END ELSE` (concluding a multiline `THEN` clause and beginning an `ELSE` clause) is also valid.

The following are valid syntactic forms:

```plaintext
command args
THEN
statement1
statement2
END
ELSE
statement1
statement2
END

command args THEN
statement1
statement2 END
ELSE
statement1
statement2 END

command args THEN
statement1
statement2 END
ELSE
statement1
statement2 END
```

60 Caché MultiValue Basic Reference
**Statement Terminator**

The `END` keyword is used with another keyword in a few statements to indicate the end of the code encompassed by that statement. These uses are:

- `BEGIN CASE ... CASE ... END CASE`
- `BEGIN TRANSACTION ... END TRANSACTION`
- `TRY ... CATCH ... END TRY`

**Routine Terminator**

When used outside of a block structure clause `END` terminates routine or program execution. Commands following an `END` statement are not executed. If additional lines of code appear after the `END` statement, Caché (and all emulation modes), by default, generates an error: “Unexpected line outside of program”. You can set `$OPTIONS IGNORE.EXTRA.LINES` to ignore lines that appear after the `END` statement, rather than issuing an error message.

**See Also**

- `GOTO` statement
- `$OPTIONS` statement
- `IF...THEN` statement
- `RETURN` statement
END TRANSACTION

Specifies where to continue execution after a transaction.

END [TRANSACTION | WORK]

Description

The END TRANSACTION statement specifies the end of a transaction. This is where to continue program execution following a COMMIT statement or a ROLLBACK statement.

If an END TRANSACTION is encountered before either a COMMIT or a ROLLBACK, the current transaction is rolled back.

The TRANSACTION or WORK keywords are optional and provides no functionality. They are provided solely for compatibility with other MultiValue vendor products.

Note: Caché MVBasic supports two sets of transaction statements:

- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.
- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.

These two sets of transaction statements should not be combined.

Example

The following example performs database operations within a transaction. It sets a variable x, which determines whether the transaction should be committed or rolled back.

```
PRINT "Before the transaction"
BEGIN TRANSACTION
  ...
  IF x=0 THEN COMMIT
  ELSE ROLLBACK
END
PRINT "Transaction rolled back"
END TRANSACTION
PRINT "After the transaction"
```

See Also

- BEGIN TRANSACTION statement
- COMMIT statement
- ROLLBACK statement
**ENTER**

Transfers control to an external subroutine.

<table>
<thead>
<tr>
<th>ENTER name</th>
</tr>
</thead>
</table>

**Arguments**

- **name** Name of the external subroutine to call.

**Description**

The **ENTER** statement can be used to call an external subroutine. The external subroutine must have been compiled and cataloged. No parameters can be passed using **ENTER**; use **CALL** if you need to pass parameters to a subroutine. When **ENTER** is used to call an external subroutine, the **RETURN** statement within the external subroutine does not return control to calling program; use **CALL** if you need to return following a subroutine call.

**ENTER** calls the external subroutine without increasing the stack level. This can be useful when issuing a large number of calls without returning. Because **ENTER** is not increasing the stack level, a <FRAMESTACK> error cannot occur.

You can use **name** to specify the external subroutine either directly or indirectly:

- The **name** argument can specify the exact name under which the subroutine was cataloged.
- The **name** argument can specify the name of a variable that contains the name of the subroutine. A variable of this type is prefaced with the @ symbol. A variable name can be a local variable, or an element of an array.

You can also use the **COMMON** statement to make specified variables available to all external subroutines.

**ENTER, CALL, GOSUB, and SUBR**

The **ENTER** statement is used to call an external subroutine with no parameter passing or return, and without increasing the stack level. The **CALL** statement is used to call an external subroutine with parameter passing and returning. **CALL** increases the stack level.

The **GOSUB** statement is used to call an internal subroutine. The **SUBR** function is used to call an external subroutine that returns a value.

**Examples**

The following example uses **ENTER** to call an external subroutine:

```cacheml
Main
  x="Burma"
  PRINT x ! Returns "Burma"
  ENTER ErrorSub
  PRINT x ! Does not execute

ErrorSub
  PRINT "An error occurred"
  QUIT
```

**See Also**

- **CALL** statement
- **COMMON** statement
- **RETURN** statement
- **SUBROUTINE** statement
Caché MultiValue Basic Commands

- **END** statement
- **DIM** statement
- **GOSUB** statement
- **SUBR** function
EQUATE

Replaces a symbol with a value at compile time.

| EQUATE symbol TO expression [, ...] |
| EQU symbol TO expression [, ...] |
| EQUATE symbol LITERALLY str [, ...] |
| EQU symbol LIT str [, ...] |

**Arguments**

- **symbol**: The placeholder symbol to be replaced, specified as one or more characters. The first character must be a letter or percent sign (%). Subsequent characters may be letters, numbers, percent sign (%), underscore (_), or dollar sign ($). The final character may not be an underscore.
- **expression**: The value used to replace all instances of `symbol` at compile time. Any valid Caché MVBasic expression.
- **str**: The string used to replace all instances of `symbol` at compile time. Specified as a quoted string.

**Description**

**EQUATE** replaces every instance of `symbol` in the program with the specified expression or variable. **EQUATE** performs this substitution at compile time. Therefore, the value replaced is not affected by program execution. **EQUATE** can be used to replace executable statements in the program. Variables perform substitutions during program execution and cannot be used to modify the program’s executable code.

You can specify multiple `symbol TO expression` and `symbol LITERALLY str` clauses in any combination as a comma-separated list. You can insert line breaks as needed following a comma separator.

**EQUATE** treats a sequence of words separated by -> as a single entity. For example:

```plaintext
EQUATE vin TO car(?)
AutoCheck->>vin = vin
returns AutoCheck->>vin = car(?).
```

The **EQUATE** keyword can be abbreviated as **EQU**. The **LITERALLY** keyword can be abbreviated as **LIT**.

**Examples**

The following example replaces at compile time every instance of the symbol `addlength` with the expression `BYTE-LEN(x)+20` or `LEN(x)+10`, depending on the setting of the Unicode variable:

```plaintext
IF Unicode=1
THEN EQUATE addlength TO BYTELEN(x)+20
ELSE EQUATE addlength TO LEN(x)+10
```

The following example replaces at compile time every instance of the symbol `letters` with the contents of the variable `alpha`:

```plaintext
EQUATE letters LITERALLY "alpha"
BEGIN CASE
  CASE lang=English
    alpha="abcdefghijklmnopqrstuvwxyz"
  CASE lang=Greek
    alpha="αβγδεζηθικλμνξοπρστυφψχζ" µ
  END CASE
```

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See Also

- Variables
ERRMSG

Displays the specified error message.

ERRMSG errcode [,val1[,val2]]

Arguments

<table>
<thead>
<tr>
<th>errcode</th>
<th>An expression that resolves to a MultiValue error code; commonly (but not always) specified as a positive integer. The error code can be specified as a literal or as a expression that resolves to a literal value. A non-numeric literal value must be specified as a quoted string.</th>
</tr>
</thead>
<tbody>
<tr>
<td>val</td>
<td>Optional — A comma-separated list of one or argument values inserted into the error message text. These argument values can be specified as literals or as expressions that resolve to literals. A non-numeric literal value must be specified as a quoted string.</td>
</tr>
</tbody>
</table>

Description

ERRMSG displays the error message text corresponding to the errcode error code. Error messages are defined in the ERRMSG file. An error message text commonly includes the error code (in square brackets) as part of the message.

If you specify a errcode value that does not correspond to an error code, ERRMSG displays the string “Errmsg” with the error code in square brackets.

If you specify one or more val arguments, ERRMSG displays the errcode error message text with these val arguments inserted in the message. If the errcode error message does not take an inserted value, the val argument is ignored. If the errcode value does not correspond to an error code, ERRMSG returns the “Errmsg” string with val appended and followed by a caret (^) separator character.

Examples

The following examples return an error message that does not take a supplied value:

ERRMSG 94
ERRMSG 94,24
ERRMSG 94,"test1","test2"

all of these return: [94] End of file.

The following examples return an error message that takes one supplied value:

ERRMSG 40
ERRMSG 40,24
ERRMSG 40,"test1","test2"

these return:

[40] Program '' has not been compiled.
[40] Program '24' has not been compiled.
[40] Program 'test1' has not been compiled.

The following examples specify a num value that does not correspond to an error code:

ERRMSG 50
ERRMSG 50,24
ERRMSG 50,"test1","test2"

these return:

Errmsg[50]
Errmsg[50]24^
Errmsg[50]test1^test2^
For a list of error codes and corresponding error messages, see Error Messages in the Caché MultiValue Commands Reference.

See Also

- ABORTE statement
- STOPE statement
EXECUTE

Executes a MultiValue command from within a program, passing and returning values.

Use any of the following three syntactical forms:

**EXECUTE command**

```
[CAPTURING {dynarray | NULL} | OUTPUT oref]
[PASSLIST [dynarray]]
[RTNLIST var]
[{SETTING | RETURNING} dynarray]
```

**EXECUTE command**

```
[, IN < expression]
[, OUT > var]
[, SELECT[ (list) ] < dynarray]
[, SELECT[ (list) ] > var]
[, PASSLIST[ (dynarray) ]]
[, STATUS > var]
```

**EXECUTE command**

```
[ ,//IN. < expression]
[ ,//OUT. > var]
[ ,//SELECT.[ (list) ] < dynarray]
[ ,//SELECT.[ (list) ] > var]
[ ,//PASSLIST.[ (dynarray) ]]
[ ,//STATUS. > var]
```

**Arguments**

| **command** | One or more MultiValue commands, each command specified as a quoted string. A string can be quoted using single quotes ('cmd arg'), double quotes ("cmd arg"), or backslashes (\cmd arg\). To specify multiple commands, separate the commands with a Field Mark ("cmd1 arg":@FM:"cmd2 arg"). |
| **var** | A variable used to hold a value. |
| **dynarray** | A dynamic array. |
| **oref** | An object reference. The corresponding class must have (at minimum) a WriteLine() method (which inserts a newline at the end of the write operation) and a Write() method (which does not insert a newline). |

**Description**

The **EXECUTE** command executes the specified Caché MultiValue command(s), then returns execution to the next MVBasic statement following the **EXECUTE**. It initially searches the VOC for the **command**; if the **command** is not found in the VOC, it searches the global catalog. For lookup details, refer to CATALOG in the Caché MultiValue Commands Reference.

The first syntactical form supports the following optional clauses:

- The **CAPTURING** clause diverts all terminal output from the MultiValue command to the supplied **dynarray** variable. This output is stored as a dynamic array, with lines separated by Field Marks. If **command** executes successfully, the resulting terminal output is captured; if **command** fails, the error message is captured. **CAPTURING NULL** discards all terminal output, with the following exceptions: Output from the **OUT** statement is displayed. Output from non-MultiValue commands or shell commands cannot be captured, and is therefore displayed. If **command** includes the **HUSH ON** command, output is not stored in **dynarray** based on that command, and terminal display is disabled upon return from the **EXECUTE** command.
• The OUTPUT clause diverts all terminal output from the MultiValue command to the supplied oref. (One use of this object is to invoke a class from which you can execute write methods to write to a sequential file.) This is especially useful when handling extremely large command outputs (>3.6 Mbytes). The following example:

```apl
oref = "%Stream.FileCharacter"->%New()
EXECUTE "LIST BIGFILE ID-SUPP A1" OUTPUT oref
```
directs the output to the standard Caché %Stream class using the standard Write() and WriteLine() methods. An object derived from a user-written class can be used if it has both a Write() and WriteLine() method, as shown in the example below. A WriteLine() method ends by forcing a new line; a Write() method does not force a new line.

If an error occurs, such as specifying a filevar that is not an existing sequential file, EXECUTE fails without displaying an error message. It is the programmer’s responsibility to check the @SYSTEM.RETURN.CODE for -1, indicating an error. If using a Unicode version of Caché, you must change the file translation in the locale. The OUTPUT clause and the CAPTURING clause are mutually exclusive.

• The PASSLIST clause supplies the specified dynarray to the executed command as the current default external select list.

• The RTNLIST clause receives the default select list (if any) produced by the executed command.

• The RETURNING clause receives the ERRMSG error message string with which the command terminated. The format is a dynamic array containing the ERRMSG number followed by the parameters.

The second and third syntactical forms support the following optional clauses:

• The IN clause specifies the input value for command.

• The OUT clause assigns the output from command to var. The var variable must be simple variable name. It cannot include a system variable, an EQUATE, a dynamic array reference, or a substring reference.

• The PASSLIST clause supplies the specified dynarray to the executed command as the current default external select list.

• The STATUS clause var variable contains the execution status of the last executed list or select command. If the command completed successfully, var contains the number of items listed, selected, or otherwise processed. If the command failed, var contains -1. If the specified command name is not a valid command, var contains -1. Commands that do not list or select items do not set var; var is set to 0 regardless of whether the command succeeded or failed. var can be a simple variable, or a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

**EXECUTE, PERFORM, and CHAIN**

The EXECUTE command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement. EXECUTE can pass values to the MultiValue command(s) and return values from the MultiValue command(s).

The PERFORM command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement. PERFORM cannot pass or return values.

The CHAIN command executes a single MultiValue command from within MVBasic. It does not return execution to MVBasic. CHAIN cannot pass values.

**Emulation**

In Reality emulation, EXECUTE executes all stacked data, regardless of list status. In Caché and all other emulations, only the EXECUTE command argument is executed. For all emulations (except Reality) EXECUTE either clears or maintains stacked data on the DATA queue, depending on the STACK.GLOBAL option.
EXECUTE supports the STACK.GLOBAL option, which can be set using $OPTIONS. When STACK.GLOBAL is on, EXECUTE does not clear unused items from the DATA queue upon completion. By default, STACK.GLOBAL is on for Caché, and for UniVerse, UniData, PICK, Prime, PIOpen, and IN2 emulations. STACK.GLOBAL is off for all other emulations.

In jBASE emulation, the RTNLIST clause returns the select list expanded to a dynamic array. All other emulations return the select list name. The PASSLIST clause requires that the select list be designated as external. This external select list bit setting is only used for jBASE emulation.

EXECUTE supports the RETURNING.CODE option, which can be set using $OPTIONS.

In UniData and UDPICK emulations, a command name with an initial character of * is handled as a global name. EXECUTE removes the leading * and then looks up the resulting command name in the global catalog in SYS.MV, rather than looking up in the VOC. If the runtime environment is not a UniData emulation, a normal VOC lookup is done on the *command name.

Invoking Other Command Shells

You can use the $EXECUTE command to issue an ObjectScript command from within Caché MVBasic.

You can use the PCPERFORM command to issue an operating system command from within Caché MVBasic.

Examples

The following example issues the MultiValue LISTME command, captures its output in the dynamic array variable currusers and then returns execution to the MVBasic program:

```mv
PRINT TIME()
EXECUTE "LISTME" CAPTURING currusers
PRINT TIME()
PRINT currusers
```

The following example shows how to use EXECUTE to execute multiple MultiValue commands:

```mv
PRINT TIME()
EXECUTE "SLEEP 2":@FM:"SLEEP 3"
PRINT TIME()
```

This following example directs output to a sequential file using the OUTPUT clause. It uses the standard Caché-supplied %Stream.FileCharacter class, which uses an operating system file as temporary storage. The location of the file is determined by the class itself, although a method allows you to override the default location. This example uses the default location. Once the object is closed, the temporary file is deleted. In this example, the size of the output from the LIST command is limited only by the maximum size of the file:

```mv
* Execute the LIST command to an object.
* oref = "%Stream.FileCharacter"->%New()
EXECUTE "LIST BIGFILE ID-SUPP A1 SAMPLE 100" OUTPUT oref
* * Read back that object, one line at a time.
* oref->Rewind()
lineno = 1
LOOP WHILE oref->AtEnd = 0 DO
line = oref->ReadLine()
PRINT lineno "R%4":": " : OCONV(line,"MCP")
lineno = lineno + 1
REPEAT
```

The following example uses an OUTPUT clause with a user-defined MVExecute.Output class:
The following is the definition of this user-defined MVExecute.Output class. It contains the required Write() and WriteLine() methods, and a ReadLine() method:

```
Class MVExecute.Output Extends %Persistent
{
    Property LineCount As %Integer;
    Property Lines As array Of %String;
    Method Write(line As %String) As %Integer [ Language = mvbasic ]
    {
        IF NOT(@ME->LineCount) THEN
            @ME->LineCount = 1
            dummy = @ME->Lines->SetAt("",1)
        END
        LineNew = @ME->Lines->GetAt(@ME->LineCount) : line
        dummy = @ME->Lines->SetAt(LineNew , @ME->LineCount)
        RETURN 0
    }
    Method WriteLine(line As %String) As %Integer [ Language = mvbasic ]
    {
        IF NOT(@ME->LineCount) THEN
            @ME->LineCount = 1
            dummy = @ME->Lines->SetAt("",1)
        END
        LineNew = @ME->Lines->GetAt(@ME->LineCount) : line
        dummy = @ME->Lines->SetAt(LineNew , @ME->LineCount)
        @ME->LineCount = @ME->LineCount + 1
        RETURN 0
    }
    Method ReadLine(LineNumber As %Integer) As %String [ Language = mvbasic ]
    {
        IF LineNumber LE 0 OR LineNumber GT @ME->LineCount THEN RETURN "??"
        RETURN @ME->Lines->GetAt(LineNumber)
    }
}
```

See Also

- CHAIN statement
- OUT statement
- PERFORM statement
- STATUS function
- ObjectScript: XECUTE command
EXIT

Exits a LOOP...REPEAT or FOR...NEXT statement.

Arguments

The EXIT statement takes no arguments.

Description

The EXIT statement can only be used within a LOOP...REPEAT or FOR...NEXT control structure to provide an alternate way to exit the loop. EXIT transfers control to the statement immediately following the end of the loop structure (the NEXT or REPEAT keyword).

Any number of EXIT statements may be placed anywhere in the block of code statements. EXIT is commonly used with the evaluation of some condition (such as an IF...THEN statement).

When used within nested loop statements, EXIT only exits the loop in which it occurs; EXIT transfers control to the loop that is nested one level above the exited loop.

The GOTO statement can also be used to exit from a loop control structure. The CONTINUE statement exits from the current iteration of a loop; the EXIT statement exits from the loop.

Emulation

In jBASE emulation mode, EXIT has both an argumentless and an argumented form.

- EXIT without an argument is used to exit a loop, as described above. The keyword BREAK without an argument can also be used for this purpose.
- EXIT with an argument is used to exit a program and return the argument value. The argument is commonly an integer code value.

See Also

- FOR...NEXT statement
- LOOP...REPEAT statement
- GOTO statement
- CONTINUE statement
FILELOCK

Locks a MultiValue file.

FILELOCK [filevar] [,locktype] [ON ERROR statements] [LOCKED statements]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>Optional — A file variable name used to refer to a MultiValue file. This filevar is supplied by the OPEN statement. If not specified, the default file is locked.</td>
</tr>
<tr>
<td>locktype</td>
<td>Optional — The type of lock requested, specified by the keyword SHARED or EXCLUSIVE. If not specified, the default is EXCLUSIVE.</td>
</tr>
</tbody>
</table>

Description

The FILELOCK statement is used to lock a MultiValue file. It takes the file identifier filevar, defined by the OPEN statement.

You can optionally specify a LOCKED clause. This clause is executed if filevar refers to a file that has already been locked by another user. The clause is executed if locktype conflicts with an existing lock. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

If a file is locked by another user, the STATUS function returns the process ID (pid) of the user holding the lock.

You can optionally specify an ON ERROR clause. If file lock fails, the ON ERROR clause is executed. This may occur if filevar does not refer to a currently open file. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can release a file lock by issuing a FILEUNLOCK, issuing a RELEASE with no record ID, or by closing the file.

File and Record Locking

A FILELOCK is equivalent to taking a RECORDLOCK on all records in the file. For FILELOCK to exclusively lock a file, not only must no other user have a conflicting FILELOCK, but no other user may have a RECORDLOCKU or RECORDLOCKL for any record of the file. You can check the status of file locks and record locks using the RECORD-LOCKED function.

Lock Promotion

If you have a shared lock on a file, then request an exclusive lock on the same file, MVBasic attempts to get the exclusive lock. If it is successful, your shared lock is promoted to an exclusive lock. The result is that you hold one exclusive lock, not two locks.

See Also

- OPEN statement
- FILEUNLOCK statement
- RELEASE statement
- **RECORDLOCKED** function
- **STATUS** function
FILEUNLOCK

Unlocks a MultiValue file.

FILEUNLOCK [filevar] [ON ERROR statements]

Arguments

| filevar | Optional — A file variable name used to refer to a MultiValue file. This filevar is supplied by the OPEN statement. If not specified, the default file is unlocked. |

Description

The FILEUNLOCK statement is used to unlock a MultiValue file, undoing the lock established by FILELOCK. FILEUNLOCK only releases locks established by FILELOCK. It does not release record locks; record locks can be released using the RELEASE statement. You can check the status of file locks and record locks using the RECORDLOCKED function.

You can unlock a MultiValue file by issuing a FILEUNLOCK, by issuing a RELEASE with no record ID, or by closing the file.

FILEUNLOCK takes the file identifier filevar, defined by the OPEN statement.

You can optionally specify an ON ERROR clause. If file unlock fails, the ON ERROR clause is executed. This may occur if filevar does not refer to a currently open file. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

See Also

- CLOSE statement
- FILELOCK statement
- RELEASE statement
- STATUS statement
- RECORDLOCKED function
- STATUS function
FIND

Finds an element of a dynamic array by exact value.

FIND data IN dynarray SETTING f[,v[,s]] [THEN statements] [ELSE statements]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>The data value of an element. This value must be the complete value of the element.</td>
</tr>
<tr>
<td>dynarray</td>
<td>Any valid dynamic array.</td>
</tr>
<tr>
<td>f</td>
<td>A variable that receives an integer denoting the Field level of the dynamic array where the element data was found. Fields are counted from 1.</td>
</tr>
<tr>
<td>v</td>
<td>Optional — A variable that receives an integer denoting the Value level of the dynamic array where the element data was found. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td>s</td>
<td>Optional — A variable that receives an integer denoting the Subvalue level of the dynamic array where the element data was found. Subvalues are counted from 1 within a Value.</td>
</tr>
</tbody>
</table>

Description

The FIND statement locates the data value in a dynamic array and returns its location by setting the f, v, and s variables to integers. For example, if data is located in the third Value of the second Field, FIND sets f=2 and v=3.

The data value must be an exact match with the full value of an element in dynarray. It cannot be a substring of an element value. Matching is case-sensitive. If data does not match an element value, f, v, and s are unchanged and retain their previous values.

The f, v, and s arguments accept a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If data is located in dynarray, the THEN clause is executed. If data is not located in dynarray, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

The FIND statement returns the f, v, and s position of a dynamic array element by specifying the element's exact value. The FINDSTR statement returns the f, v, and s position of a dynamic array element by specifying a substring found in that element. The EXTRACT function returns the value of a dynamic array element by specifying its f, v, and s position.

You can use the <> operator or the REPLACE function to replace an element value in a dynamic array based on position. For further details, see the Dynamic Arrays page of this manual.

Examples

The following example uses the FIND statement to find the second value from the first field of a dynamic array:

cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
FIND "London" IN cities SETTING v,f,s
PRINT v,f,s

See Also

• FINDSTR statement
• **LOCATE** statement
• **EXTRACT** function
• **REPLACE** function
• Dynamic Arrays
• Strings
• Variables
FINDSTR

Finds an element of a dynamic array by substring value.

```
FINDSTR substring IN dynarray[,occurrence] SETTING fm[,vm[,sm]] [THEN statements]
[ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>substring</td>
<td>A string to match against each element in <code>dynarray</code>.</td>
</tr>
<tr>
<td>dynarray</td>
<td>The target dynamic array in which <code>substring</code> is located.</td>
</tr>
<tr>
<td>occurrence</td>
<td>Optional — An integer that specifies which occurrence of substring to return <code>dynarray</code>. The default is 1.</td>
</tr>
<tr>
<td>fm</td>
<td>Variables that receive an integer specifying the Field Mark (fm) Value Mark (vm) and Subvalue Mark (sm) where <code>substring</code> is located in <code>dynarray</code>. For further information on these level delimiters, see the Dynamic Arrays page of this manual.</td>
</tr>
<tr>
<td>vm</td>
<td></td>
</tr>
<tr>
<td>sm</td>
<td></td>
</tr>
</tbody>
</table>

**Description**

The `FINDSTR` statement searches a dynamic array for the specified substring. If it locates the substring, it sets integer count variables specifying which element of the dynamic array contains the substring. By default, it locates the first occurrence of `substring` in the dynamic array, reading left to right. You can set the optional `occurrence` argument for subsequent occurrences of `substring` in the dynamic array.

If `FINDSTR` finds `substring`, it sets `fm`, `vm`, and `sm` to an integer count. If dynamic array delimiters for a lower level do not exist, `FINDSTR` sets this level's variable (`vm` and/or `sm`) to 1. If `substring` is not located, `fm`, `vm`, and `sm` are not modified, and continue to hold their previous values.

The `fm`, `vm`, and `sm` arguments accept a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

You can optionally specify a `THEN` clause, an `ELSE` clause, or both a `THEN` and an `ELSE` clause. If `substring` is located in `dynarray`, the `THEN` clause is executed. If `substring` is not located in `dynarray`, the `ELSE` clause is executed. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a `THEN`, `ELSE`, or `END` keyword on that line.

The `FINDSTR` statement returns the `f`, `v`, and `s` position of a dynamic array element by specifying a substring found in that element. The `FIND` statement returns the `f`, `v`, and `s` position of a dynamic array element by specifying the element's exact value. The `EXTRACT` function returns the value of a dynamic array element by specifying its `f`, `v`, and `s` position.

**Examples**

The following example shows how to use the `FINDSTR` statement:

```
statecity="Kansas":@VM:"Kansas City":@VM:"Topeka"
@FM:"Missouri":@VM:"St Louis":@VM:"Kansas City"
FOR x=1 TO 5
  FINDSTR "Kansas" IN statecity,x SETTING f,v,s
  PRINT f,v,s
NEXT
```

This example returns the following values for `f`, `v`, and `s`:
See Also

- FIND statement
- EXTRACT function
- REPLACE function
- Dynamic Arrays
- Strings
- Variables
FLUSH

Flushes (immediately applies) writes to a sequential I/O file.

```
FLUSH filevar [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>filevar</th>
<th>A file variable name used to refer to a MultiValue sequential I/O file. This filevar is supplied by the OPENSEQ statement.</th>
</tr>
</thead>
</table>

**Description**

The **FLUSH** statement flushes the I/O buffer for a MultiValue sequential file. That is, it immediately performs any pending file I/O WRITESEQ operations. It takes the file identifier `filevar`, defined by the **OPENSEQ** statement.

You can optionally specify a **THEN** clause, an **ELSE** clause, or both a **THEN** and an **ELSE** clause. If the file buffer flush is successful (the specified file exists), the **THEN** clause is executed. If the buffer flush fails (the specified file does not exist), the **ELSE** clause is executed. The `statements` argument can be the **NULL** keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a **THEN**, **ELSE**, or **END** keyword on that line.

Caché MVBasic also provides a **NOBUF** statement, which disables I/O buffering, causing all subsequent I/O operations to be immediately issued to the sequential file.

**See Also**

- **OPENSEQ** statement
- **WRITESEQ** statement
- **NOBUF** statement
FOOTING

Prints a footer at the bottom of each output page.

**FOOTING** [ON channel] footer

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>channel</td>
<td>Optional — An integer that specifies a logical print channel. The default is 0.</td>
</tr>
<tr>
<td>footer</td>
<td>The footer to print on output pages, specified as a string enclosed in double quotation marks. This footer can consist of any combination of literal text and code characters. Code character letters are enclosed in single quote characters, and are not case-sensitive.</td>
</tr>
</tbody>
</table>

### Description

The **FOOTING** statement prints a footer at the bottom of each page of printed output text. The **footer** can consist of a literal text and code characters that either specify text (for example, include the current date), or control the printing of footer text (for example, center the footer). A **footer** is always enclosed in double quotation marks. To include letter code characters, enclose them in single quotation marks. To include a literal single quotation mark, double it. For example: "Mary''s Report".

The **FOOTING** operation can be reversed using **PRINTER RESET**, which resets the footing (and heading) to null.

The optional **channel** specifies the logical print channel for this output. The range of available values is -1 through 255 (inclusive). If **channel**=-1, output is displayed on the terminal screen. If **channel** is not specified, the default logical print channel is 0.

The following are the available code characters that supply footer text:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'D'</td>
<td>Include current date formatted as dd mmm yyyy. For example, 11 Sep 2006.</td>
</tr>
<tr>
<td>'T'</td>
<td>Include current time and date formatted as hh:mm:ss dd mmm yyyy. Time is in 12–hour format with “am” or “pm” appended. For example, 7:45:22pm 11 Sep 2006.</td>
</tr>
<tr>
<td>'P'</td>
<td>Include current page number, right-aligned. The default alignment is 4 digits. You can specify a larger or smaller alignment by appending an integer to 'P'. For example, 'P2'. This code specifies the page number position and alignment; the <strong>PAGE</strong> statement defines the actual page number value.</td>
</tr>
<tr>
<td>'S'</td>
<td>Include current page number, left-aligned. This code specifies the page number position and alignment; the <strong>PAGE</strong> statement defines the actual page number value.</td>
</tr>
<tr>
<td>'R'</td>
<td>Include record ID, left-justified.</td>
</tr>
</tbody>
</table>

The 'S' and 'P' code characters specify whether an increasing number of digits (1, 10, 100, etc.) should expand the page number to the left or to the right. These code characters can be included at any point within the text of a footer. The page number appears at that point, either left-aligned ('S') or right-aligned ('P'). By default, both 'S' and 'P' are left-justified. To right-justify a page number, use the 'G' code, as follows: 'GS' or 'GP'.

The following are the available code characters that format footer text:
| 'C'  | Center the footer. You can adjust centering alignment by appending an integer to 'C'. For example, 'C15'. You can also center a footer using the 'G' code character. |
| 'G'  | Insert spaces to evenly distribute the footer across the full available width. You can specify multiple 'G' codes within a footer. |
| 'L'  | Line break. Text after line break defaults to left-justified. |
| 'N'  | Suppress automatic paging. |
| 'Q'  | Treat \, ], and ^ as literals, not code characters for rest of footer. |

By default, a footer is left-justified. To right-justify a footer, specify a 'G' before the footer text: "'G'Annual Report". To center a footer, specify a 'G' before and after the text: "'G'Annual Report'G'". To spread out the parts of a footer, specify a 'G' between literals in the footer: "'G'Annual'G'Report'G'".

By default, the backslash (\), right square bracket (\]), and caret (^) are code characters. To include these characters as literals in a footer, use the 'Q' code character. Any instances of these three characters following the 'Q' code in the footer are treated as literals, not code characters.

The FOOTING statement places text at the bottom of each page. The HEADING statement places text at the top of each page. The PAGE statement advances printing to the next page and prints any defined heading or footing on that page.

**Examples**

The following example centers the current date at the bottom of each page. Note that the footer must be enclosed in double quotation marks, even when there is no literal footer text:

FOOTING "'CD'"

The following example centers two lines of footer, with the page number right-justified on the first footer line:

FOOTING "'G'Big Widgets Corporation'GS''LC'First Quarter Report"

The following example left-justifies two lines of footer, with the page number at the end of the first footer line and the time and date at the end of the second footer line. Note that the punctuation code characters are not enclosed in single quotes:

FOOTING "Big Widgets Corporation\]First Quarter Report \"

**See Also**

- HEADING statement
- PAGE statement
- PRINTER statement
- PRINTER RESET statement
FORMLIST

Selects field ids into a numbered select list.

FORMLIST dynarray [TO listnum] [ON ERROR statements]
FORMLIST [filevar] [TO listnum] [ON ERROR statements]

Description
The FORMLIST statement is functionally identical to the SELECT statement.

See Also
- SELECT statement
FOR...NEXT

Repeats a group of statements a specified number of times.

```
FOR var = start TO end
    [STEP increment]
    [WHILE expression]
    [UNTIL expression]
    statements
NEXT [var]
```

Arguments

The FOR...NEXT statement syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>var</td>
<td>A numeric variable used as a loop counter. var must be a local variable. It can be a % variable. It can be a subscripted array. var cannot be an @ variable, a global variable, or an object property. It cannot be an element of a user-defined type.</td>
</tr>
<tr>
<td>start</td>
<td>Initial value of counter.</td>
</tr>
<tr>
<td>end</td>
<td>Final value of counter.</td>
</tr>
<tr>
<td>STEP increment</td>
<td>Optional — The STEP clause sets the amount the counter is changed each time through the loop. increment can be a positive or negative integer. If a STEP clause is not specified, increment defaults to 1. If increment is 0, FOR...NEXT loops infinitely.</td>
</tr>
<tr>
<td>WHILE expression</td>
<td>Optional — The WHILE and UNTIL clauses specify a test condition for exiting the FOR loop. You can omit or specify either clause, or specify both clauses in any order.</td>
</tr>
<tr>
<td>UNTIL expression</td>
<td></td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements between FOR and NEXT that are executed the specified number of times.</td>
</tr>
</tbody>
</table>

Description

The FOR...NEXT statement begins with a FOR keyword with var=start TO end to establish a loop counter. This is followed by one or more optional clauses: STEP, WHILE, and UNTIL. The loop itself consists on one or more executable statements. The FOR loop is ended by the mandatory NEXT keyword.

The counter functions as follows:

- If start < end, the loop executes the specified number of times.
- If start = end, the loop executes once.
- If start > end, the loop does not execute.

Most commonly, start and end are positive integers. They can, however, be positive or negative integers or decimal numbers. The optional STEP clause sets an increment (or decrement) for the counter. By default, the counter increments by 1. The increment argument can be either positive (increment) or negative (decrement). Most commonly increment is an integer, but it can be a decimal number. An increment of 0 causes an infinite loop.

Once the loop starts and all statements in the loop have executed, increment is added to the counter. At this point, either the statements in the loop execute again (based on the same test that caused the loop to execute initially), or the loop is exited and execution continues with the statement following the NEXT keyword.

You can nest FOR...NEXT loops by placing one FOR...NEXT loop within another. Give each loop a unique variable name as its counter. The following construction is correct:
FOR i = 1 TO 10
 FOR j = 1 TO 10
   FOR k = 1 TO 10
     ! Some statements
   NEXT
 NEXT
NEXT

You can use a `CONTINUE` statement to interrupt a loop and return to the counter.

**Notes**

Changing the value of counter while inside a loop can make it more difficult to read and debug your code.

**FOR and GOTO**

Caché MVBasic permits you to exit or enter a `FOR` loop using a `GOTO` statement. This implementation of `GOTO` follows MultiValue standards, and is less restrictive than the ObjectScript standard for `GOTO` statements.

**FOR.INCR.BEF**

Caché MVBasic supports `FOR.INCR.BEF` as the Caché default. This option increments the `FOR` loop counter before performing bounds checking. To perform bounds checking before incrementing the loop, specify `$OPTIONS –FOR.INCR.BEF` to turn off this option.

**See Also**

- `CONTINUE` statement
- `EXIT` statement
- `GOTO` statement
- `LOOP...REPEAT` statement
- `IF...THEN` statement
FUNCTION

Defines an external function.

FUNCTION name[(arglist)]
    [statements]
    RETURN(returnval)

Arguments

<table>
<thead>
<tr>
<th>name</th>
<th>Name of the FUNCTION; follows standard variable naming conventions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>arglist</td>
<td>Optional — List of variables specifying arguments that are passed to the FUNCTION procedure when it is called. Multiple arguments are separated by commas. The arglist is enclosed with parentheses.</td>
</tr>
<tr>
<td>statements</td>
<td>A group of statements to be executed within the body of the FUNCTION procedure.</td>
</tr>
<tr>
<td>returnval</td>
<td>Return value of the FUNCTION. If no return value is specified, FUNCTION returns the empty string.</td>
</tr>
</tbody>
</table>

Description

The FUNCTION statement defines an external function that returns a value to the invoking procedure. This FUNCTION procedure is visible to all other procedures in your script. The values of local variables in a FUNCTION are not preserved between calls to the procedure.

The FUNCTION statement is very similar to SUBROUTINE, except that FUNCTION returns a value. Like a SUBROUTINE procedure, a FUNCTION procedure is a separate procedure that can take arguments, perform a series of statements, and change the values of its arguments. However, unlike a SUBROUTINE procedure, you can use a FUNCTION procedure on the right side of an expression in the same way you use any intrinsic function.

There cannot be a label on the FUNCTION statement line. The FUNCTION statement must be the first line in the external function, with the following exceptions: comment lines, $OPTIONS statements, $COPYRIGHT statements, and DIM statements that do not dimension a static array. For example, DIM Var() and DIM abc are permitted, but DIM Var(2) is not.

There can only be one FUNCTION statement in an external function (no nested functions). You can’t define a FUNCTION procedure inside another FUNCTION or inside a SUBROUTINE procedure.

Before invoking a function, it must be locally defined using the DEFFUN statement.

Examples

The following two examples show the definition of a function and the invocation of that function:

FUNCTION IsGreaterThan(lower, upper)
    IF lower < upper
        THEN RETURN(1)
        ELSE RETURN(0)
    DEFFUN IsGreaterThan(x,y)
    CRT IsGreaterThan(x,y)

See Also

- DEFFUN statement
- DIM statement
• **RETURN** statement
• **SUBROUTINE** statement
GET(ARG.)

Retrieves the next command line argument.

GET(ARG.[,n]) variable [THEN statements] [ELSE statements]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Optional — An integer specifying which command line argument to retrieve. The default is the first unread argument (the next argument).</td>
</tr>
<tr>
<td>variable</td>
<td>A local variable used to hold the value of the command line argument retrieved.</td>
</tr>
</tbody>
</table>

Description

The GET(ARG.) statement retrieves a command line argument, copying its value into variable. Each time you invoke GET(ARG.) it updates a command line pointer. Therefore, repeated invocation of GET(ARG.) without the n argument results in the sequential retrieval of each command line argument in left-to-right order.

The keyword ARG. (note the period at end of this keyword) and the surrounding parentheses are mandatory.

You can use the optional n value to retrieve a command line argument by its integer position in the command line argument list. Command line arguments are counted from 1. If n=0, GET(ARG.) retrieves the next command line argument.

GET(ARG.) considers all values following the program name to be command line arguments. Command line arguments are separated by blank spaces; a blank space within a quoted string is not treated as a command line argument separator.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the command line argument retrieval is successful, the THEN clause is executed. If there are no command line arguments, no more command line arguments, or if you specify a value of n that does not correspond to a command line argument, or a negative value for n, GET(ARG.) executes the ELSE clause. If no ELSE clause in provided, GET(ARG.) returns the empty string to variable. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

The GET(ARG.) statement both moves the command line argument pointer and retrieves the argument value. The SEEK(ARG.) statement just moves the command line argument pointer. The EOF(ARG.) function returns whether or not the command line argument pointer is past the end of the list of command line arguments.

See Also

- SEEK(ARG.) statement
- EOF(ARG.) function
GETLIST

Retrieves a saved select list.

```
GETLIST listname [TO listnum] [SETTING variable] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>listname</td>
<td>A record ID assigned to a saved select list.</td>
</tr>
<tr>
<td>TO listnum</td>
<td>Optional — A numbered select list, specified as an integer from 0 through 10. If omitted, select list 0 is used.</td>
</tr>
<tr>
<td>SETTING variable</td>
<td>Optional — An integer count returned, which contains the number of elements in the specified select list.</td>
</tr>
</tbody>
</table>

**Description**

The `GETLIST` statement retrieves a saved select list, making it available to the `READNEXT` statement. You specify the `listname` specifying the storage location of the select list, and the `listnum` of a numbered active select list into which to copy it. The select list was saved using `WRITELIST`.

The `listname` select list is saved in the &SAVEDLISTS& file. Caché stores this file using the ^SAVEDLISTS global.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the saved select list retrieval is successful, the THEN clause is executed. If saved select list retrieval fails (`listname` does not exist), the ELSE clause is executed. The `statements` argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

**See Also**

- `READNEXT` statement
- `WRITELIST` statement
GOSUB

Transfers program execution to a label, with return option.

GOSUB label

Arguments

| label | Any valid label. The label name can be optionally followed by a colon (:) |

Description

The GOSUB statement is used to transfer execution to the line of code identified by label. This label identifies an internal subroutine that is executed until a RETURN statement is encountered. Execution then reverts to the line immediately following the GOSUB statement.

Under the following circumstances control does not revert to the line following the GOSUB statement: The internal subroutine invokes an ENTER statement, or the internal subroutine terminates with an END statement.

The label argument value corresponds to line of code identified by a label identifier. Non-numeric labels end with a colon character; this colon is option when specifying the label argument.

The GOSUB statement is similar to GOTO, except that GOSUB permits a RETURN. The ON statement provides a way to select one of several GOSUB labels, based on an integer value.

Emulation

jBASE emulation uses the ONGO.RANGE option setting for handling out-of-range label values.

Examples

The following example illustrates the use of the GOSUB statement:

```plaintext
IF TIME()=0 THEN
   GOSUB Midnight:
   PRINT "Delayed", TIME()
ELSE
   PRINT TIME()
END IF
Midnight:
PRINT "It's midnight, time is reset to 0"
SLEEP 1
RETURN
```

See Also

- GOTO statement
- RETURN statement
- END statement
- ON statement
- Labels
GOTO

Transfers program execution to a label.

```
GOTO label
G label
```

**Arguments**

| label | Any valid label. The label name can be optionally followed by a colon (:) |

**Description**

The GOTO statement is used to transfer execution to the line of code identified by `label`. The label argument value corresponds to line of code identified by a label identifier. Numeric labels do not use a colon suffix. Non-numeric labels end with a colon character; this colon is option when specifying the label argument.

G is an abbreviation for the GOTO statement. The GOSUB statement is similar to GOTO, except that it permits a RETURN. The ON statement provides a way to select one of several GOTO labels, based on an integer value.

Commonly, GOTO is used within a code block of an IF...THEN statement.

GOTO can be used to exit from a FOR...NEXT or LOOP...REPEAT loop. You can also use the EXIT statement to cause execution to jump out of a FOR...NEXT or LOOP...REPEAT loop. You can use the CONTINUE statement to cause execution to jump back to the FOR or LOOP statement to perform the next loop iteration.

GOTO can be used to enter the middle of a FOR...NEXT or LOOP...REPEAT loop. This use of GOTO is generally not recommended, and is not supported in other Caché languages, such as ObjectScript.

**Emulation**

jBASE emulation uses the ONGO.RANGE option setting for handling out-of-range label values.

**Examples**

The following examples illustrate the use of the GOTO statement with numeric and non-numeric labels:

**Numeric label:**

```
IF TIME()=0 THEN
  GOTO 20
ELSE
  PRINT Time()
END IF
END
20
  PRINT "It's midnight, time is reset to 0"
END
```

**Non-numeric label:**

```
IF TIME()=0 THEN
  GOTO Midnight
ELSE
  PRINT Time()
END IF
END
Midnight:
  PRINT "It's midnight, time is reset to 0"
END
```
See Also

- **GOSUB** statement
- **ON** statement
- **IF...THEN** statement
- **EXIT** statement
- **FOR...NEXT** statement
- **LOOP...REPEAT** statement
- **CONTINUE** statement
- **Labels**
HEADING

Prints a header at the top of each output page.

HEADING [ON channel] header

Arguments

<table>
<thead>
<tr>
<th></th>
<th>Optional — An integer that specifies a logical print channel. The default is 0.</th>
</tr>
</thead>
<tbody>
<tr>
<td>channel</td>
<td>The header to print on output pages, specified as a string enclosed in double quotation marks. This header can consist of any combination of literal text and code characters. Code character letters are enclosed in single quote characters, and are not case-sensitive.</td>
</tr>
</tbody>
</table>

Description

The **HEADING** statement prints a header at the top of each page of output text. This output text can be displayed on a terminal (by default) or directed to a printer (by specifying PRINTER ON).

The header can consist of a literal text and code characters that either specify text (for example, include the current date), or control the printing of header text (for example, center the header). A header is always enclosed in double quotation marks. To include letter code characters, enclose them in single quotation marks. To include a literal single quotation mark, double it. For example: "Mary''s Report".

The **HEADING** operation can be reversed using PRINTER RESET, which resets the heading (and footing) to null.

The optional **channel** specifies the logical print channel for this output. The range of available values is -1 through 255 (inclusive). If **channel**=-1, output is displayed on the terminal screen. If **channel** is not specified, the default logical print channel is 0.

The following are the available code characters that supply header text:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>'D'</td>
<td>Include current date formatted as dd mmm yyyy. For example, 11 Sep 2006.</td>
</tr>
<tr>
<td>'T'</td>
<td>Include current time and date formatted as hh:mm:ss dd mmm yyyy. Time is in 12–hour format with “am” or “pm” appended. For example, 7:45:22pm 11 Sep 2006.</td>
</tr>
<tr>
<td>'P'</td>
<td>Include current page number, right-aligned. The default alignment is 4 spaces. You can specify a larger or smaller alignment by appending an integer to ‘P’. For example, ‘P2’. ‘PP’ prints the page number twice, both right aligned 4 spaces. This code specifies the page number position and alignment; the <strong>PAGE</strong> statement defines the actual page number value.</td>
</tr>
<tr>
<td>'S'</td>
<td>Include current page number, left-justified. This code specifies the page number position and alignment; the <strong>PAGE</strong> statement defines the actual page number value.</td>
</tr>
<tr>
<td>'R'</td>
<td>Include record ID, left-justified.</td>
</tr>
</tbody>
</table>

The 'S' and 'P' code characters specify whether an increasing number of digits (1, 10, 100, etc.) should expand the page number to the left or to the right. These code characters can be included at any point within the text of a header. The page number appears at that point, either left-aligned ('S') or right-aligned ('P'). By default, both 'S' and 'P' are left-justified. To right-justify a page number, use the 'G' code, as follows: 'GS' or 'GP'.

The following are the available code characters that format header text:
### Center header

<table>
<thead>
<tr>
<th>Char</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'C'</td>
<td>Center the header. You can adjust centering alignment by appending an integer to 'C'. For example, 'C15'. You can also center a header using the 'G' code character.</td>
</tr>
<tr>
<td>'G'</td>
<td>Insert spaces to evenly distribute the header across the full available width. You can specify multiple 'G' codes within a header.</td>
</tr>
<tr>
<td>'L'</td>
<td>Line break. Text after line break defaults to left-justified.</td>
</tr>
<tr>
<td>'N'</td>
<td>Suppress automatic paging.</td>
</tr>
<tr>
<td>'Q'</td>
<td>Treat , ], and ^ as literals, not code characters for rest of header.</td>
</tr>
</tbody>
</table>

By default, a header is left-justified. To right-justify a header, specify a 'G' before the header text: "'G'Annual Report". To center a header, specify a 'G' before and after the text: "'G'Annual Report'G'". To spread out the parts of a header, specify a 'G' between literals in the header: "'G'Annual'G'Report'G'".

By default, the backslash (\), right square bracket (]), and caret (^) are code characters. To include these characters as literals in a header, use the 'Q' code character. Any instances of these three characters following the 'Q' code in the header are treated as literals, not code characters.

To clear an existing heading, specify **HEADING CHAR(255)**. If you specify more than one HEADING statement in a program, MVBasic issues a form feed before executing the second (and all subsequent) HEADING statement(s).

The **HEADING** statement places text at the top of each page. The **FOOTING** statement places text at the bottom of each page. The **PAGE** statement advances printing to the next page and prints any defined heading or footing on that page.

### Emulation

IN2, jBASE, MVBase, PICK, Reality, R83, POWER95, Ultimate: in these emulation modes, the **HEADING** statement is immediately applied when issued.

D3: The initial **HEADING** statement is immediately applied when issued. Subsequent **HEADING** statements are applied following either the end of a page or the issuing of a **PAGE** statement. This does not apply if **PRINTER ON** is immediately followed by a **PAGE** statement, or if a **PRINT** statement is followed by **HEADING**.

jBASE: 'PP' includes the page number right aligned 4 spaces.

Reality: 'P' includes the page number with no alignment; 'PP' includes the page number right aligned 4 spaces.

In Cache MultiValue Basic, the **HEADING** is applied to only the current output device. For example, if you specify **HEADING** for the terminal page header, then specify **PRINTER ON**, you must specify **HEADING** again for the printer page header. In D3, MVBase, and Reality, if you specify **HEADING** for the terminal page header, then specify **PRINTER ON**, the terminal header is inherited by printer channel 0.

### Examples

The following example centers the current date at the top of each page. Note that the header must be enclosed in double quotation marks, even when there is no literal header text:

```
HEADING "'CD'"
```

The following example centers two lines of header, with the page number right-justified on the first header line:

```
HEADING "'G'Big Widgets Corporation'GS'"'LC'First Quarter Report"
```

The following example left-justifies two lines of header, with the page number at the end of the first header line and the time and date at the end of the second header line. Note that the punctuation code characters are not enclosed in single quotes:

```
HEADING "'C'Current Time: 'T'Date: 'D"'
```
See Also

- FOOTING statement
- PAGE statement
- PRINTER statement
- PRINTER RESET statement
HUSH

Suppresses all screen display.

```
HUSH [ON | OFF | flag] [SETTING var]
```

**Arguments**

<table>
<thead>
<tr>
<th>flag</th>
<th><em>Optional</em> — An expression that evaluates to a boolean value. 0=disable hushing. 1 (or any non-zero number)=enable hushing. The same boolean values can be supplied using the ON or OFF keyword.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETTING var</td>
<td><em>Optional</em> — A variable that <code>HUSH</code> sets to the hush state (0 or 1) prior to invoking the command. This clause is useful for restoring the prior <code>HUSH</code> state setting.</td>
</tr>
</tbody>
</table>

**Description**

The `HUSH` statement is used to enable or disable all output display to the screen. It can be executed using the ON or OFF keyword, or by using a boolean `flag` value. `HUSH` with no arguments toggles the current hush state.

When `HUSH` is ON, all screen output is disabled, both user input and program output, including display of the programmer prompt. This distinguishes it from the `ECHO` statement, which only disables the display of user input.

The `HUSH` statement *does not* disable display of output from the `OUT` statement.

**See Also**

- `ECHO` statement
- `OUT` statement
**IF...THEN...ELSE**

Conditionally executes a group of statements, depending on the value of an expression.

```
IF condition THEN statements
IF condition ELSE elsestatements
IF condition THEN statements ELSE elsestatements

IF condition
[THEN
  statements
END]
[ELSE
  elsestatements
END]
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>An expression that evaluates to <strong>True</strong> or <strong>False</strong>. For further details on</td>
</tr>
<tr>
<td></td>
<td>boolean logical operators, refer to the Operators page of this manual.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements executed if <code>condition</code> is <strong>True</strong>.</td>
</tr>
<tr>
<td>elsestatements</td>
<td>One or more statements executed if no previous <code>condition</code> expression is</td>
</tr>
<tr>
<td></td>
<td><strong>True</strong>.</td>
</tr>
</tbody>
</table>

### Description

The **IF** statement performs a boolean test on `condition`, and then executes either the THEN clause (`condition=1` (true)) or the ELSE clause (`condition=0` (false)).

You can omit or include either the THEN clause or the ELSE clause. If `condition=1` and the THEN clause is omitted, or `condition=0` and the ELSE clause is omitted, **IF** returns the empty string. Further **IF** statements can be nested within THEN or ELSE clauses.

**IF** can be coded as a single-line statement, or as a code block statement using the **END** keyword. You can use any of the single-line forms for short, simple tests. However, the block form provides more structure and flexibility than the single-line form and is usually easier to read, maintain, and debug.

When executing a block **IF**, `condition` is tested. If `condition` is **True**, the statements following **THEN** are executed. If `condition` is **False**, the statements following **ELSE** are executed. After executing the statements following **THEN** or **ELSE**, execution continues with the statement following **END**.

What follows the **THEN** keyword is examined to determine whether or not a statement is a block **IF**. If anything other than a comment appears after **THEN** on the same line, the statement is treated as a single-line **IF** statement.

For a block **IF** statement, the **IF** keyword must be the first statement on a line. The block **IF** must end with an **END** statement.

The `condition` expression can be a compound expression, using `=` (equal to), `#` (not equal to), and other the comparison operators. You can use literals, variables, and dynamic arrays as `condition` expression elements. Multiple test expressions can be associated by AND and OR logical operators.

### See Also

- **CASE** statement
- **Operators**
Reads a single character of user input.

IN variable [FOR timeout [THEN statements] [ELSE statements]]

Arguments

<table>
<thead>
<tr>
<th>variable</th>
<th>A variable used to hold the user input character.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOR timeout</td>
<td>Optional — An expression that resolves to an integer specifying the number of tenths of a second to wait for input before timing out. A timeout value of 0 is permitted. The FOR clause requires either a THEN clause or an ELSE clause, or both.</td>
</tr>
</tbody>
</table>

Description

The IN statement pauses program execution for user input, then reads a single character of user input into variable. The character is stored in variable as an ASCII code value. It is therefore necessary to use the CHAR function to display the character.

You specify the timeout value in tenths of a second; however, Caché only handles timeout in whole seconds. Caché rounds this timeout value to an integer number of whole seconds. Any timeout value less than 10 is rounded up to one second.

If no FOR clause is specified, the IN statement pauses execution indefinitely until receiving user input. The FOR clause, which is used with the THEN and ELSE clauses, provides for timeout of this pause for user input.

If you have specified a FOR clause, you can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the user input occurs within the FOR timeout, the THEN clause is executed. If the user input does not occur within the FOR timeout, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

By default, the input character is not echoed, regardless of the setting of ECHO. However, echoing is emulation-dependent. For example, in D3 emulation the input character is always echoed, regardless of the setting of ECHO. The user value is echoed to the terminal; it is never echoed to the printer.

If you specify Ctrl-C as the user input to IN, the process enters the ObjectScript (COS) debugger. It displays the instruction “Type G to continue or Q to exit.” You can disable this use of Ctrl-C by specifying the BREAK OFF statement before issuing the IN statement.

You can also use the KEYIN function to receive a single character of user input, or the INPUT statement to receive one or more characters of user input. You can use the <<<...>>> inline prompt to prompt for a user input value to insert in a MVBasic statement or a MultiValue command line command. The <<<...>>> inline prompt is described in the Caché MultiValue Commands Reference.

See Also

- INPUT statement
- KEYIN function
INPUT

Receives user input.

```
INPUT [@(col[,row])] variable [,length [___]] [:] [format] [FOR n | WAITING n] [THEN statements] [ELSE statements]
```

INPUT variable,-1

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ (col, row)</td>
<td>Optional — A clause that specifies the location (column and row) to put the input prompt on the screen. If you specify this clause, <code>INPUT</code> displays the previous value of <code>variable</code> at the prompt. A <code>col</code> value of 0 or 1 displays the prompt at column 1. If <code>row</code> is omitted, it defaults to <code>row=1</code>, the top of the Terminal window; <code>row=23</code> is the bottom of the Terminal window.</td>
</tr>
<tr>
<td>variable</td>
<td>A <code>variable</code> used to receive the user input. This variable does not need to be previously defined. If <code>length</code> is not specified, you can follow <code>variable</code> with a colon (<code>:</code>) character to suppress the line return. This character is further described below.</td>
</tr>
<tr>
<td>length</td>
<td>Optional — An integer specifying the maximum length of the input data. By default, the input data is accepted when the number of characters specified in <code>length</code> are input. If less than the number of characters specified in <code>length</code> are input, the input data is accepted when the user presses the Enter key. If <code>length</code> is omitted, or <code>length=0</code>, data of any length can be specified. The data is accepted by pressing the Enter key. The <code>length</code> integer can be followed by the underscore (<code>_</code>) character, and/or the colon (<code>:</code>) character (in any order). These special-purpose characters are described below. If <code>length</code> is -1, <code>variable</code> is assigned a boolean value indicating whether or not data was input. This option does not prompt the user for data.</td>
</tr>
<tr>
<td>:</td>
<td>Suppresses line return.</td>
</tr>
<tr>
<td>_</td>
<td>Requires Enter key to accept input data, regardless of the length of the input data.</td>
</tr>
<tr>
<td>format</td>
<td>Optional — A format mask string used to validate the input data. <code>format</code> can be specified with or without <code>length</code>. If <code>length</code> is specified, <code>format</code> can be preceded by a comma delimiter or just a blank space. For further details on format mask strings, refer to the <code>FMT</code> function.</td>
</tr>
<tr>
<td>FOR n</td>
<td>The <code>FOR n</code> and <code>WAITING n</code> clauses are functionally identical ways to specify a timeout value. <code>n</code> is an integer specifying tenths of a second to wait before timing out. Caché rounds <code>n</code> to the nearest whole second interval.</td>
</tr>
<tr>
<td>WAITING n</td>
<td></td>
</tr>
</tbody>
</table>

**Description**

The `INPUT` statement has two forms:

- **INPUT** with `length` specified as a positive integer, or with `length` unspecified. This syntax receives input data. It can be used in interactive programs to receive input data from the user, or to receive input data non-interactively from the `DATA` statement.
- **INPUT** with `length` specified as -1. This syntax tests for the presence of input data and returns a boolean value.
Receiving Input Data

The **INPUT** statement is used in interactive programs to receive input from the user. **INPUT** pauses program execution while awaiting user input. By default, it displays a question mark (?) prompt to receive user input. (This prompt is modifiable using the **PROMPT** statement.) The user types this input which is echoed character-by-character at the input prompt.

- If *length* omitted, the user must press the Enter key to accept the input data.
- If the input data is less than the number of characters specified in *length* (or *length*=0), the user must press the Enter key to accept the input data.
- If the input data is equal to the number of characters specified in *length* the input data is accepted without pressing the Enter key. However, if the underscore (_) character is specified after the *length* argument, *length* specifies the maximum number of characters that can be input, but accepting the input data requires pressing the Enter key, regardless of the number of input characters.

**INPUT** can also receive data from the **DATA** statement, as described below. If data is present in a **DATA** statement, the ? prompt and user input are suppressed, and input is taken from **DATA**.

By default, when **INPUT** accepts data input it performs a line return. You can suppress this line return by following either the *variable* or the *length* argument with a colon character (:``). You can append a colon to *variable* if *length* is not specified; otherwise, append the colon to *length*. You can include or omit a space between *variable* or *length* and the colon.

If *length*=0, user input continues until the Enter key is pressed.

If you specify the optional @(col,row) clause, the question mark (?) prompt appears at the specified column and row location. This prompt displays the previous value of *variable*. (If *variable* is undefined, the prompt displays an empty string as the previous value.) To accept the previous value, press the Enter key. To delete and replace this value, type the new value. To replace this value with a null value, press the space bar or tab key, then press the Enter key. This @(col,row) clause suppresses the line return following data input. For further details, refer to the @ function.

By default, the input characters and the @ clause previous value are echoed, regardless of the setting of ECHO. However, **INPUT** echoing is emulation-dependent. These values are echoed to the terminal; they are never echoed to the printer.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If any data is input, the THEN clause is executed. If no data is input (the Enter key is pressed), the ELSE clause is executed. The *statements* argument can be the **NULL** keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can also use the **KEYIN** function or the IN statement to receive a single character of user input. You can use the <<...>> inline prompt to prompt for a user input value to insert in a MVBasic statement or a MultiValue command line command. The <<...>> inline prompt is described in the Caché MultiValue Commands Reference.

Timeout

Specifying a timeout for a user input prompt is optional, but highly recommended. You can specify a FOR *n* clause or a WAITING *n* clause to establish how long **INPUT** should wait for completion of user input data before timing out. These two clauses are functionally identical. Input completion is determined by either the Enter key or *length*.

The *n* value is an integer, specifying timeout in tenths of a second. However, Caché timeout is executed in whole seconds. For *n* values less than 10, Caché times out at 1 second. For *n* values greater than 10, Caché rounds to the closest whole second interval. Therefore an *n* value of 3 specifies three-tenths of a second, but actually times out at one second; an *n* value of 13 specifies thirteen-tenths of a second, but is rounded down to 10, so actually times out at one second; an *n* value of 16 is rounded up to 20, so actually times out at two seconds.

When timeout occurs, Caché MVBasic executes the ELSE clause (if present). If no ELSE clause is specified, Caché MVBasic executes the next statement.
INPUT and INPUTIF

INPUT does not support type-ahead — the user's ability to type input data before the prompt is displayed. The INPUTIF statement does support type-ahead. INPUT and INPUTIF are otherwise identical.

Testing for the Presence of Input Data

If \( \text{length} = -1 \), INPUT does not prompt the user for data. It checks the input buffer for the presence of data and places a boolean value in \( \text{variable} \): 1 if data was present in the input buffer; 0 if no data was present in the input buffer. An empty string ("") is considered data. INPUT with \( \text{length} = -1 \) tests for the presence of input data, but does not remove data from the input buffer or advance a buffer pointer.

You can use the \( \text{DATA} \) statement to place data in the input buffer. You can use the \( \text{CLEARDATA} \) statement to remove all data from the input buffer. This is shown in the following example:

```
INPUT var,-1 THEN PRINT "Boolean=",var        ;! prints 0
DATA "abc"
INPUT var,-1 THEN PRINT "Boolean=",var        ;! prints 1
CLEARDATA
INPUT var,-1 THEN PRINT "Boolean=",var        ;! prints 0
```

Because INPUT with \( \text{length} = -1 \) does not prompt for data, the underscore (_) and colon (:) special-purpose characters have no effect. The @([col],[row]), format, and FOR \( n \) or WAITING \( n \) clauses also have no effect.

To test for the presence of user-input data, use the \( \text{SLEEP} \) statement to allow time for the user to type (or not type) data to the input buffer before INPUT checks the input buffer for the presence of data. This is shown in the following example:

```
SLEEP 5
;! suspends execution for 5 seconds, allowing the user to type data
INPUT var,-1 THEN PRINT "Boolean=",var        ;! prints 1 if user input data during sleep interval
;! or prints 0 if the user did not input data during sleep interval
;! The user-input data (if any) will appear at the MV command prompt after the execution of this statement.
```

Non-text Input Values

Null String

To input a null string, you must first designate a character to represent the null string using the \( \text{INPUTNULL} \) statement. You then specify that designated character to INPUT to specify the null string. This \( \text{INPUTNULL} \) character designation only applies to the INPUT statement. In all other contexts this character is a literal.

Space and Tab

The user can input space characters and tab characters. In variable space and tab are distinct characters. Both space and tab are \( \text{length} = 1 \), and both can be removed using a single backspace. However, when echoing input to the terminal, both space and tab are echoed as a space character.

Ctrl-C

If the user types Ctrl-C at the prompt, INPUT behavior depends on the \( \text{BREAK} \) setting.

- If \( \text{BREAK} \) is disabled (OFF), any input data that the user has typed into INPUT up to that point is deleted. The user can then type a new input value at the prompt and press Enter.
- If \( \text{BREAK} \) is enabled (ON), the process checks the login mode. If in Programmer mode, the process enters the ObjectScript debugger. If in Application mode, it does not enter the debugger. For further details refer to the ObjectScript \( \text{BREAK} \) command in the Caché ObjectScript Reference.

INPUT and DATA

If you use the \( \text{DATA} \) statement to pre-define a user input value, the INPUT statement takes its value from the \( \text{DATA} \) statement rather than from user input. The INPUT statement does not pause program execution or require user interaction.
The DATA statement value does not conclude with a return character, and the INPUT statement does not issue a line return. If the length argument is specified, only that number of characters is input from the DATA item value, but the entire DATA item is consumed.

The length argument suffix characters (colon or underscore) have no effect on DATA statement input. INPUT treats a DATA value of the empty string (DATA "") as an actual data value: If length=-1, INPUT sets variable=1.

If a DATA statement contains a comma-separated list of arguments, these arguments are supplied in order to multiple invocations of the INPUT statement.

Values supplied by a DATA can be flushed using the CLEARDATA statement. Following a CLEARDATA, the next INPUT prompts the user for input data.

You can configure INPUT to accept only stacked DATA input values. You can configure this behavior using the class method %SYSTEM.MV.InputDataOnly(). Setting InputDataOnly() to 0 (the default) causes INPUT to accept both stacked DATA and user-input data values; once all stacked DATA values are exhausted, the next INPUT statement prompts the user for input data. Setting InputDataOnly() to 1 causes INPUT to accept only stacked DATA values; once all stacked DATA values are exhausted, the next INPUT statement issues an ABORT. You can determine the status of the InputDataOnly() flag by displaying the ObjectScript $MVV(218) special variable.

Examples

The following example displays the input prompt and pauses ten seconds for user input:

```
PRINT "Input the person’s last name"
INPUT namevar,16 FOR 100
IF namevar=""
  PRINT "No name input"
ELSE
  PRINT "Last name (max 16 chars) ":namevar
```

The following example positions the input prompt using the @(col,row) clause, then takes an input of any length to variable namevar. If you press the Enter key or timeout without supplying any user input, namevar retains the default value "ANONYMOUS".

```
namevar="ANONYMOUS"
INPUT @(1,23) namevar,16 FOR 100
```

The following example takes input data from the DATA statement. At each iteration INPUT takes the next DATA value. Note that in this program INPUT takes a maximum of 5 characters, regardless of the length of each DATA value; each iteration advances to the next DATA value. This program does not pause for user input. However, if the FOR loop iterated one more time, the fifth INPUT would prompt the user:

```
DATA "Adams","Bean","Clarkenwell","Davis"
FOR i=1 TO 4
  INPUT namevar,5
  PRINT "Last name (max 16 chars) ":namevar
NEXT
```

Emulation

Several aspects of INPUT echoing display are emulation-dependent:

For all emulations, except PIOpen, regardless of ECHO setting, with INPUT @, the cursor is initially positioned, the prompt displayed, the original value of the data is displayed, and the cursor is positioned on the first character of the original value for user input.

For PIOpen, the cursor is positioned at the location specified by INPUT@, not on the prior position (as in other emulations), and the original value of the data is not displayed.

With ECHO OFF set, the original value of the input variable is not displayed in all emulations except UniVerse and Cache.
With **ECHO OFF** set, when you type user input it is displayed character-by-character in Cache, UniVerse, INFORMATION, PIOpen, PICK, and IN2 emulations; typing is not echoed in all other emulations.

With **ECHO OFF** set, when input has been satisfied (by pressing Enter or by entering the number of characters specified on INPUT @) the new value of the variable is redisplayed for most emulations. On PIOpen and UniData no redisplay occurs. On jBASE, if **ECHO ON** the cursor is positioned and the new value is displayed; if **ECHO OFF** the cursor is positioned, and blank spaces the length of the new value are displayed. With **ECHO OFF** set, D3 and Reality replace the length of the original value with blank spaces and then display the new value. With **ECHO OFF** set, UniVerse replaces the original value with blank spaces when the user types the first character; UniVerse redisplays the new value after you press the Enter key.

**See Also**

- IN statement
- INPUTIF statement
- INPUTNULL statement
- DATA statement
- PROMPT statement
- CLEARDATA statement
- BREAK statement
- KEYIN function
- STATUS function
INPUTCLEAR

Clears input data from the type-ahead buffer.

Arguments
None.

Description
The INPUTCLEAR statement immediately deletes (clears) any user input data stored in the type-ahead buffer. It does not wait for the next READ statement. This affects the INPUTIF statement, which receives user input from the type-ahead buffer. INPUTCLEAR has no effect on the INPUT statement, which does not use a type-ahead buffer.

The INPUTCLEAR and CLEARINPUT statements are functionally identical.

See Also
• INPUTIF statement
• CLEARINPUT statement
INPUTCTRL

Filters control characters from input.

```
INPUTCTRL [ON | OFF | flag]
```

**Arguments**

| flag | A boolean value. 0: no filtering of control characters (the default). 1 (or any non-zero number): control characters are filtered out of the input stream. The same boolean values can be supplied using the OFF and ON keywords. |

**Description**

The `INPUTCTRL` statement is used to filter out control characters from the characters accepted by the `INPUT` command. It can be executed using the ON or OFF keyword, or by using a boolean `flag` value. The default is OFF, meaning control characters are accepted by `INPUT`.

When `INPUTCTRL` is on, control character sequences that perform operations are neither executed nor recorded as part of the input string (for example, Ctrl-c). Control characters that code for special characters are recorded as part of the input string (for example, Ctrl-r or Ctrl-w).

The `INPUTCTRL` is only applied to the current EXECUTE level.

You can use the `CONTROL.CHARS` command line command to set or display the current process-wide default for control character filtering.

**See Also**

- `IN` statement
- `INPUT` statement
- `INPUTIF` statement
INPUTERR

Writes a message to the user terminal.

INPUTERR [message [, ...] ]

Arguments

message

Optional — A string literal to write to the terminal screen. Can be an expression or variable that resolves to a literal value. If omitted, a blank line is written.

Description

The INPUTERR statement performs several operations affecting the user terminal.

- It advances the terminal cursor to the last line of the current page. For further information on page lines refer to the SYSTEM function and the ASSIGN statement.
- It writes the optional message to the terminal screen at the new cursor location. If you specify multiple comma-separated message arguments, they are displayed with tab spacing, similar to the PRINT or CRT command. You can also concatenate multiple message arguments, using the colon (:) concatenation operator.
- It deletes (clears) any user input data stored in the type-ahead buffer. This affects the INPUTIF statement, which receives user input from the type-ahead buffer.

The message is cleared by the next INPUT @(col,row) statement.

Emulation

Caché and UniVerse clear user input data stored in the type-ahead buffer. All other emulations do not perform this action.

See Also

- INPUT statement
- INPUTIF statement
INPUTIF

Receives data from input buffer.

\[
\text{INPUTIF} \ [\text{col}, \text{row}] \text{ variable } [, \text{length } _-] \text{ [:] [format]} \\
\quad \text{(THEN statements | ELSE statements)} \\
\text{INPUTIF variable,-1 (THEN statements | ELSE statements)}
\]

Description

The INPUTIF statement is used to receive data from the input buffer. While it can be used for interactive user input, this usage is not recommended.

INPUT and INPUTIF are similar, with the following differences:

- INPUTIF does not display a prompt when awaiting user input. INPUT displays a prompt.
- INPUTIF does not support timeout clause syntax. For this reason, it should not be used for interactive user input in most circumstances. INPUT supports timeout.
- INPUTIF requires either a THEN clause, an ELSE clause, or both. For INPUT the THEN clause and ELSE clause are optional.
- INPUTIF takes the THEN clause when the Enter key is pressed without typing user input data. INPUT takes the ELSE clause if length is not -1 and the Enter key is pressed without typing user input data.

For further details on INPUTIF, refer to the INPUT statement.

See Also

- INPUT statement
INPUTNULL

Specifies a null character for INPUT.

```
INPUTNULL char
```

**Arguments**

| char  | An expression that resolves to a single character. |

**Description**

The `INPUTNULL` statement designates a character to represent the null string. If you specify this character to an `INPUT` statement, it is saved to the variable as a null string (a string of length 0). This character remains as the designated null string character for the current process until you reset it by specifying `INPUTNULL ""`.

`INPUTNULL` only affects the `INPUT` statement. It has no effect on the `IN` statement or the `KEYIN` function.

**Example**

The following example designates the `^` character to represent the null string for `INPUT`:

```
INPUTNULL "^"
INPUT @(1,23) inval
?^
PRINT "Value =":inval
Value =
PRINT LEN(inval)
0
```

**See Also**

- `INPUT` statement
**INS**

Inserts data in a dynamic array.

INS expression BEFORE dynarray <f[,v[,s]]>

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression</td>
<td>The data to be inserted.</td>
</tr>
<tr>
<td>dynarray</td>
<td>The name of a valid dynamic array. If the dynamic array does not exist, <strong>INS</strong> creates it.</td>
</tr>
<tr>
<td>f</td>
<td>An integer specifying the Field level of the dynamic array in which to insert the data. Fields are counted from 1.</td>
</tr>
<tr>
<td>v</td>
<td>Optional — An integer specifying the Value level of the dynamic array in which to insert the data. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td>s</td>
<td>Optional — An integer specifying the Subvalue level of the dynamic array in which to insert the data. Subvalues are counted from 1 within a Value.</td>
</tr>
</tbody>
</table>

**Description**

The **INS** command inserts a data value at the specified dynamic array location. Which element to insert is specified by the f, v, and s integers. For example, if f=2 and v=3, this means insert the new data value as the third value in the second field. The **INS** statement does not overwrite; if there already was a third value, the insert increments its location to the fourth value. **INS** adds multiple delimiter characters, when needed, to place the data value at the specified location.

To insert a value at the beginning of a **dynarray** set f to 1 or 0. To insert a value at the end of a **dynarray** set f to -1. If lower level delimiters exist in **dynarray**, setting an upper level to 0, the null string, a non-numeric value, or an undefined variable is equivalent to setting it to 1.

Both the **INS** command and the **INSERT** function insert a value into a dynamic array. The **INS** command changes the value of the supplied **dynarray**. The **INSERT** function returns a dynamic array containing the insert; it does not change the value of the supplied **dynarray**.

**Examples**

The following example uses the **INS** command to insert the second value in the first field of a dynamic array:

```cache
cities="New York";@VM:"London";@VM:"Chicago";@VM:"Boston";@VM:"Los Angeles"
INS "Providence" BEFORE cities <1,2>
PRINT cities
! Returns: "New YorkýProvidenceýLondonýChicagoýBostonýLos Angeles"
```

**See Also**

- **INSERT function**
- **COUNTS function**
- **DELETE function**
- **EXTRACT function**
- **Dynamic Arrays**
$KILL

Deletes variables.

$KILL variable[, ...]

Arguments

| variable | The variable(s) to be deleted by the $KILL command. variable can be a single variable name or a comma-separated list of variable names. |

Description

The $KILL statement deletes the specified variable or comma-separated list of variables. The variables can be local variables, process-private variables, or globals. They do not have to be actual defined variables, but they must be valid variable names. You cannot kill a special variable, even if its value is user-specified. Attempting to do so generates a <SYNTAX> error.

The ASSIGNED function returns 0 if a variable is unassigned or has been deleted.

Using $KILL to delete variables frees up local variable storage space. To determine or set the maximum local variable storage space (in kilobytes), use the ObjectScript $ZSTORAGE special variable. To determine the currently available local variable storage space (in bytes), use the $STORAGE special variable.

Examples

In the following example, $KILL deletes local variables a, b, and d. The PRINT returns 3 and 5.

```caché
a=1
b=2
c=3
d=4
e=5
$KILL a,b,d
PRINT a,b,c,d,e
```

In the following example, $KILL deletes the process-private global ^||ppglob and all of its subscripts. No other variables are affected.

```caché
^||ppglob(1)="fruit"
^||ppglob(1,1)="apples"
^||ppglob(1,2)="oranges"
$KILL ^||ppglob
PRINT ^||ppglob(1),^||ppglob(1,1)
```

Notes

$KILL and Objects

Object variables (OREFs) automatically maintain a reference count — the number of items currently referring to an object. Whenever you set a variable or object property to refer to an object, Caché increments the object’s reference count. When you $KILL a variable, Caché decrements the corresponding object reference count. When this reference count goes to 0, the object is automatically destroyed; that is, Caché removes it from memory. The object reference count is also decremented when a variable is set to a new value, or when the variable goes out of scope.

In the case of a persistent object, call the %Save() method before removing the object from memory if you wish to preserve changes to the object. The %Delete() method deletes the stored version of a Caché object; it does not remove the in-memory version of that object.
Using $KILL with Arrays

You can use $KILL to delete an entire array or a selected node within an array. The specified array can be a local variable, a process-private global, or a global variable. For further details on global variables with subscripted nodes, see Global Structure in Using Caché Globals.

To delete a global array and all of its subordinate nodes, simply supply the global name to $KILL.

To delete an array node, supply the appropriate subscript. For example, the following $KILL command deletes the node at subscript 1,2. This example uses the ASSIGNED function to return a boolean value indicating whether the variable has been deleted:

```
^fruitbasket(1)="fruit"
^fruitbasket(1,1)="apples"
^fruitbasket(1,2)="oranges"
^fruitbasket(1,2,1)="navel"
PRINT ^fruitbasket(1)," contains ",^fruitbasket(1,1),
   " and ",^fruitbasket(1,2)
PRINT ^fruitbasket(1,2)," contains ",^fruitbasket(1,2,1),
   " and ",^fruitbasket(1,2,2)
$KILL ^fruitbasket(1,2)
PRINT "1st level node: ",ASSIGNED(^fruitbasket(1))
PRINT "2nd level node: ",ASSIGNED(^fruitbasket(1,1))
PRINT "Deleted 2nd level node: ",ASSIGNED(^fruitbasket(1,2))
PRINT "3rd level node under deleted 2nd: ",ASSIGNED(^fruitbasket(1,2,1))
```

When you delete an array node, you automatically delete all nodes subordinate to that node and any immediately preceding node that contains only a pointer to the deleted node. If a deleted node is the only node in its array, the array itself is deleted along with the node.

See Also

- Variables
- ASSIGNED function
- UNASSIGNED function
LET

Assigns a value to a variable.

LET var=expression

Arguments

<table>
<thead>
<tr>
<th>var</th>
<th>Any valid variable name.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression</td>
<td>Any MVBasic expression that resolves to a value.</td>
</tr>
</tbody>
</table>

Description

The LET statement assigns the value of `expression` to the variable `var`. You can perform the same assignment operation by just specifying `var=expression` without the LET keyword. For further details on assignment operations, refer to the Variables page of this manual.

LET permits value assignment to all valid variable names, including variable names that are keywords. For clarity and compatibility, use of keywords as variable names is discouraged.

Examples

The following examples use LET to assign values to the variable `x`:

- LET x=12
- LET x="Fred"
- LET x="Con":"catenate"
- LET x=""  
- LET x=4+4*3;  ! Returns 16
- LET x=(4+4)*3;  ! Returns 24

See Also

- Variables
LOCATE

Finds an element in a specified part of a dynamic array by exact value.

LOCATE data IN dynarray<\[f[,v[,s]]]\] [,start] [BY format] SETTING variable
THEN statements [ELSE statements]
LOCATE(data,dynarray[,f[,v];variable[;format]]) [THEN statements] [ELSE statements]

Arguments

**data**
The element value to search for in *dynarray*. This value must be the complete value of the element. An expression that evaluates to a string or a numeric value. Values are case-sensitive.

**IN dynarray**
A valid dynamic array.

**f**
*Optional* — An integer that denotes the Field level of the dynamic array to search for the element *data*. Fields are counted from 1. The surrounding angle brackets are required.

**v**
*Optional* — An integer that denotes the Value level of the dynamic array to search for the element *data*. Values are counted from 1.

**s**
*Optional* — Supported by Some Emulations Only — An integer that denotes the Subvalue level of the dynamic array to search for the element *data*. Subvalues are counted from 1.

**start**
*Optional* — An integer specifying the starting location to begin searching the level specified in *f*, *v*, and *s*. This argument is not supported by all emulations.

**BY format**
*Optional* — specifies the collation sequence. Specify *format* as a quoted string with one of the following values: “AL” (ascending, left justified); “AR” (ascending, right justified); “DL” (descending, left justified); “DR” (descending, right justified).

**SETTING variable**
A local variable that LOCATE sets to an integer specifying either where *data* is located or where *data* can be added.

Description

The LOCATE statement is used to search for an element value in a dynamic array and return the search results by setting *variable*. Caché MVBasic supports both syntactical forms, as shown above.

In Caché MVBasic you can set the *f*, *v* variables to integers to specify which data item(s) of the dynamic array to search. If you search with just the *dynarray* array name, you are searching for an Field within the dynamic array. If you search with *dynarray<\[f]\*> then you are searching within Field *f* of *dynarray* for a Value. If you search with *dynarray<\[f,v]\*> you are searching for a Subvalue within the Value *dynarray<\[f,v]\*>. For example, setting *f=2* searches the second dynamic array field for the *data* value. Caché MVBasic LOCATE does not support *s* (Subvalue level); this is only supported by the INFORMATION, PIOpen, and UniData emulations, which use a different search logic, as described below.

The *data* value must be an exact match with the full value of an element in *dynarray*. It cannot be a substring of an element value. Matching is case-sensitive. If *data* does not match an element value, *variable* is set to an integer 1 larger than the current last element. This specifies how many elements were searched and where the missing value can be appended to the existing values. LOCATE behavior when *dynarray* is the null string (""") is described below.
The \( f, v, \) and \( s \) arguments accept a single dynamic array reference (\( A_i \)), a single substring reference (\( A[s, l] \)), or a substring reference nested inside a dynamic array reference (\( A_i[s, l] \)).

The optional \texttt{BY} clause specifies the collation (ascending or descending) and the justification (left or right) used to locate a value. Left justification is commonly used for strings, and right justification is used for numbers. Positive and negative numbers are sorted in numeric sequence, regardless of the justification. However, a mixed numeric value (for example \(-24\text{degrees}\)) sorts in string collation sequence, rather than numeric sequence.

You can optionally specify a \texttt{THEN} clause, an \texttt{ELSE} clause, or both a \texttt{THEN} and an \texttt{ELSE} clause. If \texttt{data} is located in \texttt{dynarray}, the \texttt{THEN} clause is executed. If \texttt{data} is not located in \texttt{dynarray}, the \texttt{ELSE} clause is executed. The \texttt{statements} argument can be the \texttt{NULL} keyword, a single statement, or a block of statements terminated by the \texttt{END} keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a \texttt{THEN}, \texttt{ELSE}, or \texttt{END} keyword on that line.

**Null Value Arguments**

\textbf{LOCATE} behavior when \texttt{data} and/or \texttt{dynarray} has an empty string value is as follows:

- \texttt{data=", dynarray=value}: Sets \texttt{variable} to an integer 1 larger than the last element of \texttt{dynarray}. The \texttt{ELSE} clause is taken. If \texttt{start} is specified with a value greater than 1, \texttt{variable=start}.

- \texttt{data=value, dynarray=":} Sets \texttt{variable}=1. The \texttt{ELSE} clause is taken. This is because searching for a nonempty string treats an empty dynamic array component as containing zero subcomponents, so zero components are searched and the \texttt{LOCATE} stops before searching the subcomponent at position 1. If \texttt{start}=0 or \texttt{start}=1, \texttt{variable}=1; if \texttt{start} is greater than 1, \texttt{variable=start}.

- \texttt{data=", dynarray=":} Sets \texttt{variable}=1. The \texttt{THEN} clause is taken. This is because searching for the empty string in the subcomponent contained in an empty component of a dynamic array considers that component as containing one empty subcomponent at position 1 which matches the searched-for empty string. If \texttt{start} is specified with a value other than 1, the \texttt{ELSE} clause is taken. If \texttt{start}=0 or \texttt{start}=1, \texttt{variable}=1; if \texttt{start} is greater than 1, \texttt{variable=start}.

**LOCATE and FIND**

The \texttt{LOCATE} statement and the \texttt{FIND} statement both search for an exact element value in a dynamic array and return its location. Both support optional syntax \texttt{THEN} for successful search and \texttt{ELSE} for unsuccessful search. They differ in the following ways:

- \texttt{FIND} is used to search an entire dynamic array; there is no way to limit its scope to a portion of the dynamic array. \texttt{LOCATE} can use the \( f, v, \) and \( s \) variables to limit the scope of the search.

- When a search is successful, \texttt{FIND} returns an absolute location within the dynamic array; \texttt{LOCATE} returns a count relative to the specified starting location.

- When a search is unsuccessful, \texttt{FIND} provides no location information; \texttt{LOCATE} provides information on where the missing value could be appended to the existing values.

To locate an element in a dynamic array by a substring value, use the \texttt{FINDSTR} statement. To return the value of an element by specifying its dynamic array location, use the \texttt{EXTRACT} function.

**Emulation**

In \texttt{INFORMATION}, \texttt{PIOpen}, \texttt{UDPick}, and \texttt{UniData}, \( f, v, \) and \( s \) arguments mean to search at that level, rather than to search within that level. The \( f, v, \) and \( s \) argument values are start positions, rather than array subscripts. The search begins at the lowest level specified and only that level is searched. For this reason, these emulations require the \( f \) argument, and only these emulations support the \( s \) argument. \texttt{SOPTIONS INFO.LOCATE} supports this emulation feature. If \texttt{dynarray} is the null string (""), the \texttt{SETTING variable} is the integer value of the lowest specified level (\( f, v, \) or \( s \)). These emulations do not support the \texttt{start} argument.
In UniData, if \( f \) is less than or equal to 0, it is treated as 1. If \( v \), or \( s \) (or both) are less than or equal to 0, they are ignored. If \( data="" \) and \( dynarray="" \) the THEN clause is always taken, regardless of the value of \( start \).

## Examples

The following example uses the `LOCATE` statement to find the second value from the first field of a dynamic array:

```c
LOCATE "London" IN cities<1> SETTING a
  THEN PRINT "found",a
  ! returns "found 2" found in field 1 at position 2
  ELSE PRINT "not found",a
LOCATE "London" IN cities<2> SETTING a
  THEN PRINT "found",a
  ELSE PRINT "not found",a
  ! returns "not found 1", append to field 2 at level 1
LOCATE "London" IN cities<1,3> SETTING a
  THEN PRINT "found",a;
  ELSE PRINT "not found",a
  ! returns 2 not found, append to field 2 at level 2
```

The following example uses the second syntactical form of `LOCATE`. It is otherwise identical to the previous example:

```c
LOCATE("London",cities<1>;a)
  THEN PRINT "found",a
  ! returns "found 2" found in field 1 at position 2
  ELSE PRINT "not found",a
LOCATE("London",cities<2>;a)
  THEN PRINT "found",a
  ELSE PRINT "not found",a
  ! returns "not found 1", append to field 2 at position 1
LOCATE("London",cities<1,3>;a)
  THEN PRINT "found",a;
  ELSE PRINT "not found",a
  ! returns 2 not found, append to field 2 at level 2
```

## See Also

- `FIND` statement
- `FINDSTR` statement
- `EXTRACT` function
- Dynamic Arrays
- Strings
- Variables
LOCK

LOCK
Obtains a logical process lock.
LOCK name [THEN statements] [ELSE statements]

Arguments
name

A number or a string, or an expression that evaluates to a number or a string specifying a
lock name. Commonly, an integer from 0 through 64.

Description
The LOCK statement sets a named process lock, preventing other processes from obtaining a lock with the same name.
Process locks are not incremental: A process can set the same lock multiple times with LOCK. A single UNLOCK releases
the lock
Commonly, name evaluates to an integer in the range 0 through 64. However, in Caché any number or string may be
specified as a logical lock name. The lock name may not be empty, so LOCK "" sets LOCK 0.
You can specify optional THEN and ELSE clauses. If you obtain lock name, the THEN clause is executed. If you already
have lock name, the THEN clause is also executed. If you could not obtain lock name because it is held by another resource,
the ELSE clause is executed. If you could not obtain lock name because it is held by another resource, the ELSE clause is
executed.
Unlike READU locks, process locks set in a program are not released automatically when the program terminates. The
lock belongs to the process, and persists for the life of the process, unless unlocked explicitly using the UNLOCK statement.
You can determine which locks are held using the LIST.LOCKS command line command. You can unlock one or all locks
using the CLEAR.LOCKS command line command. These commands are described in the Caché MultiValue Commands
Reference.

Example
The following example uses the LOCK statement to obtain a logical lock named 17.
a=17
LOCK a THEN PRINT "Got the Lock"
ELSE PRINT "Couldn't get the lock"
.
.
.
UNLOCK a

See Also
•

UNLOCK statement

•

LIST.LOCKS command line command

•

CLEAR.LOCKS command line command

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LOOP...REPEAT

Repeats a block of statements while a condition is true or until a condition becomes true.

```plaintext
LOOP [(WHILE | UNTIL) condition [DO] ]
  statements
REPEAT

LOOP statements
[WHILE | UNTIL) condition [DO] ]
REPEAT
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>Optional — Numeric or string expression that evaluates to True or False. Loop repeats either WHILE condition is True, or UNTIL condition is True. If this clause is omitted, an infinite loop occurs.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements that are repeated while or until condition is True.</td>
</tr>
</tbody>
</table>

Description

The LOOP...REPEAT statement is a flow-of-control statement that repeats a block of program statements zero or more times. The loop is performed either UNTIL condition becomes true, or WHILE condition remains true. The two syntax forms are equivalent.

The REPEAT keyword is mandatory, signalling the end point of the loop. The DO keyword is optional; if specified it must be on the same line as the condition clause.

You can use the CONTINUE statement to cause execution to jump to the next iteration of the loop.

LOOP...REPEAT statements can be nested.

Examples

The following examples illustrate use of the LOOP...REPEAT statement. All four examples are exactly equivalent; each executes the loop 10 times:

```
x=0
LOOP UNTIL x=10
  PRINT RND(100)
  ! Generate a random number between 1 and 100
  x=x+1
REPEAT
```

```
x=0
LOOP WHILE x<10
  PRINT RND(100)
  ! Generate a random number between 1 and 100
  x=x+1
REPEAT
```

```
x=0
LOOP
  PRINT RND(100)
  ! Generate a random number between 1 and 100
  x=x+1
UNTIL x=10
REPEAT
```
x=0
LOOP
  PRINT RND(100)
  ! Generate a random number between 1 and 100
  x=x+1
  WHILE x<10
  REPEAT

See Also

- CONTINUE statement
- EXIT statement
- FOR...NEXT statement
**MAT**

Assigns values to all the elements in a dimensioned array.

<table>
<thead>
<tr>
<th>MAT array = value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT array1 = MAT array2</td>
</tr>
</tbody>
</table>

**Arguments**

<table>
<thead>
<tr>
<th>array</th>
<th>Name of an existing array. This array must have been dimensioned using the DIM statement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>value</td>
<td>The value to assign to all of the elements of the array. An expression that resolves to a value.</td>
</tr>
</tbody>
</table>

**Description**

The **MAT** statement assigns values to all of the elements of a specified array. This array may be one-dimensional or two-dimensional. **MAT** has two forms:

- **MAT array=value** assigns the same value to every element of the array.
- **MAT array1=MAT array2** assigns the values of the elements in `array2` to the corresponding elements in `array1`. Both `array1` and `array2` must already have been dimensioned using the **DIM** statement. The arrays may be differently dimensioned. If there are more elements in `array2` than `array1`, the excess `array2` elements are ignored. If there are more elements in `array1` than `array2`, the excess `array1` elements are not assigned a value. All uninitialized variables are treated as zero-length strings (""").

**Note:** This statement cannot be executed from the MVBasic command shell. Attempting to do so results in a MVBasic syntax error.

**Emulation**

D3 supports `array1 = MAT array2` as functionally equivalent to **MAT array1 = MAT array2**.

**Examples**

The following examples illustrate the use of the **MAT** statement:

```
! Dimension a one-dimensional array with 6 elements.
DIM MyVector1(6)
! Dimension a one-dimensional array with 10 elements.
DIM MyVector2(10)
! Assign the value "pending" to all elements of MyVector2
MAT MyVector2="pending"
! Assign the values of elements of one array to another array
MAT MyVector1=MAT MyVector2
! Results are a that MyVector1 contains 6 elements all assigned
! the value "pending"
```

**See Also**

- **DIM** statement
- **MATBUILD** statement
- **MATPARSE** statement
- **MATREAD** statement
- **MATWRITE** statement
• Variables
MATBUILD

Builds a dynamic array from a dimensioned array.

MATBUILD dynarray FROM array [,start [,end]] [USING delimiter]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>A dynamic array, each element of which receives the value of the corresponding dimensioned array element.</td>
</tr>
<tr>
<td>array</td>
<td>Name of an existing dimensioned array. This array must have been dimensioned using the DIM statement.</td>
</tr>
<tr>
<td>start</td>
<td>Optional — An integer that specifies the first element to be transcribed. The default is 1.</td>
</tr>
<tr>
<td>end</td>
<td>Optional — An integer that specifies the last element to be transcribed. You must specify a start value to specify an end value. The default is the last element in array.</td>
</tr>
<tr>
<td>USING delimiter</td>
<td>Optional — The dynamic array delimiter character to be used to separate elements, specified as a variable (for example @VM) or a quoted string. The default is a field mark (@FM). If a string of more than one characters is specified, only the initial character is used. The empty string (&quot;&quot;&quot;) is a valid value here; it’s use would create a string of concatenated elements, not a dynamic array.</td>
</tr>
</tbody>
</table>

Description

The MATBUILD statement assigns the values of the elements of a specified dimensioned array to a dynamic array. You can create a dynamic array containing all of the element values of the dimensioned array, or you can limit the dynamic array to those elements of the dimensioned array between start and end.

Note: This statement cannot be executed from the MVBasic command shell. Attempting to do so results in a MVBasic syntax error.

By default, MATBUILD assigns empty strings to unassigned nodes. If the highest subscripts of the dimensioned array are unassigned or have empty string values, the dynamic array is truncated at the last assigned data value. This behavior can be configured using the %SYSTEM.Process.MVUndefined() method.

MATBUILD is the functional opposite of MATPARSE.

Emulation

D3, jBASE, MVBase, R83, POWER95, Reality, and Ultimate set $OPTIONS MATBUILD.UNASSIGNED.ERROR. This causes these emulations to not support unassigned dimensioned array nodes. If MATBUILD encounters an unassigned node, it issues an <UNDEFINED> error. This behavior can be configured using the %SYSTEM.Process.MVUnknown() method.

UniData MATBUILD does not truncate the highest subscripts of a dimensioned array if they are unassigned or have empty string values.

Examples

The following example illustrates the use of the MATBUILD statement:
! Dimension a one-dimensional array with 6 elements.
DIM MyVector1(6)
! Assign the value "pending" to all elements of MyVector1
MAT MyVector1="pending"
! Assign the values of elements of a dimensioned array
! to a dynamic array
MATBUILD mydynarray FROM MyVector1 USING "^"

The results are the mydynarray dynamic array string assigned the value
"pending^pending^pending^pending^pending^pending". Here the "^" character is used as the dynamic array
delimiter, rather than the default field mark character.

See Also

- DIM statement
- MAT statement
- MATPARSE statement
- MATREAD statement
- MATWRITE statement
- Variables
MATPARSE

Builds a dimensioned array from a dynamic array.

MATPARSE array [, start [, end]] FROM dynarray [USING delimiter]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>array</td>
<td>Name of an existing dimensioned array. This array must have been dimensioned using the DIM statement.</td>
</tr>
<tr>
<td>start</td>
<td>Optional — An integer that specifies the first dimensioned array element to receive a value. The default is 1.</td>
</tr>
<tr>
<td>end</td>
<td>Optional — An integer that specifies the last dimensioned array element to receive a value. You must specify a start value to specify an end value. The default is the last element in array.</td>
</tr>
<tr>
<td>dynarray</td>
<td>An existing dynamic array, each element of which is transcribed to the corresponding dimensioned array element.</td>
</tr>
<tr>
<td>USING</td>
<td>Optional — Specifies the dynamic array delimiter character used to define separate elements. The default is a field mark (@FM).</td>
</tr>
</tbody>
</table>

Description

The MATPARSE statement assigns the values of the elements of a dynamic array to a dimensioned array. You can create a dimensioned array containing all of the element values of the dynamic array, or you can limit the transcription of dynamic array elements to those only dimensioned array elements between start and end.

Note: This statement cannot be executed from the MVBasic command shell. Attempting to do so results in a MVBasic syntax error.

MATPARSE is the functional opposite of MATBUILD.

Examples

The following example illustrates the use of the MATPARSE statement:

```
! Dimension a static array
DIM MyArray(2,5)
! Create a dynamic array with 5 elements
MyDyn="Fred":@FM:"Barney":@FM:"Wilma":@FM:"Betty":@FM:"Pebbles"
! Assign dynamic array elements to the dimensioned static array
MATPARSE MyArray FROM MyDyn
! Display the number of elements parsed
CRT INMAT()
! Display static array element values
CRT MyArray(1,2); ! returns "Barney"
CRT MyArray(1,3); ! returns "Wilma"
```

The following example uses a start value of 2. It is otherwise identical to the previous example:

```
! Dimension a static array
DIM MyArray(3,5)
! Create a dynamic array with 5 elements
MyDyn="Fred":@FM:"Barney":@FM:"Wilma":@FM:"Betty":@FM:"Pebbles"
! Assign dynamic array elements to the dimensioned static array
MATPARSE MyArray,2 FROM MyDyn
! Display the number of elements parsed
CRT INMAT()
! Display static array element values
CRT MyArray(1,2); ! returns "Fred"
CRT MyArray(1,3); ! returns "Barney"
```
The following example uses Value Marks (@VM) as the dynamic array delimiters. It is otherwise identical to the first example:

```
! Dimension a static array
DIM MyArray(2,5)
! Create a dynamic array with 5 elements
MyDyn="Fred":@VM:"Barney":@VM:"Wilma":@VM:"Betty":@VM:"Pebbles"
! Assign dynamic array elements to the dimensioned static array
MATPARSE MyArray FROM MyDyn USING @VM
! Display the number of elements parsed
CRT INMAT()
! Display static array element values
CRT MyArray(1,2); ! returns "Barney"
CRT MyArray(1,3); ! returns "Wilma"
```

See Also

- DIM statement
- MAT statement
- MATBUILD statement
- MATREAD statement
- MATWRITE statement
- INMAT function
- Dynamic Arrays
MATREAD, MATREADL, MATREADU

Reads data from a MultiValue file to a dimensioned array.

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>array</td>
<td>Name of an existing dimensioned array that receives the file data. This array must have been dimensioned using the DIM statement.</td>
</tr>
<tr>
<td>filevar</td>
<td>A local variable used as the file identifier of an open MultiValue file. This variable is set by the OPEN statement.</td>
</tr>
<tr>
<td>recID</td>
<td>The record ID of the record to be read, specified as either a number or an alphanumeric string of up to 31 characters. Letters in a recID are case-sensitive. For naming conventions, refer to MATWRITE.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

### Description

The MATREAD, MATREADL, and MATREADU statements read the specified record into a dimensioned array.

You must use the OPEN statement to open the MultiValue file before issuing any of these statements.

You must use the DIM statement to dimension array before issuing any of these statements. If a record read by MATREAD has more attributes than specified by DIM, the handling of these extra attributes is controlled by the STATIC.DIM option:

- With $OPTIONS STATIC.DIM (the default in Reality, PICK, Ultimate, POWER95, MVBase, IN2, and R83 emulations) dimensioned arrays are created starting from element #1. When there is a MATREAD of more attributes than the array has dimensions, the extra attributes are appended to the last element, and INMAT returns 0 to indicate the overflow. On legacy platforms, there is no array element 0, and the array usually cannot be re-dimensioned, but Cache does have an element 0 and allows re-dimensioning.

- With $OPTIONS -STATIC.DIM (the default in Cache, UniVerse, UniData, INFORMATION, PIOpen, UDPICK, D3, and jBASE emulations) dimensioned arrays are created starting from element 0. When there is a MATREAD with more attributes than dimensions, the extra attributes are put into element 0.

A read operation must be able to acquire at least a shared lock on the desired resource. The MATREADL statement acquires a shared lock before performing the read. The MATREADU statement acquires an update (exclusive) lock before performing the read. An optional LOCKED clause is provided that is executed if the desired lock could not be acquired. A MATREAD pauses execution until it can acquire a shared lock on the specified record.

You can optionally specify a LOCKED clause. This clause is executed if MATREADL or MATREADU could not perform a read due to lock contention. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is
specified, program execution waits indefinitely for the conflicting lock to be released. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause, which is executed if array is not a MultiValue dimensioned array. If no ON ERROR clause is present, the ELSE clause is taken, or an <ARRAY DIMENSION> error is issued. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. MATREAD executes the THEN clause if the read was successful. The THEN clause is executed even when all remaining field identifiers are the null string. MATREAD executes the ELSE clause if the read operation fails. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

MATREAD, MATREADL, and MATREADU all read the specified MultiValue file record value into array. If recID refers to a non-existent record, the read operation fails.

Note: This statement cannot be executed from the MVBasic command shell. Attempting to do so results in a MVBasic syntax error.

The various MATREAD statements read from a MultiValue file into a dimensioned array. The various READ statements read from a MultiValue file into a dynamic array.

Examples

The following example illustrates the use of the MATREAD statement:

```caché
DIM myarray(6)
OPEN "TEST.FILE" TO myfile
MATREAD myarray FROM myfile,1
PRINT "the number of records read:" , INMAT()
PRINT "the record value:" , myarray(1)
```

See Also

- DIM statement
- MAT statement
- MATBUILD statement
- MATPARSE statement
- MATWRITE statement
- OPEN statement
- READ statement
- INMAT function
- Variables
MATWRITE, MATWRITEU

Writes data from a dimensioned array to a MultiValue file record.

```
MATWRITE array (ON | TO) filevar,recID
  [SETTING var] [ON ERROR statements] [LOCKED statements] [THEN statements] [ELSE statements]

MATWRITEU array (ON | TO) filevar,recID
  [SETTING var] [ON ERROR statements] [LOCKED statements] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>array</th>
<th>Name of an existing dimensioned array that supplies the record data written to the MultiValue file. This array must have been dimensioned using the DIM statement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>A local variable used as the file identifier of an open MultiValue file. This variable is set by the OPEN statement. You can specify either ON or TO as the keyword.</td>
</tr>
<tr>
<td>recID</td>
<td>The record ID of the record to be written, specified as either a number or an alphanumeric string of up to 31 characters. Letters in a recID are case-sensitive. Additional naming conventions are described below.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The MATWRITE statements are used to write data from a dimensioned array to a record in a MultiValue file.

- MATWRITE writes a record, then releases the update (exclusive) record lock
- MATWRITEU writes a record, retaining the update (exclusive) record lock

You can optionally specify a LOCKED clause. This clause is executed if the write command could not acquire an exclusive record lock due to lock contention. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause, which is executed if array is not a MultiValue dimensioned array. If no ON ERROR clause is present, an <ARRAY DIMENSION> error is issued. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the record write is successful, the THEN clause is executed. If record write is attempted but fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.
You can use the \texttt{STATUS} function to determine the status of the write operation, as follows: 0=write successful; -1=write failed because file not open (or opened by another process).

\textbf{Note:} This statement cannot be executed from the MVBasic command shell. Attempting to do so results in an MVBasic syntax error.

\section*{Record Naming Conventions}

The following are naming conventions for a valid MultiValue \texttt{recID}:

- A \texttt{recID} can be a number or an alphanumeric string.
- If a number, it is converted to canonical form: multiple plus and minus signs are resolved, and the plus sign, and leading and trailing zeros are removed. If the number is enclosed in single or double quotation marks, conversion to canonical form is not performed. Only a single period can be specified, which is used as the decimal separator character.
- If an alphanumeric string, the first character must be a letter, dollar sign ($), or percent sign (%). Subsequent characters may be letters, numbers, or percent characters. If the first character is a dollar sign ($), all subsequent characters must be letters.
- The period (.) character can appear within a \texttt{recID}. If the \texttt{recID} is alphabetic any number of periods can be specified; these periods are stripped out and are not part of the \texttt{recID}. If the \texttt{recID} is a mixed alphanumeric, no periods may be specified.
- The \texttt{recID} may be enclosed in single or double quotation marks, these become part of the record name, unless the \texttt{recID} is an integer in canonical form. Single and double quotes are equivalent. Thus: "4"='4'=4 and "rec1"='rec1' but not equal to rec1. Do not specify a blank space within a \texttt{recID}.
- A \texttt{recID} is case-sensitive.
- A \texttt{recID} is limited to 31 characters. You may specify a \texttt{recID} longer than 31 characters, but only the first 31 characters are used. Therefore, a \texttt{recID} must be unique within its first 31 characters.

\section*{Empty Nodes}

By default, \texttt{MATWRITE} assigns empty strings to unassigned nodes. If the highest subscripts of the dimensioned array are unassigned or have empty string values, the resulting record is truncated at the last assigned data value. This behavior can be configured using the \texttt{%SYSTEM.Process.MVUndefined()} method.

\section*{Record Locks}

\texttt{RECORDLOCKU} performs an update (exclusive) lock on a record. This update record lock is automatically released when you write data to the record using \texttt{MATWRITE}. The \texttt{MATWRITEU} command does not release the update record lock. You can check the status of an update record lock using the \texttt{RECORDLOCKED} function. You can explicitly release an update record lock using the \texttt{RELEASE} command.

\section*{MATWRITE and WRITE}

The \texttt{MATWRITE} and \texttt{MATWRITEU} statements write from a dimensioned array to a MultiValue file record. The various \texttt{WRITE} statements write from a dynamic array (or an ordinary string) to a MultiValue file record.

\section*{Emulation}

D3, jBASE, MVBase, R83, POWER95, Reality, and Ultimate set $\texttt{OPTIONS MATBUILD.UNASSIGNED.ERROR}$. This causes these emulations to not support unassigned dimensioned array nodes. Because \texttt{MATWRITE} uses \texttt{MATBUILD} to construct the output string, if \texttt{MATWRITE} encounters an unassigned node, it issues an \texttt{<UNDEFINED>} error. This behavior can be configured using the \texttt{%SYSTEM.Process.MVUndefined()} method.
UniData MATWRITE truncates the highest subscripts of a dimensioned array if they are unassigned or have empty string values. (UniData MATBUILD does not truncate in these circumstances.)

By default, Caché and the D3, jBASE, PIOpen, Prime, UniData, and UniVerse emulations do not set $OPTIONS STATIC.DIM: all other emulations set $OPTIONS STATIC.DIM. When set, STATIC.DIM re-dimensions an array at runtime when there are more attributes than the number of dimensioned array elements. Thus excess attributes are appended to the end of the array. When STATIC.DIM is not set, excess attributes are placed in array element 0.

**Examples**

The following example writes a line of data to an existing sequential file on a Windows system:

```basic
DIM myarray(6)
OPEN "TEST.FILE" TO mytest
IF STATUS()=0
THEN
  MATWRITE myarray TO mytest,1
  ON ERROR PRINT "MATWRITE error occurred"
  CLOSE mytest
END
ELSE
  PRINT "File open failed"
END
```

**See Also**

- DIM statement
- MAT statement
- MATBUILD statement
- MATPARSE statement
- MATREAD statement
- OPEN statement
- STATUS statement
- WRITE statement
- Variables
$MERGE

Merge two arrays.

$MERGE destination=source

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>destination</td>
<td>A local variable, process-private global, or global to be merged. If specified as a class property, the source variable must be a multidimensional (subscripted) variable.</td>
</tr>
<tr>
<td>source</td>
<td>A local variable, process-private global, or global to be merged. If specified as a class property, the source variable must be a multidimensional (subscripted) variable.</td>
</tr>
</tbody>
</table>

**Description**

The $MERGE statement is used to merge two arrays. $MERGE destination=source copies source into destination and all descendants of source into descendants of destination. It does not modify source, or kill any nodes in destination.

**Note:** $MERGE operates only on non-MultiValue arrays. It cannot be used with a MultiValue static dimensioned array that has been declared using DIM.

$MERGE simplifies the copying of a subtree (multiple subscripts) of a variable to another variable. Either variable can be a subscripted local variable, process-private global, or global. A subtree is all variables that are descendants of a specified variable.

If destination is undefined, $MERGE defines it and sets it to source. If source is undefined, $MERGE completes successfully, but does not change destination. When the destination and source are the same variable, no merge occurs. $MERGE issues an error if the source and destination have a parent-child relationship.

You can specify multiple, comma-separated destination=source pairs. They are evaluated in left-to-right order.

The $MERGE command can take longer than most other Caché MVBasic commands to execute. As a result, it is more prone to interruption. The effect of interruption is implementation-specific. Under Caché, an interruption may cause an unpredictable subset of the source to have been copied to the destination subtree.

**See Also**

- Global Structure chapter in Using Caché Globals
NAP

Suspended processing for a specified number of milliseconds.

\[ \text{NAP} \ [\text{millisecs}] \]

**Arguments**

| millisecs | *Optional* — An integer count of milliseconds. If omitted, execution is suspended for 1 millisecond. |

**Description**

The **NAP** statement specifies the number of milliseconds to suspend program execution. There are one thousand milliseconds in a second. If you specify **NAP** with no argument, it suspends program execution for one millisecond.

The **SLEEP** and **RQM** statements can be used to suspend program execution for a specified number of seconds.

**See Also**

- **SLEEP** statement
- **RQM** statement
NOBUF

Turns off buffering for sequential file I/O.

**NOBUF filevar [THEN statements] [ELSE statements]**

**Arguments**

| filevar | A file variable name used to refer to a MultiValue sequential I/O file. This filevar is supplied by the OPENSEQ statement. |

**Description**

By default, sequential file I/O is performed using I/O buffering. This buffer is automatically assigned as part of the OPENSEQ operation. I/O buffering significantly improves overall performance, but means that write operations are not immediately applied to the sequential file. The NOBUF statement disables the I/O buffer for an open MultiValue sequential file. That is, all I/O operations are immediately executed on the sequential file.

NOBUF takes the file identifier filevar, defined by the OPENSEQ statement. Thus, NOBUF can only be issued after a sequential file has been opened with I/O buffering.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file buffer is successfully disabled (the specified filevar exists), the THEN clause is executed. If the buffer disable fails (usually because the specified filevar does not exist), the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

Caché MVBasic also provides a FLUSH statement, which immediately writes the current contents of the I/O buffer to the sequential file.

**See Also**

- OPENSEQ statement
- WRITESEQ statement
- FLUSH statement
**NULL**

Performs no operation, used in a clause.

| NULL |

**Arguments**

The **NULL** statement takes no arguments.

**Description**

The **NULL** statement performs no operation. It is used to indicate in an optional clause that no operation is to be performed when that clause is executed. It can be used within a **THEN** clause, an **ELSE** clause, or an **ON ERROR** clause. It is most commonly used in a **THEN** clause. For example:

```
WRITE mydata TO filevar,recID
  THEN NULL
  ELSE GOTO write_error
PRINT "All done"
```

**NULL** transfers control to the statement immediately following the **THEN**...**ELSE** construction.

**See Also**

- **END** statement
- **IF...THEN** statement
ON

Transfers program execution to one of several internal subroutines or labels.

ON integer GOSUB labell[,label2][...]  
ON integer GOTO labell[,label2][...]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>integer</td>
<td>A positive non-zero integer that corresponds to the list of labels.</td>
</tr>
<tr>
<td>label</td>
<td>Any valid label. The label name can be optionally followed by a colon (:)</td>
</tr>
</tbody>
</table>

Description

The **ON** statement is used to transfer execution to one of the *labels* specified by the **GOSUB** or **GOTO** keyword. Which label to transfer execution to is specified by the *integer* argument: a value of 1 transfers control to the first listed *label*, a value of 2 transfers control to the second listed *label*, and so forth.

For a **GOTO**, this label identifies a line of code in the current program. For a **GOSUB**, this label identifies an internal subroutine that is executed until a **RETURN** statement is encountered. Execution then reverts to the line immediately following the **ON...GOSUB** statement. (Execution of an internal subroutine can also terminate with an **END** statement, which does not return control.)

The *label* argument value corresponds to line of code identified by a *label* identifier. Non-numeric labels end with a colon character; this colon is option when specifying the *label* argument.

See Also

- **GOSUB** statement
- **GOTO** statement
- **RETURN** statement
- **Labels**
OPEN

Opens a MultiValue file.

OPEN [SECTION,] mvfile [TO filevar] [SETTING var] [ON ERROR statements] [THEN statements] [ELSE statements]

**Arguments**

<table>
<thead>
<tr>
<th>SECTION</th>
<th>Optional — An expression evaluating to “DICT”, “DATA”, or “”. Unless SECTION is “DICT”, the section opened by OPEN is determined by the mvfile argument.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA DICT</td>
<td>Optional — A keyword specifying whether to access the MultiValue data file or the dictionary file. The default is to access the data file. Note the required comma following this keyword.</td>
</tr>
<tr>
<td>mvfile</td>
<td>An expression evaluating to a filename defined in the VOC, or an mv filename path. See the Description below.</td>
</tr>
<tr>
<td>filevar</td>
<td>Optional — A local variable name assigned to the MultiValue file. If omitted, the file is opened into the special variable @STDFIL.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The OPEN statement is used to open the mvfile MultiValue file. This must either be an existing file defined as a file in the VOC, or the VOC itself. You can create a MultiValue file by using the CREATE.FILE verb.
You can specify *mvfile* in any of the following ways:

```
"filename"
"filename,"
"filename,datasection"
"account,"
"account,filename,"
"account,filename,datasection"
```

The following four **OPEN** statements all do the same thing:

```
OPEN "DATA","filename"
OPEN "DATA filename"
OPEN "filename"
OPEN "filename,filename"
```

The following two **OPEN** statements both do the same thing:

```
OPEN "DICT","filename"
OPEN "DICT filename"
```

Note the trailing comma(s) in several of these formats. "filename" and "filename," are functionally identical. If you specify "account,", the VOC for the specified account is opened. If mvfile is an empty string, **OPEN** executes its ELSE clause.

The **OPEN** statement assigns a *filevar* variable to the specified MultiValue file. *filevar* is a local variable specific to the current process. You use this *filevar* variable to refer to the MultiValue file in subsequent **READ**, **WRITE**, and other file statements. Issuing a **CLOSE** statement deletes the *filevar* value.

A process can successfully issue multiple concurrent **OPEN** statements against the same MultiValue file. Multiple processes can issue concurrent **OPEN** statements against the same MultiValue file.

You can optionally specify an ON ERROR clause, which is executed if an argument is invalid. The **statements** argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file open is successful (the specified file exists), the THEN clause is executed. If file open fails (the specified file does not exist), the ELSE clause is executed. Commonly, a **STOP** is issued as part of an ELSE clause. The **statements** argument can be the NULL keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the **STATUS** function to determine the status of the file open operation, as follows: 0=success; -1=file does not exist.

After opening a file, you can use the **STATUS** statement to obtain file status information. You can use the **FILEINFO** function to get information about an open file.

**OPEN** is used to open a MultiValue file for **READ** and **WRITE** access. Use **OPENSEQ** to open a sequential file.

The following example uses **OPEN** to open the VOC file:

```
OPEN 'VOC' TO MyVoc
IF 0=STATUS() THEN PRINT 'Opened file' ELSE STOP 201,'VOC'
CLOSE MyVoc
IF 0=STATUS() THEN PRINT 'Closed file' ELSE PRINT 'Close error'
```

**Directory Direct Reference**

You can use the double slash (/) prefix to directly reference a directory pathname from the **OPEN** command. For example:
OPEN "/C:/temp" TO DSCB
WRITE results ON DSCB,"results.txt"

This program opens the Windows directory C:/temp and creates the file C:/temp/results.txt.
The directory pathname must be preceded by //, and must not already exist in the VOC.
The DICT and DATA keywords are not meaningful in this context. Either may be specified or omitted without affecting the directory reference.

**Emulation**

You may specify the keyword SYSTEM before the account portion of myfile. For example:
"SYSTEM,account, filename". In Caché MVBasic this keyword is a no-op, it is provided for compatibility with other MultiValue implementations.

In D3 emulation mode, you can specify MDS, rather than SYSTEM, as this no-op keyword prefix.

**See Also**

- READ statement
- WRITE statement
- CLOSE statement
- OPENSEQ statement
- STATUS statement
- OPENPATH statement
- FILEINFO function
- STATUS function
OPENINDEX

Opens an index.

OPENINDEX filename,indexname TO ivar [THEN statements] [ELSE statements]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filename</td>
<td>The name of a MultiValue file defined in the VOC, or the name VOC. filename must be specified as a quoted string. If there are multiple defined data sections (data files), you can specify filename as &quot;filename,datasection&quot;.</td>
</tr>
<tr>
<td>indexname</td>
<td>The name of a defined index, specified as a quoted string.</td>
</tr>
<tr>
<td>ivar</td>
<td>The name of an index variable, a dynamic array.</td>
</tr>
</tbody>
</table>

Description

The **OPENINDEX** statement is used to open an existing index and create an ivar (index variable) for use by the **SELECT**, **SELECT ATKEY**, or **SELECTINDEX** statement.

The ivar argument accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the index is opened, the THEN clause is executed. If the index cannot be opened, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

Examples

The following example used **OPENINDEX** to open an index to VOC on the attribute F1. The **SELECT** selects this index to a select list. The **READNEXT KEY** reads an item from the select list:

```cache
OPENINDEX 'VOC','F1' TO IdxFp ELSE ABORT
SELECT IdxFp TO IdxList
READNEXT KEY Idx,Id FROM IdxList
```

See Also

- **SELECT** statement
- **SELECT ATKEY** statement
- **SELECTINDEX** statement
- **READNEXT** statement
- **READNEXT KEY** statement
OPENPATH

Opens a directory.

\[
\text{OPENPATH } \text{pathname} \quad \begin{array}{l}
\text{[TO filevariable]} \\
\text{[SETTING var]} \quad \text{[ON ERROR statements]} \\
\text{[[THEN statements]} \quad \text{[ELSE statements]]}
\end{array}
\]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pathname</td>
<td>Optional — A fully-qualified pathname of a directory, specified as a quoted string. For example: “C:\foo\”</td>
</tr>
<tr>
<td>TO filevariable</td>
<td>Optional — A structure that contains the file type and the file name. For details, see below.</td>
</tr>
<tr>
<td>SETTING var</td>
<td>Optional — When an error occurs, sets the local variable var to the operating system’s error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

Description

OPENPATH opens a directory. Each filename within the directory is represented as a record ID. Subsequent READ statements specify these files using the record IDs.

The filevariable string has the following structure:

\[$C(128)_$MVV(1)_$C(FileType)_$C(DictFlag)_$LIST(FileName1[,FileName2])$

The FileType codes are as follows: 0=Select List; 1=OS File; 2=Directory; 3=Global

The DictFlag codes are as follows: 0=data file; 1=dictionary file

FileName1 specifies (depending on the FileType) the filename, directory name, or global name.

FileName2 is only specified for FileTypes 2 and 3: If FileType 2=the VOC id for the OS file name. If FileType 3 = the VOC id for the file name.

The filevariable argument accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l])

You can optionally specify an ON ERROR clause, which is executed when the directory is located but could not be opened. The ELSE clause is executed when the directory could not be located. If no ON ERROR clause is specified, the ELSE clause is executed for both types of failed access. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the directory open succeeds, the THEN clause is executed. If the directory open fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.
See Also

- OPEN statement
- OPENSEQ statement
- READ statement
- WRITE statement
- STATUS function
**OPENSEQ**

Opens a file for sequential access.

```
OPENSEQ filename TO filevar [LOCKED statements] [ON ERROR statements] [THEN statements] [ELSE statements]
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filename</td>
<td>The file to be opened. A fully-qualified Windows or UNIX® file pathname, specified as a quoted string. For two-part versions of this argument, see the Emulation section below.</td>
</tr>
<tr>
<td>TO filevar</td>
<td>A file variable name used to refer to the file in Caché MVBasic. filevar can be a simple variable, or can be a single dynamic array reference (A&lt;i&gt;), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A&lt;i&gt;[s,l]).</td>
</tr>
</tbody>
</table>

### Description

The **OPENSEQ** statement is used to open a file for sequential access. This can be an existing file or a new file. It assigns the file to filevar.

You can optionally specify a LOCKED clause, which is executed if **OPENSEQ** could not open the specified file due to lock contention. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause, which is executed if the file could not be opened. If no ON ERROR clause is present, the ELSE clause is taken for this type of error condition. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file open is successful (the specified file exists), the THEN clause is executed. If file open fails (the specified file does not exist), the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the STATUS function to determine the status of the sequential file open operation, as follows: 0=success; -1=file does not exist.

To create a file, you must first issue an **OPENSEQ** statement, giving the fully-qualified pathname for the file you wish to create. Because the file does not yet exist, the **OPENSEQ** appears to fail, taking its ELSE clause and setting the value returned by the STATUS function to -1. However, the **OPENSEQ** sets its filevar to an identifier for the specified file. You then supply this filevar to CREATE to create the new file.

The filename must be a fully-qualified pathname. The directories specified in filename must exist for a file create to be successful. Pathnames are not case-sensitive; however, case is preserved when you specify a filename to create a sequential file.
After opening a file, you can use the **STATUS** statement to obtain file status information. You can use **READBLK**, **READSEQ**, **WRITEBLK**, and **WRITESEQ** to perform sequential read and write operations. You can use **CLOSESEQ** to release an open file, making it available to other processes.

**File Locking**

Issuing **OPENSEQ** gives the process exclusive access to the specified file. An **OPENSEQ** locks the file against an **OPENSEQ** issued by any other process. This lock persists until the process that opened the file releases the lock, by issuing a **CLOSE**, a **CLOSESEQ**, or a **RELEASE** statement.

Issuing an **OPENSEQ** for a non-existent file also performs an exclusive file lock, so that your process can issue a **CREATE** to create this file. A **CLOSE** or **CLOSESEQ** releases this file lock, whether or not the file has been successfully created.

If an **OPENSEQ** without a LOCKED clause attempts to open a file already opened by another process, the **OPENSEQ** waits until the first process closes (or releases) the desired file. If an **OPENSEQ** with a LOCKED clause attempts to open a file already opened by another process, the **OPENSEQ** concludes by executing the LOCKED clause statements. The ELSE clause is not invoked because of lock contention.

**FILEINFO and @FILENAME**

You can use the **FILEINFO** function to return sequential file information, including whether a specified *filevar* has been defined (*key*=0) and the *filename* specified in **OPENSEQ** for that *filevar* (*key*=2). The **@FILENAME** system variable also contains the *filename* specified in the most recent **OPENSEQ**.

In both cases, the file does not have to exist; if **OPENSEQ** specifies a non-existent file, both **FILEINFO** and **@FILENAME** return the specified pathname as a directory path. Subsequently creating this file does not change the **FILEINFO** and **@FILENAME** pathname values. If the file does not exist, the **FILEINFO** file type (*key*=3) is 0. Creating the file changes this **FILEINFO** file type to 5.

**Sequential File I/O Buffering**

By default, sequential file I/O is performed using I/O buffering. This buffer is automatically assigned as part of the **OPENSEQ** operation. I/O buffering significantly improves overall performance, but means that write operations are not immediately applied to the sequential file.

Caché MVBasic provides two statements that override I/O buffering. The **FLUSH** statement immediately writes the current contents of the I/O buffer to the sequential file. The **NOBUF** statement disables the I/O buffer for the duration of the sequential file open. That is, all subsequent I/O write operations are immediately executed on the sequential file.

**Emulation**

For jBASE emulation, the *filename* argument can be specified with a two-part *path*,*filename* syntax. When executed, the two parts are concatenated together, with a delimiter added to the end of *path*, when necessary. For example, **OPENSEQ 'c:\temp\', 'mytest.txt' TO FD** or **OPENSEQ 'c:\temp', 'mytest.txt' TO FD**.

For other emulation modes, the *filename* argument can be specified with a two-part *file*,*itemID* syntax. The *file* part is a dir-type file defined in the VOC master dictionary, and the *itemID* part is an operating system file within that directory.

**Examples**

The following example opens a sequential file on a Windows system and writes a line to it. If the file does not exist, it creates the file:
See Also

- CREATE statement
- DELETESEQ statement
- READSEQ statement
- WRITESEQ statement
- FLUSH statement
- NOBUF statement
- CLOSESEQ statement
- RELEASE statement
- STATUS statement
- FILEINFO function
- STATUS function
- @FILENAME system variable
$OPTIONS

Sets configuration options for MultiValue implementations.

$OPTIONS option

Arguments

| option          | The name of a single option, or the names of multiple options separated by spaces. Option names are not case-sensitive. |

Description

The $OPTIONS statement provides emulation/compatibility options for the various “flavors” of MultiValue database systems for the current MVBasic program. There are two basic types of options:

- Emulation options. You specify the desired emulation, which sets multiple default values appropriate for that MultiValue “flavor”.
- Flag options that set a single specific default value, usually by turning a behavior on or off.

An $OPTIONS statement may specify multiple option values, separating the values with a blank space. If you specify an emulation option, it must be the first option value specified.

Emulation Options

Each option sets the appropriate configuration values for that MultiValue implementation. The following option database system values are supported:

- Cache
- D3
- IN2
- INFORMATION
- jBASE
- MVBase
- PICK
- POpen
- Prime
- R83
- POWER95
- Reality
- UDPICK
- Ultimate
- UniData
- UniVerse

$OPTIONS sets the emulation for the duration of the current MVBasic program. Emulation is specific to the current account. An $OPTIONS statement can only specify one emulation option.

Both “Prime” and “INFORMATION” option values set an emulation of “INFORMATION.” An option value of “Default” sets an emulation of “CACHE”. You can determine the current emulation using the SYSTEM(1001) and SYSTEM(1051) functions.

You can set the systemwide MultiValue emulation for the current account using the CEMU command line command, as described in the Caché MultiValue Commands Reference.

D3 emulation, by default, provides variable names that are not case-sensitive. Use of such variables is not advised when interacting with Caché CSP variables, ZEN, and other InterSystems software, all of which uses case-sensitive variables. To make D3 emulation use case-sensitive variables, specify the flag option $OPTIONS -NO.CASE. Refer to Chapter 13 Other Compatibility Issues in Operational Differences between MultiValue and Caché for further details.
Flag Options

Caché MVBasic supports many flag option values that affect the default behavior of individual statements or functions. These are provided to support porting or emulation of specific functional differences between the various MultiValue implementations.

To turn on (activate) a flag option value, specify the option name ($OPTIONS CASE). To turn off a flag option value, prefix the option name with a minus sign ($OPTIONS -CASE). You can specify multiple flag options, separated by blanks. The emulation option, if present, must be specified as the first option.

The specific flag option values are listed in the $OPTIONS section of Operational Differences between MultiValue and Caché. They are described individually in the reference page for the statement or function for which they modify default behavior.

Command Line Emulation Mode

From the MultiValue Shell, the emulation mode is specified for the current account (namespace) using the CEMU command line command. The initialization value is Cache. However, once CEMU sets an emulation for an account, that emulation is persistent across processes and Caché restart. This is the emulation mode used for the compilation and execution of an MVBasic statement from the command line.

Use the $OPTIONS statement to temporarily override the emulation setting established by CEMU. To specify an option setting other than the ones set by the CEMU emulation mode, it is necessary to specify the $OPTIONS statement and the MVBasic statement that it affects on the same command line.

For example, the default value for SYSTEM(33) is the contents of the command stack. To return the UniData SYSTEM(33) value (the system platform name), it is necessary to specify $OPTIONS UniData on the same command line. This is shown in the following Windows example:

USER:CEMU
Emulation for account 'USER' is 'CACHE'
USER:;PRINT SYSTEM(33)
0
USER:;$OPTIONS UniData ;PRINT SYSTEM(33)
Windows NT
USER:;PRINT SYSTEM(33)
;PRINT SYSTEM(33);$OPTIONS UniData ;PRINT SYSTEM(33);PRINT SYSTEM(33);CEMU

The following example sets a custom emulation. It begins in Cache' emulation (SYSTEM(1001)=0). $OPTIONS sets the emulation as PICK (SYSTEM(1001)=5) and also turn off the CASE option (-CASE). This makes local variable names not case-sensitive. The result is a PICK emulation without case sensitivity, which is a behavior otherwise only found in D3 emulation.

USER:CEMU
Emulation for account 'USER' is 'CACHE'
USER:;PRINT SYSTEM(1001)
0
USER:;$OPTIONS PICK -CASE ;x=123 ;PRINT SYSTEM(1001) ;PRINT x ;PRINT X
5
123
123
USER:;$PRINT SYSTEM(1001)
0

See Also

• SYSTEM function
• $OPTIONS section in Operational Differences between MultiValue and Caché
• CEMU command line command in the Caché MultiValue Commands Reference
OUT

Displays the character(s) specified by the corresponding numeric code(s).

```
OUT int[,int2[,...]
```

**Arguments**

| int | An integer code that corresponds to a character. You can specify a single character code or a comma-separated list of character codes. |

**Description**

The OUT statement displays the specified characters on the terminal screen. Valid int codes include the ASCII character codes and the Unicode character codes. Codes are specified as base-10 integers. You can specify a single character, or a comma-separated list of characters. Characters specified in a list are concatenated into an output string.

The OUT statement display is not suppressed by the HUSH statement or the EXECUTE statement's CAPTURING clause.

**Examples**

The following example displays the character string “ABCD”:

```
OUT 65,66,67,68
```

The following example displays a character string of the first four lowercase letters of the Greek alphabet:

```
OUT 945,946,947,948
```

The following example displays the Euro currency symbol:

```
OUT 8364
```

The following example rings the bell on the terminal:

```
OUT 7
```

**See Also**

- EXECUTE
- HUSH
PAGE

Advances printing to the next output page.

PAGE [ON channel] [pagenum]

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Optional</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>channel</td>
<td>—</td>
<td>The ON clause specifies a print channel as an integer value of -1 through 255. If not specified, the print channel defaults to 0, which is the current terminal session screen.</td>
</tr>
<tr>
<td>pagenum</td>
<td>—</td>
<td>An integer specifying the page number to print on the next page. Page numbering must be defined in the header or footer for this option to take effect.</td>
</tr>
</tbody>
</table>

Description

The PAGE statement advances the output device (printer or terminal) to a new page. If a header and/or a footer are defined, PAGE prints these on the new page. If the header and/or footer defines a page number field, PAGE uses the pagenum field to specify the page number to print on the new page.

The optional channel specifies the logical print channel for this output. The range of available values is -1 through 255 (inclusive). If channel=-1, output is displayed on the terminal screen. If channel is not specified, the default logical print channel is 0 (the current user terminal).

For PAGE ON channel (with channel \(< 0\)) to affect a print job, the PRINTER ON statement must have been specified. Otherwise, no operation is performed.

Before calling PAGE, you can use the HEADING and FOOTING statements to define the text to be printed at the top and bottom of each page. After calling PAGE, you can use the PRINT statement to specify the text to be printed on the new page.

Page Length and Number Settings

You can determine the current page length by calling SYSTEM(3). You can determine the current page number by calling SYSTEM(5). You can change these values by calling the ASSIGN statement.

See Also

- ASSIGN statement
- FOOTING statement
- HEADING statement
- PRINT statement
- PRINTER statement
- SYSTEM function
PCPERFORM

Issues an operating system command and returns to MVBasic.

```
PCPERFORM cmdstr [CAPTURING {var | NULL}]
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>cmdstr</code></td>
<td>An operating system command to be issued to the operating system shell (command prompt). Specified as a variable or a quoted string. This string cannot exceed 248 characters in length.</td>
</tr>
<tr>
<td>CAPTURING <code>var</code></td>
<td>Optional — a variable used to receive the operating system’s response. You can specify a local variable name or the NULL keyword.</td>
</tr>
</tbody>
</table>

### Description

The PCPERFORM statement is used to issue an operating system shell command from within Caché MVBasic. If you specify a CAPTURING `var` clause, the response from the operating system is returned as the value of `var`. CAPTURING `NULL` discards the response from the operating system.

### Invoking Other Shells

You can use the EXECUTE, PERFORM, and CHAIN commands to issue MultiValue commands from within Caché MVBasic.

You can use the $XECUTE command to issue an ObjectScript command from within Caché MVBasic.

### Invoking Operating System Commands from the MV Shell

You can use the DOS or SH MultiValue command line commands to issue an operating system shell command from the MultiValue Shell. For further details refer to the Caché MultiValue Commands Reference.

### See Also

- CHAIN statement
- EXECUTE statement
- PERFORM statement
- $XECUTE statement
PERFORM

Executes a MultiValue command from a program and returns.

**PERFORM command**

**Arguments**

| command          | One or more MultiValue commands, each command specified as a quoted string. A string can be quoted using single quotes ('cmd arg'), double quotes ("cmd arg"), or backslashes (\cmd arg). To specify multiple commands, separate the commands with a Field Mark ("cmd1 arg":@FM:"cmd2 arg"). |

**Description**

The `PERFORM` command executes the specified Caché MultiValue command(s), then resumes execution of the MVBasic program. It initially searches the VOC for the `command`; if the `command` is not found in the VOC, it searches the global catalog. For lookup details, refer to `CATALOG` in the *Caché MultiValue Commands Reference*.

**EXECUTE, PERFORM, and CHAIN**

The `EXECUTE` command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement in the invoking program. `EXECUTE` can pass values to the MultiValue command(s) and return values from the MultiValue command(s).

The `PERFORM` command executes one or more MultiValue commands from within MVBasic, then returns execution to the next MVBasic statement in the invoking program. `PERFORM` cannot pass or return values.

The `CHAIN` command executes a single MultiValue command from within MVBasic. It does not return execution to the invoking program. `CHAIN` cannot pass values.

**Emulation**

In Reality and D3 emulations, the `PERFORM` command is functionally identical to the `EXECUTE` command.

In UniData and UDPICK emulations, a `command` name with an initial character of * is handled as a global name. `PERFORM` removes the leading * and then looks up the resulting command name in the global catalog in SYS.MV, rather than looking up in the VOC. If the runtime environment is not a UniData emulation, a normal VOC lookup is done on the *`command` name.

**Examples**

The following example shows how to use `PERFORM` to execute multiple MultiValue commands:

```mv
PRINT TIME()
PERFORM "SLEEP 2":@FM:"SLEEP 3"
PRINT TIME()
```

**See Also**

- `CHAIN` statement
- `EXECUTE` statement
- ObjectScript: `XECUTE` command
PRECISION

Specifies the maximum number of decimal digits when transforming a floating point number.

```
PRECISION int
```

### Arguments

| int | An integer specifying the maximum number of decimal digits. |

### Description

The PRECISION statement specifies the maximum number of decimal digits to display when converting a floating point number. It rounds the decimal portion to the number of decimal digits specified in `int`. The default number of decimal digits is 4.

**PRECISION does not** add trailing zeros to numbers with fewer decimal digits than specified.

If `int` is 0, the null string, or a non-numeric string, PRECISION rounds all decimal digits to the nearest integer value.

### Examples

The following example illustrates use of the PRECISION statement to provide a precision value to the FIX function:

```
mynum=123.987654321
PRINT FIX(mynum)
! returns 123.9877
! (rounds to the default precision of 4)
PRECISION 2
PRINT FIX(mynum)
! returns 123.99
! (rounds to a precision of 2)
```

### See Also

- FIX function
PRINT

Prints to the terminal or to a specified device.

```
PRINT text[:]
PRINT [ON channel] text [format][:]
PRINT ON CHANNEL #channel
```

**Arguments**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ON channel</strong></td>
<td>Optional — The ON clause specifies a print channel as an integer value of -1 through 255. If not specified, the print channel defaults to 0, which is the current terminal session screen.</td>
</tr>
<tr>
<td><strong>text</strong></td>
<td>Optional — Any MVBasic expression that resolves to a quoted string or a numeric. You can specify a single expression or a series of expressions separated by either commas (,) or colons (:). A comma inserts a tab spacing between the two strings. A colon concatenates the two strings. If text is omitted, a blank line is returned.</td>
</tr>
<tr>
<td><strong>format</strong></td>
<td>Optional — A code specifying how to handle text, specified as a quoted string. This format is applied to the text that immediately precedes it. Whitespace characters may be inserted between text and format.</td>
</tr>
</tbody>
</table>

**Description**

**PRINT** displays the items specified in text to the screen, or to the device specified by the ON channel clause. If no text is specified, **PRINT** displays a blank line.

To print to a printer, the **PRINTER ON** command must have been issued. The **channel** specifies a printer print channel as a positive integer. If channel is 0 or -1, the text is printed to the terminal screen (or to a CAPTURING clause), regardless of whether **PRINTER ON** has been set.

A text can consist of a single string or numeric expression, or a series of expressions alternating with separator characters. Any text may be followed by an optional **format**. This format applies only to the text string that immediately precedes it.

The following separators are supported:

- A comma (,) used as a separator character inserts a predefined tab between to items. By default, tabs are set at ten column intervals. You can specify a comma before the first expression to indent that expression. You cannot specify a comma after the last expression; this results in a syntax error. You can specify a series of commas to specify multiple tabs; an odd number of commas increments the number of tabs. Thus, one or two commas (exp, exp or exp,,exp) equals one tab, three or four commas (exp,,,exp or exp,,,,exp) equals two tabs, and so forth.

- A colon (:) used as a separator character concatenates two items. Specifying a colon before the first expression has no effect. Specifying a colon after the last expression enables concatenation of the results of two commands. By default, a **PRINT** statement ends by issuing a linefeed and carriage return. However, if you end the **PRINT** argument with a colon, **PRINT** does not issue the linefeed and carriage return. This enables you to concatenate the output of the next statement to the **PRINT** output.

The **PRINT (without the ON clause)**, **DISPLAY**, and **CRT** commands are identical.

**Formatting**

The optional **format** argument specifies how to handle text. **PRINT** supports three types of **format** arguments:

- @ function formatting
- implicit formatting, using FMT function codes
You can use an @ function with positive arguments to specify the column position and/or line position at which to print. For example, CRT @(15):"Over here!" prints the literal string starting at column 16. You can also use the @ function with negative arguments to change screen display modes. For example, CRT @(-1):"Over here!" clears the screen, then prints the literal string at line 1, column 1.

To advance to the next page, and to print defined headings and footings, use the PAGE statement.

You can use the optional format argument to specify display width, justification, fill characters, and zero filling or rounding for decimal digits. This is known as “implicit formatting” because it is equivalent to inserting a FMT function as one of the PRINT arguments. For further details on the available format codes, refer to the FMT function.

You can disable implicit formatting by specifying $OPTIONS NO.IMPLICIT.FMT. Specifying this option prevents the evaluation of the format argument in CRT, PRINT, or DISPLAY. It has no effect on the explicit use of the FMT function.

Implicit conversion performs many of the OCONV function conversions by specifying the conversion code as the format argument. For example, both of the following perform date conversion from internal to display format:

```
PRINT 14100 "D";          ! "08 AUG 2006"
PRINT OCONV(14100,"D");  ! "08 AUG 2006"
```

For further details on the available format conversion codes, refer to the OCONV function.

**Examples**

The following examples illustrate the use of the PRINT statement:

```
PRINT "hello","world!"
```

returns:

```
hello    world!
```

```
PRINT "hello":"world!"
```

returns:

```
helloworld!
```

```
PRINT "hello"
PRINT "world!"
```

returns:

```
hello
world!
```

```
PRINT "hello":
PRINT "world!"
```

returns:

```
helloworld!
```

**Emulation**

For Caché and most emulations, if channel is a positive integer, PRINT output always goes to a spooler print job, regardless of the use of PRINTER ON or PRINTER OFF. D3, jBASE, and Reality emulations send the PRINT output to the screen if the application has not executed a PRINTER ON statement.
See Also

- CRT statement
- DISPLAY statement
- ECHO statement
- PAGE statement
- PRINTER ON statement
- @ function
- FMT function
- SPACE function
- SPOOLER function
PRINTER

Specifies whether to direct output to the printer.

<table>
<thead>
<tr>
<th>PRINTER ON</th>
<th>PRINTER OFF</th>
<th>PRINTER CLOSE [ON nnn]</th>
</tr>
</thead>
</table>

**Arguments**

<table>
<thead>
<tr>
<th>ON nnn</th>
<th>Optional — The print channel as assigned by the PRINT statement. Specified as an integer value in the range 0 through 255. If omitted, the default is print channel 0.</th>
</tr>
</thead>
</table>

**Description**

PRINTER ON directs output to the printer. After setting this option, PRINT statements direct their output to the print buffer, with the exception of PRINT ON 0 or PRINT ON -1 which always output to the terminal screen. PRINTER ON has no effect on CRT statements, which always output to the terminal screen.

PRINTER CLOSE spools the print buffer to the printer and closes the print channel. The ON nnn clause allows you to specify which print channel. If this clause is omitted, Caché MVBasic closes print channel 0; this behavior is emulation-dependent. An implicit PRINTER CLOSE is issued when the program terminates.

PRINTER OFF directs subsequent output to the screen (the default output device).

**Note:** PRINTER RESET is listed in this manual as a separate command, not an option of the PRINTER command.

**Emulation**

PRINTER CLOSE with no argument closes only print channel 0 in Caché and in UniVerse emulation (and some other emulations). In PICK and Reality (and some other emulations) PRINTER CLOSE with no argument closes all print channels. This behavior is governed by the SP-CONDUCT bit mask 4096.

**See Also**

- PRINT statement
- SPOOLER function
**PRINTER RESET**

Resets terminal or default printer channel characteristics.

### Description

**PRINTER RESET** resets the header, footer, and line number characteristics. It resets these characteristics for terminal output if output is directed to the terminal. It resets these characteristics for printer output if output is directed to the default print channel. Where output is directed is specified using the **PRINTER** command.

**PRINTER RESET** resets the following:

- The page header to null, removing any header set by the **HEADING** command.
- The page footer to null, removing any footer set by the **FOOTING** command.
- The current line number, resetting the value of **SYSTEM(4)**.

### See Also

- **HEADING** statement
- **FOOTING** statement
- **SPOOLER** function
PROCREAD

When called by a procedure, reads the input buffer contents.

```
PROCREAD data [THEN statements] [ELSE statements]
```

**Arguments**

| data | Name of a variable used to receive PROC data from the input buffer. |

**Description**

The `PROCREAD` statement reads the results of a PROC from the primary input buffer into the `data` variable. The MVBasic program must have been called by a procedure for `PROCREAD` to execute successfully.

The `data` variable must be a simple variable name. It cannot include a system variable, an `EQUATE`, a dynamic array reference, or a substring reference.

When reading from a PQ PROC, `PROCREAD` converts the @AM buffer delimiter to a blank space. `PROCREAD` converts empty buffer entries to the backslash (\) character. `PROCWRITE` reverses these character conversions. For this reason, including a \ literal in the input buffer should be avoided. When reading from a PQN PROC, `PROCREAD` does not perform these character conversions.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the input buffer read is successful, the THEN clause is executed, even when the contents of the input buffer is the empty string. If input buffer read operation fails, the ELSE clause is executed. If the program containing `PROCREAD` was not called by a procedure, the read operation fails and the ELSE clause is executed. The `statements` argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

**Emulation**

D3 and several other emulations support `$OPTIONS READ.RETAIN`. This option causes the `data` variable to retain its original value if `PROCREAD` fails.

**See Also**

- `PROCWRITE` statement
- Caché MultiValue PROC Reference
PROCWRITE

When called by a procedure, writes to the input buffer.

```
PROCWRITE data
```

**Arguments**

| data  | Name of a variable used to contain data to be written to the input buffer. |

**Description**

The **PROCWRITE** statement writes the contents of `data` to a PROC using the primary input buffer. The MVBasic program must have been called by a procedure for **PROCWRITE** to execute successfully.

Following the write operation, **PROCWRITE** resets the primary input buffer pointer so that it points to the beginning of the data in the buffer.

For a PQ PROC, **PROCWRITE** converts each blank space in `data` to an @AM delimiter, reversing the **PROCREAD** operation. **PROCWRITE** converts each elements that consists of a backslash (\) to an empty element, reversing the **PROCREAD** operation. Because of this backslash conversion, a backslash literal transferred by **PROCREAD** will be transferred back by **PROCWRITE** as an empty element. For this reason, backslashes in the input buffer should be avoided. This **PROCWRITE** conversion only applies to backslashes that represent empty elements (a backslash delimited by blank spaces). If a backslash is appended to other characters, **PROCWRITE** treats it as a quote delimiter.

When writing to a PQN PROC, **PROCWRITE** does not perform these character conversions.

**Emulation**

In Ultimate emulation, **PROCWRITE** converts all attribute marks (@AM) to blank spaces.

**See Also**

- **PROCREAD** statement
- Caché MultiValue PROC Reference
PROG (PROGRAM)

Specifies the program name.

<table>
<thead>
<tr>
<th>PROG name</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM name</td>
</tr>
</tbody>
</table>

**Arguments**

| name | A name used to identify the current program. Must be a valid identifier. |

**Description**

The **PROGRAM** statement is used to specify a name for the current program. It must appear as the first non-comment line of the program.

**See Also**

- Labels
- Comments


**PROMPT**

Sets the user input prompt.

```
PROMPT string
```

**Arguments**

| string | A quoted string of one or more characters to use as the user input prompt. |

**Description**

The **PROMPT** statement sets the user input prompt to the character (or characters) specified in `string`. The default prompt is the question mark (?) character.

The user input prompt is used by the **INPUT** statement. However, if a **DATA** statement is specified, **INPUT** does not display the input prompt.

**See Also**

- **DATA** statement
- **INPUT** statement
RANDOMIZE

Initializes the random-number generator.

```
RANDOMIZE [number]
```

Arguments

| number | Optional — Any valid numeric expression. |

Description

The **RANDOMIZE** statement uses `number` to initialize the **RND** function's random-number generator, giving it a seed value. By specifying the same **RANDOMIZE** `number` seed, you can use **RND** to repeatedly generate the same “random” number.

To restore true randomness, issue a **RANDOMIZE** statement without the `number` argument. If you omit `number`, the value returned by the system internal clock is used as the new seed value.

If **RANDOMIZE** is not used, the **RND** function uses the system internal clock as a seed the first time it is called, and thereafter uses the last generated random number as the next seed value.

Examples

The following example illustrates use of the **RANDOMIZE** statement:

```
RANDOMIZE 10;   ! Seeds random-number generator
PRINT RND(7)    ! Generates a random value between 1 and 6
PRINT RND(7)    ! Generates the same "random" value as above
RANDOMIZE;      ! Restores randomness
PRINT RND(7)    ! Generates a random value between 1 and 6
```

See Also

- **RND** function
READ, READL, READU, READV, READVL, READVU

Reads data from a MultiValue file.

| READ dynarray FROM filevar,recID  | [SETTING var] [ON ERROR statements] [[THEN statements] [ELSE statements]] |
| READL dynarray FROM filevar,recID | [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]] |
| READU dynarray FROM filevar,recID  | [SETTING var] [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]] |
| READV dynarray FROM filevar,recID,fieldno | [SETTING var] [ON ERROR statements] [[THEN statements] [ELSE statements]] |
| READVL dynarray FROM filevar,recID,fieldno | [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]] |
| READVU dynarray FROM filevar,recID,fieldno | [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]] |

Arguments

| dynarray | A dynamic array used to receive the field values from the file. This argument may be a local variable or an object reference. |
| filevar  | A local variable used as the file identifier of an open MultiValue file. This variable is set by the OPEN statement. |
| recID    | The record ID of the record to be read, specified as either a number or an alphanumeric string of up to 31 characters. Letters in a recID are case-sensitive. For naming conventions, refer to WRITE. |
| fieldno  | The field number of the field to be read, specified as an integer. Used with READV and READVU. If 0, returns the recID. |
| SETTING var | Optional — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause. Provided for jBASE compatibility. |

Description

These read statements read a value from a MultiValue file into a dynamic array. The READ, READL, and READU statements read the specified record into dynarray. The READV, READVL, and READVU statements reads the specified field within a record into dynarray.

The dynarray argument accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

You must use the OPEN statement to open the MultiValue file before issuing any of these READ statements.

A read operation must be able to acquire at least a shared lock on the desired resource. The READL and READVL statements acquire a shared lock before performing the read. The READU and READVU statements acquire an update lock before performing the read.
You can optionally specify a LOCKED clause for \texttt{READL}, \texttt{READU}, \texttt{READVL}, and \texttt{READVU}. This clause is executed if the statement could not acquire the desired resource due to lock contention. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The \texttt{statements} argument can be the \texttt{NULL} placeholder keyword, a single statement, or a block of statements terminated by the \texttt{END} keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause, which is executed if an argument is invalid. The \texttt{statements} argument can be the \texttt{NULL} placeholder keyword, a single statement, or a block of statements terminated by the \texttt{END} keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the read is successful, the THEN clause is executed. The THEN clause is executed even when all remaining field identifiers are the null string. If read cannot read the specified record, the ELSE clause is executed. The \texttt{statements} argument can be the \texttt{NULL} keyword, a single statement, or a block of statements terminated by the \texttt{END} keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

\textbf{Reading a Record}

\texttt{READ}, \texttt{READL}, and \texttt{READU} all read the specified MultiValue file record value into \texttt{dynarray}. If \texttt{recID} refers to a non-existent record, the read operation fails.

\textbf{Reading a Field}

\texttt{READV}, \texttt{READVL}, and \texttt{READVU} all read the specified field value from the specified MultiValue file record into \texttt{dynarray}. They do this by locating field delimiters in the record string. If \texttt{fieldno} is 0, these statements returns the specified \texttt{recID} to \texttt{dynarray}. If \texttt{fieldno} refers to a non-existent field (does not correspond to a field delimiter), these statements returns the null string to \texttt{dynarray}. If \texttt{fieldno} is 1 and the entire record consists of a single numeric value (and thus contains no field delimiters), these statements return that numeric value.

If \texttt{recID} refers to a non-existent record and \texttt{fieldno} is not 0, the read operation fails.

\textbf{Reading to an Object}

The \texttt{dynarray} argument can be an object reference, allowing \texttt{READ} to read data into an object. The following statements are all valid forms of reading to an object:

\begin{verbatim}
READ @me->prop FROM myfile,1
READ "class"->meth()->prop FROM myfile,1
READ obj->prop FROM myfile,1
READ (obj)->prop FROM myfile,1
\end{verbatim}

\textbf{READ and MATREAD}

The various \texttt{READ} statements read from a MultiValue file into a dynamic array. The various \texttt{MATREAD} statements read from a MultiValue file into a dimensioned array.

\textbf{Examples}

The following example illustrates the use of the \texttt{READ} statement:

\begin{verbatim}
OPEN "TEST.FILE" TO myfile
READ mydyn FROM myfile,1
PRINT "the record value: ",mydyn
\end{verbatim}

The following example illustrates the use of the \texttt{READV} statement:

\begin{verbatim}
OPEN "TEST.FILE" TO myfile
READV mydyn FROM myfile,1,1
PRINT "the field value: ",mydyn
\end{verbatim}
See Also

- OPEN statement
- MATREAD statement
- WRITE statement
- CLOSE statement
- STATUS function
- Dynamic Arrays
READBLK

Reads a block of data from a sequential file.

```
READBLK data FROM filevar,blksize [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>Name of a variable used to receive a block of data from a file.</td>
</tr>
<tr>
<td>filevar</td>
<td>A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ.</td>
</tr>
<tr>
<td>blksize</td>
<td>A positive integer specifying the block size, in bytes.</td>
</tr>
</tbody>
</table>

**Description**

The **READBLK** statement is used to read a block of data of a specified size from a file that has been opened for sequential access using OPENSEQ. This block of data is written to the `data` variable. The specified `blksize` can be any size.

The `data` argument accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

When invoked, **READBLK** increments a pointer to the end of the data just read, so that repeated invocations of **READBLK** read sequentially through the file data. The same file pointer is used by **READBLK** and **WRITEBLK**. If the file contains less data than `blksize`, the available data is read.

You can determine the current position of this pointer using the **STATUS** statement. You can reposition this pointer using the **SEEK** statement.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file read is successful, the THEN clause is executed. If file read fails, or if the end of the file is reached, the ELSE clause is executed. The `statements` argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the **STATUS** function to determine the status of the read operation, as follows: 0=sequential read successful; -1=read failed because file not open (or opened by another process); 1=end-of-file encountered; 2=read timed out.

**READBLK and READSEQ**

The **READBLK** command retrieves data from a sequential file in blocks of a specified length. These blocks may be of any length, and have no necessary relationship to the length of logical data units, such as lines or records, within the file. The **READSEQ** command retrieves a single line of data from a sequential file. A line of data is identified by the presence of end-of-line characters. A line of data may be of any size.

**Examples**

The following example reads the first 100 bytes of data from an existing sequential file on a Windows system:
OPENSEQ "C:\myfiles\test1" TO mytest
 IF STATUS()=0
   THEN
   READBLK mydata FROM mytest,100
   IF mydata=""
     THEN PRINT "no data"
     ELSE PRINT mydata
   END
   WEOFSEQ mytest
   CLOSESEQ mytest
   END
 ELSE
   PRINT "File open failed"
 END

See Also

- OPENSEQ statement
- WRITEBLK statement
- READSEQ statement
- SEEK statement
- STATUS statement
- STATUS function
READLIST

Reads the remaining field ids from a select list.

```
READLIST dynarray FROM slist [THEN statements] [ELSE statements]
READLIST dynarray FROM listname [account] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>A dynamic array used to receive the field values from the select list.</td>
</tr>
<tr>
<td>slist</td>
<td>An active select list, identified by number or name. A numbered select list is specified as an integer from 0 through 10. A named select list is specified as a variable name.</td>
</tr>
<tr>
<td>listname account</td>
<td>A saved select list, identified by its assigned listname record ID. If the saved select list is in the current account, omit account. If the saved select list is in another account, specify the account name, separating listname and account with a space character.</td>
</tr>
</tbody>
</table>

**Description**

The **READLIST** statement reads all remaining field identifiers from a select list into a dynamic array. If no reads have been performed on the select list, **READLIST** reads the entire select list into **dynarray**. If a **READNEXT** has been performed on the select list, **READLIST** reads the remaining select list field identifiers into **dynarray**.

You can use any of the following **SELECT** statements to create a select list: **SELECT**, **SELECTN**, **SELECTV**, **SSELECT**, **SSELECTN**, or **SSELECTV**. These various **SELECT** statements allow you to specify a numbered or named select list, with field identifiers either sorted or not sorted.

The **listname** select list is saved in the &SAVEDLISTS& file. Caché stores this file using the ^SAVEDLISTS global.

The **dynarray** variable must be simple variable name. It cannot include a system variable, an **EQUATE**, a dynamic array reference, or a substring reference.

If an error occurs during **READLIST** processing, Caché sets the **dynarray** variable to the null string (""").

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the select list pointer has not reached the end of the select list, **READLIST** executes the THEN clause. The THEN clause is executed even when all remaining field identifiers are the null string. **READLIST** executes the ELSE clause if the select list pointer has reached the end of the select list, or the select list does not exist. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

Unlike **READNEXT** and **READPREV**, **READLIST** does not clear the select list when it reaches the end of the select list. For this reason, you can follow a **READLIST** statement with a **READPREV** to read individual field identifiers backwards from the end of the select list.

**Examples**

The following example illustrates the use of the **READLIST** statement. **SELECT** copies all of the field mark identifiers into Select List 4. A **READNEXT** reads the first field mark identifier from Select List 4 into the **area** variable. A **READLIST** then reads all the remaining field mark identifiers from Select List 4 into the **dynarea** dynamic array:
regions="Northeast":@FM:="Southeast":@FM:="Northwest":@FM:="Southwest"
SELECT regions TO 4 ON ERROR PRINT "Select failed"
READNEXT area FROM 4 THEN PRINT area ELSE PRINT "no fields"
! returns "Northeast"
READLIST dynarea FROM 4 THEN PRINT dynarea ELSE PRINT "no fields"
! returns "SoutheastfNorthwestfSouthwest"
READLIST dynarea FROM 4 THEN PRINT dynarea ELSE PRINT "no fields"
! returns "no fields"

See Also

- SELECT statement
- SSELECT statement
- READNEXT statement
- READPREV statement
- Dynamic Arrays
READNEXT

Reads the next field id from a select list.

```
READNEXT fieldval [FROM slist] 
[SETTING var] [[THEN statements] [ELSE statements]]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fieldval</code></td>
<td>A variable used to receive a field value from the select list. Optionally, this can be a multilevel specification, with the levels separated by commas: <code>field,value</code> or <code>field,value,subvalue</code>.</td>
</tr>
<tr>
<td><code>slist</code></td>
<td>Optional — A select list. This can be a numbered select list specified as an integer from 0 through 10, or a named select list specified as a variable name. If <code>slist</code> is not specified or is the empty string (&quot;&quot;), the default select list (0) is accessed.</td>
</tr>
<tr>
<td><code>SETTING var</code></td>
<td>Optional — When a read error occurs, sets the local variable <code>var</code> to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The <code>SETTING</code> clause is executed before the <code>THEN</code>, or <code>ELSE</code> clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The **READNEXT** statement reads successive field identifiers from a select list, one field identifier per invocation. The field identifier is read from the `slist` select list into the `fieldval` variable. Optionally, **READNEXT** can be used to read successive values or successive subvalues within a field, by specifying a multilevel `fieldval` variable. (**READNEXT** can also be used to read successive index identifiers; this is described below.)

You can use any of the following **SELECT** statements to create a select list: **SELECT, SELECTN, SELECTV, SSELECT, SSELECTN, or SSELECTV**. These various **SELECT** statements allow you to specify a numbered or named select list, with field identifiers either sorted or not sorted.

You can optionally specify a **THEN** clause, an **ELSE** clause, or both a **THEN** and an **ELSE** clause. **READNEXT** executes the **THEN** clause if the select list pointer has not reached the end of the select list. The **THEN** clause is executed even when a field identifier is the null string. **READNEXT** executes the **ELSE** clause if the select list pointer has reached the end of the select list, or the select list does not exist. The `statements` argument can be the **NULL** keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a **THEN**, **ELSE**, or **END** keyword on that line.

**Note:** **READNEXT** reads a single field identifier from a select list into a variable. **READLIST** reads all remaining field identifiers from a select list into a dynamic array.

**READNEXT** reads the next field identifier in a select list. **READPREV** reads the previous field identifier in a select list. If **READNEXT** reaches the end of the select list, it clear the select list. For this reason, a subsequent **READPREV** cannot read backwards from the end of the select list.

**Reading an Index**

You can use **READNEXT** to perform successive reads on an index. The index must have been opened using an **OPENINDEX** statement and then selected into a named select list with a **SELECTINDEX** statement.

You can also perform successive reads on an index using the **READNEXT KEY** statement.
**Emulation**

Caché MVBasic, by default, uses select list 0 as the default select list for both internal and external use. By default, D3, Reality, R83, POWER95, MVBase, and IN2 emulations use two distinct default select lists, one internal and one external. The default external select list is 0, and the default internal select list is 10. When `READNEXT` first accesses the external select list (list 0), it moves this list to the internal select list (10). Thus subsequent `READNEXT` operations can continue to access this select list, regardless of modifications to list 0. This emulation behavior can be set using `$OPTIONS PICK.SELECT`.

UniData sets `SYSTEM(11)` to the `SELECT` count when using Select List 0. Each invocation of `READNEXT` decrements this `SYSTEM(11)` count. `READNEXT` does not decrement the `@SELECTED` count.

**Examples**

The following example illustrates the use of the `READNEXT` statement. `SELECT` copies all of the field mark identifiers into Select List 4. Each iteration of `READNEXT` reads the next field mark identifier from Select List 4 into the `area` variable:

```vbnet
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO 4 ON ERROR PRINT "Select failed"
FOR x=1 TO 5
  READNEXT area FROM 4
  PRINT area
NEXT
```

The following example illustrates the use of `READNEXT` with the THEN and ELSE clauses. `SELECTV` copies all of the field mark identifiers into Select List `mylist`. `READNEXT` reads the next field mark identifier from Select List `mylist` into the `area` variable:

```vbnet
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO mylist ON ERROR PRINT "Select failed"
x=1
LOOP WHILE x=1
  READNEXT area FROM mylist THEN PRINT area ELSE x=0
REPEAT
```

**See Also**

- `READPREV` statement
- `SELECT` statement
- `SSELECT` statement
- `SELECTINDEX` statement
- `READNEXT KEY` statement
- `GETLIST` statement
- `READLIST` statement
- Dynamic Arrays
READNEXT KEY

Reads the next key and item id from an index.

```
READNEXT KEY keyname,itemID FROM slist [THEN statements] [ELSE statements]
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>keyname</td>
<td>A variable used to receive the key name from the select list.</td>
</tr>
<tr>
<td>itemID</td>
<td>A variable used to receive the key item ID from the select list.</td>
</tr>
<tr>
<td>slist</td>
<td>A select list to an existing index. A named select list specified as a variable name.</td>
</tr>
</tbody>
</table>

### Description

The `READNEXT KEY` statement reads successive key identifiers from a select list, one key identifier per invocation. `READNEXT KEY` returns both the key name and the key item ID. The key identifier is read from the `slist` select list into the `itemID` variable.

`READNEXT KEY` is used on a select list created by either a `SELECT` or a `SELECT ATKEY`.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. `READNEXT KEY` executes the THEN clause if the select list pointer has not reached the end of the select list. The THEN clause is executed even when a key identifier is the null string. `READNEXT KEY` executes the ELSE clause if the select list pointer has reached the end of the select list, or the select list does not exist. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

### Examples

The following example used `OPENINDEX` to open an index to VOC on the attribute F1. The `SELECT` selects this index to a select list. The `READNEXT KEY` reads an item from the select list:

```
OPENINDEX 'VOC','F1' TO Idx.Fp ELSE ABORT
SELECT Idx.Fp TO Idx.List
READNEXT KEY Idx,Id FROM Idx.List
```

### See Also

- `OPENINDEX` statement
- `SELECT` statement
- `SELECT ATKEY` statement
- `SELECTINDEX` statement
- `READNEXT` statement
READPREV

Reads the previous field id from a select list.

```
READPREV fieldval [FROM slist] [SETTING var] [[THEN statements] [ELSE statements]]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>fieldval</code></td>
<td>A variable used to receive a field value from the select list. Optionally, this can be a multilevel specification, with the levels separated by commas: <code>field,value</code> or <code>field,value,subvalue</code>.</td>
</tr>
<tr>
<td><code>slist</code></td>
<td>Optional — A select list. This can be a numbered select list specified as an integer from 0 through 10, or a named select list specified as a variable name. If not specified, the default select list (0) is accessed.</td>
</tr>
<tr>
<td><code>SETTING var</code></td>
<td>Optional — When a read error occurs, sets the local variable <code>var</code> to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the THEN or ELSE clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The `READPREV` statement reads successive field identifiers from a select list in reverse order, one field identifier per invocation. The field identifier is read from the `slist` select list into the `fieldval` variable. Optionally, `READPREV` can be used to read successive values or successive subvalues within a field (in reverse order), by specifying a multilevel `fieldval` variable.

`READPREV` reads the previous field identifier in a select list. `READNEXT` reads the next field identifier in a select list.

You can use any of the following `SELECT` statements to create a select list: `SELECT`, `SELECTN`, `SELECTV`, `SSELECT`, `SSELECTN`, or `SSELECTV`. These various `SELECT` statements allow you to specify a numbered or named select list, with field identifiers either sorted or not sorted.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. `READPREV` executes the THEN clause if the select list pointer has not reached the beginning of the select list. The THEN clause is executed even when a field identifier is the null string. `READPREV` executes the ELSE clause if the select list pointer has reached the beginning of the select list, or the select list does not exist. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

If `READPREV` reaches the beginning of the select list, it clears the select list. For this reason, a subsequent `READNEXT` cannot read the first item on the select list. Similarly, if a `READNEXT` reads the last item of a select list, the list is cleared. A subsequent `READPREV` cannot be used to read backwards from the end of the select list.

`READPREV` and `READNEXT` read a single field identifier from a select list into a variable. `READLIST` reads all remaining field identifiers from a select list into a dynamic array. `READLIST` does not clear the select list. Therefore, you can follow a `READLIST` with a `READPREV` to read the last field identifier in the select list.

**Examples**

The following example illustrates the use of the `READPREV` statement. `SELECT` copies all of the field mark identifiers into Select List 4. `READNEXT` reads the next field mark identifier from Select List 4 into the `area` variable. `READPREV` reads the previous field mark identifier from Select List 4 into the `area` variable.
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO 4 ON ERROR PRINT "Select failed"
READNEXT area FROM 4
  PRINT area;  ! returns "Northeast"
READNEXT area FROM 4
  PRINT area;  ! returns "Southeast"
READPREV area FROM 4
  PRINT area;  ! returns "Northeast"

The following example uses READLIST to advance to the end of the select list, and then uses READPREV to read the last item in the select list:

regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO 4 ON ERROR PRINT "Select failed"
READLIST area FROM 4
  PRINT area;  ! returns "Northeast^Southeast^Northwest^Southwest"
READPREV area FROM 4
  PRINT area;  ! returns "Southwest"

See Also

- READLIST statement
- READNEXT statement
- SELECT statement
- SSELECT statement
- GETLIST statement
- Dynamic Arrays
**READSEQ**

Reads a line of data from a sequential file.

```
READSEQ data FROM filevar
[ON ERROR statements] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>data</th>
<th>Name of a variable used to receive a line of data from a file.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM filevar</td>
<td>A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ.</td>
</tr>
</tbody>
</table>

**Description**

The **READSEQ** statement is used to read a line of data from a file that has been opened for sequential access using OPENSEQ. This line of data is written to the `data` variable.

The `data` argument accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]).

A line of data is defined as a unit of data terminated by a newline character. Newline characters are not returned as part of `data`. When invoked, **READSEQ** increments a pointer to the next sequential unit of data, so that repeated invocations of **READSEQ** read sequentially through the file data. The same file pointer is used by **READSEQ** and **WRITESEQ**.

You can determine the current position of this pointer using the **STATUS** statement. You can reposition this pointer using the **SEEK** statement.

You can optionally specify an **ON ERROR** clause, which is executed if the file is located but could not be read. If no **ON ERROR** clause is present, the **ELSE** clause is taken for this type of error condition. The `statements` argument can be the **NULL** placeholder keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the **ON ERROR** keyword and the first line.

You can optionally specify a **THEN** clause, an **ELSE** clause, or both a **THEN** and an **ELSE** clause. If the file read is successful, the **THEN** clause is executed. If file read fails, or if the end of the file is reached, the **ELSE** clause is executed. The `statements` argument can be the **NULL** keyword, a single statement, or a block of statements terminated by the **END** keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a **THEN**, **ELSE**, or **END** keyword on that line.

You can use the **STATUS** function to determine the status of the read operation, as follows: 0=sequential read successful; -1=read failed because file not open (or opened by another process); 1=end-of-file encountered; 2=read timed out.

**READSEQ and READBLK**

The **READSEQ** command retrieves a single line of data from a sequential file. A line of data is identified by the presence of end-of-line characters. A line of data may be of any size. The **READBLK** command retrieves data from a sequential file in blocks of a specified length. These blocks may be of any length, and have no necessary relationship to the length of logical data units, such as lines or records, within the file.

**Examples**

The following example reads the first line of data from an existing sequential file on a Windows system:
OPENSEQ "C:\myfiles\test1" TO mytest
IF STATUS()=0
THEN
  READSEQ mydata FROM mytest
  IF mydata=""
  THEN PRINT "no data"
  END
  ELSE PRINT "the first line: ", mydata
  END
  WEOFSEQ mytest
  CLOSESEQ mytest
END
ELSE
  PRINT "File open failed"
END

See Also

• OPENSEQ statement
• WRITESEQ statement
• READBLK statement
• CLOSESEQ statement
• SEEK statement
• STATUS statement
• STATUS function
RECORDLOCKL, RECORDLOCKU

Locks a record in a MultiValue file.

RECORDLOCKL filevar, recID [ON ERROR statements] [LOCKED statements]
RECORDLOCKU filevar, recID [ON ERROR statements] [LOCKED statements]

Arguments

| filevar | A file variable name used to refer to a MultiValue file. This filevar is supplied by the OPEN statement. |
| recID   | The record ID of a record to be locked, specified as an integer. |

Description

The RECORDLOCK statements are used to lock a record in a MultiValue file.

- RECORDLOCKL performs a shared lock on a record. It permits other users to also get a RECORDLOCKL on the record, but prevents other uses from getting a RECORDLOCKU on the record or an exclusive FILELOCK on the file.

- RECORDLOCKU performs an update (exclusive) lock on a record. It prevents other uses from getting a RECORDLOCKL or RECORDLOCKU on the record or a FILELOCK of any type on the file.

The RECORDLOCK statements take the file identifier filevar, defined by the OPEN statement.

You can optionally specify a LOCKED clause. This clause is executed if the record to be locked has already been locked by another user. The clause is executed if the level of lock requested conflicts with an existing lock. This clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.

You can optionally specify an ON ERROR clause. If file lock fails, the ON ERROR clause is executed. This may occur if filevar does not refer to a currently open file. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can check the status of file locks and record locks using the RECORDLOCKED function.

Lock Promotion

If you have a shared lock on a record, then request an exclusive (update) lock on the same record, MVBasic attempts to get the exclusive lock. If it is successful, your shared lock is promoted to an exclusive lock. The result is that you hold one exclusive lock, not two locks.

Releasing Record Locks

Use RELEASE to release individual record locks. CLOSE releases all record locks held on the specified file. ABORT and STOP release all record locks held by the current process.

An update record lock is automatically released when you write data to the record using WRITE or WRITEV. The WRITEU and WRITEVU commands do not release the update record lock.
An update record lock is automatically released when you delete the record using `DELETE`. The `DELETEU` command does not release the update record lock.

**See Also**

- `FILELOCK` statement
- `OPEN` statement
- `RELEASE` statement
- `RECORDLOCKED` function
RELEASE

Releases record locks.

```plaintext
RELEASE [filevar [,recID]] [ON ERROR statements]
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>Optional — A file variable name used to refer to a MultiValue file. This <code>filevar</code> is supplied by the OPEN statement.</td>
</tr>
<tr>
<td>recID</td>
<td>Optional — The record ID for which record locks are to be released. If not specified, all record locks and the file lock on <code>filevar</code> are released.</td>
</tr>
</tbody>
</table>

Description

A `RELEASE` statement with no argument releases all record locks held by the current process that were applied at the current `@LEVEL` execution level. (This differs from native UniData behavior, which releases all locks held by the current process on all levels.)

A `RELEASE` statement with the `filevar` argument releases all record locks on the specified MultiValue file held by the current process. A `RELEASE` statement with the `filevar` and `recID` arguments releases the record lock for the specified record on the specified MultiValue file held by the current process.

Records are locked using the `RECORDLOCKU` and `RECORDLOCKL` statements. You can check the status of record locks (and file locks) using the `RECORDLOCKED` function.

An update record lock is automatically released when you write data to the record using `WRITE` or `WRITEV`. The `WRITEU` and `WRITEVU` commands do not release the update record lock.

An update record lock is automatically released when you delete the record using `DELETE`. The `DELETEU` command does not release the update record lock.

`CLOSE` releases all record locks held on the specified file. `ABORT` and `STOP` release all record locks held by the current process.

A file is locked using the `FILELOCK` statement. `RELEASE` with no `recID` can be used to release a locked file. This is equivalent to issuing a `FILEUNLOCK` statement.

You can optionally specify an ON ERROR clause. If a record lock release fails, the ON ERROR clause is executed. The `statements` argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

See Also

- `OPEN` statement
- `FILEUNLOCK` statement
- `RECORDLOCKL` statement
- `RECORDLOCKU` statement
- `RECORDLOCKED` function
REM

Includes a comment in a program.

REM comment

Arguments

None.

The comment argument is the text of any comment you want to include. After the REM keyword, a space is required before comment.

Description

You can use the REM statement to include comments in the source code of your program. A comment can be on a separate line, or on the same line as an executable statement. If you include a comment on the same line as an executable statement, the statement must be ended with a semicolon (;) before the comment indicator.

The REM statement is one of several single-line comment indicators. You can also use the exclamation mark (!), asterisk (*), or dollar sign asterisk ($*) to indicate a comment. Regardless of which indicator you use, all comments are single-line comments; you must specify a comment indicator for every line of a comment.

Note: Caché MVBasic contains both a REM (remarks) statement and a REM (remainder) function. These are completely unrelated and should not be confused.

Examples

The following example illustrates the use of the REM statement:

MyStr1="Hello"; REM Comment after a statement.
MyStr2 = "Goodbye"
   REM This is also a comment.
PRINT MyStr1,Mystr2; REM comment (note semicolon)
   ! This too is a comment.
   * This too is a comment.
   $* This too is a comment.

See Also

- Comments
**REMOVE**

Extracts sequential elements of a dynamic array.

```
REMOVE value FROM dynarray [AT pos] SETTING delim
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>value</code></td>
<td>A variable used to receive the extracted element value.</td>
</tr>
<tr>
<td><code>dynarray</code></td>
<td>A dynamic array from which successive data values are to be extracted.</td>
</tr>
<tr>
<td><code>AT pos</code></td>
<td>Optional — A variable specifying the initial starting position in <code>dynarray</code> as an integer character count. <code>pos</code> must be specified as a local variable, not as a numeric literal. The AT clause is provided for compatibility with D3 and UniData systems.</td>
</tr>
<tr>
<td><code>delim</code></td>
<td>A local variable that resolves to an integer code for the dynamic array delimiter type. <code>delim</code> must be specified as a local variable, not as a numeric literal. <code>delim</code> can accept a single dynamic array reference (<code>A&lt;i&gt;</code>), a single substring reference (<code>A[s,l]</code>), or a substring reference nested inside a dynamic array reference (<code>A&lt;i&gt;[s,l]</code>).</td>
</tr>
</tbody>
</table>

**Description**

The **REMOVE** statement efficiently extracts successive data values from a dynamic array. The extracted element value is placed in the `value` variable. **REMOVE** operates on a single dynamic array level; you specify the level delimiter using the `delim` argument. **REMOVE** maintains an internal pointer so that repeated calls return successive element values. When the last element value has been extracted, **REMOVE** sets `value` to the empty string.

You can use the **GETREM** function to return the character position in `dynarray` of the **REMOVE** pointer.

**Note:** The **REMOVE** statement is identical to the **REVREMOVE** statement, except that **REVREMOVE** operates in the reverse direction. The **REMOVE** function, **REMOVE** statement, and **REVREMOVE** statement all share the same pointer. It is incremented by a **Remove** and decremented by a **Revremove**.

The `delim` variable resolves to an integer code with one of the following values:

<table>
<thead>
<tr>
<th><code>delim</code></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>End of file</td>
</tr>
<tr>
<td>1</td>
<td>@IM Item Mark CHAR(255)</td>
</tr>
<tr>
<td>2</td>
<td>@FM Field Mark CHAR(254)</td>
</tr>
<tr>
<td>3</td>
<td>@VM Value Mark CHAR(253)</td>
</tr>
<tr>
<td>4</td>
<td>@SM Subvalue Mark CHAR(252)</td>
</tr>
<tr>
<td>5</td>
<td>@TM Text Mark CHAR(251)</td>
</tr>
</tbody>
</table>

**Examples**

The following example successively extracts the first 5 Value Mark elements from a dynamic array:
names="Fred":@VM:"Barney":@VM:"Wilma":@VM:"Betty"
delim=3
FOR x=1 TO 5
    REMOVE val FROM names SETTING delim
    PRINT val
    ! Returns:
    !   Fred
    !   Barney
    !   Wilma
    !   Betty
    !   **
NEXT

See Also

- REVREMOVE statement
- SETREM statement
- EXTRACT function
- GETREM function
- REMOVE function
**RETURN**

Returns from a subroutine or function.

```
RETURN[(retval)] [TO label]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>retval</td>
<td>Optional (Functions Only) — An expression that evaluates to the return value for a user-defined function. The return value must be enclosed in parentheses. If not specified, an empty string is returned.</td>
</tr>
<tr>
<td>TO label</td>
<td>Optional (Subroutines Only) — Any valid label. The label name can be optionally followed by a colon (:)</td>
</tr>
</tbody>
</table>

**Description**

The **RETURN** statement is used to end execution of a user-defined subroutine or function and return control to the statement that invoked the subroutine or function.

**Subroutines**

The **RETURN** statement with no argument ceases execution of a subroutine and returns control to the **GOSUB** statement (for an internal subroutine) or the **CALL** statement (for an external subroutine) that invoked the subroutine. Program execution resumes with the line immediately following the **GOSUB** or **CALL**.

You can terminate an external subroutine with a **RETURN** or with an **END** statement.

The **RETURN** statement with a TO label clause ceases execution of a subroutine and transfers execution to the internal subroutine identified by the specified label.

**Functions**

The **RETURN** statement ceases execution of a function and returns retval to the location where the function was invoked. If no retval is specified, an empty string is returned.

Before invoking a user-defined external function, it is necessary to locally define the function using the **DEFFUN** statement.

**See Also**

- **CALL** statement
- **GOSUB** statement
- **END** statement
- **FUNCTION** statement
- **Labels**
REVREMOVE

Extracts sequential elements of a dynamic array in reverse order.

REVREMOVE value FROM dynarray SETTING delim

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>value</td>
<td>A variable used to receive the extracted element value.</td>
</tr>
<tr>
<td>dynarray</td>
<td>A dynamic array from which successive data values are to be extracted.</td>
</tr>
<tr>
<td>delim</td>
<td>A local variable that resolves to an integer code for the dynamic array delimiter type. delim must be specified as a local variable, not as a numeric literal. delim can accept a single dynamic array reference (A&lt;i&gt;), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A&lt;i&gt;[s,l]).</td>
</tr>
</tbody>
</table>

Description

REVREMOVE efficiently extracts successive data values from a dynamic array beginning at the end of the string. The extracted element value is placed in the value variable. REVREMOVE operates on a single dynamic array level; you specify the level delimiter using the delim argument. REVREMOVE maintains an internal pointer so that repeated calls return successively previous element values. When the last element value has been extracted, REMOVE sets value to the empty string.

You can use the GETREM function to return the character position in dynarray of the REVREMOVE pointer.

Note: The REVREMOVE statement is identical to the REMOVE statement, except that it operates in the reverse direction. The REMOVE function, REMOVE statement, and REVREMOVE statement all share the same pointer. It is incremented by a Remove and decremented by a Revremove.

The delim variable resolves to an integer code with one of the following values:

<table>
<thead>
<tr>
<th>delim</th>
<th>End of file</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>@IM Item Mark CHAR(255)</td>
</tr>
<tr>
<td>1</td>
<td>@FM Field Mark CHAR(254)</td>
</tr>
<tr>
<td>2</td>
<td>@VM Value Mark CHAR(253)</td>
</tr>
<tr>
<td>3</td>
<td>@SM Subvalue Mark CHAR(252)</td>
</tr>
<tr>
<td>4</td>
<td>@TM Text Mark CHAR(251)</td>
</tr>
</tbody>
</table>

Examples

The following example successively extracts the last 5 Value Mark elements from a dynamic array:

```plaintext
names= "Fred":@VM:"Barney":@VM:"Wilma":@VM:"Betty"
FOR x=1 TO 5
  REVREMOVE val FROM names SETTING 3
  PRINT val
  | Returns:
  | ! Betty
  | ! Wilma
  | ! Barney
  | ! "Fred"
  | ! ""
NEXT
```
See Also

- REMOVE statement
- SETREM statement
- EXTRACT function
- GETREM function
- REMOVE function
ROLLBACK

Reverts all changes made during the current transaction.

```
ROLLBACK [TRANSACTION | WORK] [THEN statements] [ELSE statements]
```

Description

The ROLLBACK statement reverts all changes made during the current transaction initiated by a BEGIN TRANSACTION statement. All file changes issued during the transaction are undone, returning the data to the state prior to the BEGIN TRANSACTION.

The ROLLBACK must be specified between the BEGIN TRANSACTION and END TRANSACTION statements. Following a ROLLBACK, program execution skips to the line of code following the END TRANSACTION statement.

The TRANSACTION or WORK keywords are optional and provides no functionality. They are provided solely for compatibility with other MultiValue vendor products.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the transaction rollback is successful, the THEN clause is executed. If the transaction rollback fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

To commit the changes made during the current transaction, issue a COMMIT statement, rather than a ROLLBACK statement.

After the transaction is closed, program execution continues at the END TRANSACTION statement.

Note:  Caché MVBasic supports two sets of transaction statements:

- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.
- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.

These two sets of transaction statements should not be combined.

Locks and Transactions

File locks and record locks that were taken out during a transaction are released at the end of a transaction. If there are nested transactions, the release of locks taken out during the inner transactions is delayed until the completion of the outermost transaction. This release of locks is part of a successful COMMIT or ROLLBACK operation. Locks are described in the LOCK statement.

Unaffected by ROLLBACK

- The contents of spooler and form queues, and any print jobs queued or in progress.
- The contents of the &PH& file and any spawned PHANTOM (background) processes.
- The contents of the &COMO& file used to keep an audit trail of terminal inputs.

Example

The following example performs database operations within a transaction. It sets a variable x, which determines whether the transaction should be committed or rolled back.
PRINT "Before the transaction"
BEGIN TRANSACTION

  .

IF x=0
  THEN COMMIT
END
ELSE ROLLBACK
  THEN PRINT "Rollback successful"
  ELSE PRINT "Rollback failed"
END
PRINT "This should not print"
END TRANSACTION
PRINT "Transaction resolved"

See Also

• BEGIN TRANSACTION statement
• END TRANSACTION statement
• COMMIT statement
RQM

Suspends processing for a specified duration.

RQM [seconds]
RQM time

Arguments

<table>
<thead>
<tr>
<th>seconds</th>
<th>Optional — An integer count of seconds. If omitted, execution is suspended for 1 second.</th>
</tr>
</thead>
<tbody>
<tr>
<td>time</td>
<td>A wakeup time, specified in 24-hour format as hh:mm:ss, or in 12-hour format as hh:mm:ssAM or hh:mm:ssPM.</td>
</tr>
</tbody>
</table>

Description

The RQM statement has two formats. You can either specify the number of seconds to suspend program execution, or specify the time at which to resume execution. If you specify RQM with no argument, it suspends program execution for one second. You can specify seconds as an integer or a fraction. If seconds is a decimal number, it is rounded to the nearest whole second.

You can specify time in either 24-hour or 12-hour format. A 24-hour time is specified as hh:mm:ss. A 12-hour time is specified as hh:mm:ss[AM | PM]. In both formats, spaces are not permitted, leading zeros may be omitted, and the seconds component of the time is optional. The following are all valid 24-hour format time values: 02:34, 2:34:00, 14:34, 14:34:00. The following are all valid 12-hour format time values: 2:34PM, 02:34PM, 2:34:00PM, 2:34AM. Midnight can be represented by 24:00, 00:00, 12:00PM, 00:00PM, or 00:00AM. An invalid time argument generates a syntax error.

RQM is a synonym for SLEEP.

You can use NAP to suspend program execution for a specified number of milliseconds.

See Also

- NAP statement
- SLEEP statement
- SLEEP command in Caché MultiValue Commands Reference
SEEK

Repositions the file pointer for a sequential file.

```
SEEK filevar [,offset [,relto]] [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>filevar</code></td>
<td>A file variable name used to refer to the file in Caché MVBasic. This <code>filevar</code> is obtained from <code>OPENSEQ</code>.</td>
</tr>
<tr>
<td><code>offset</code></td>
<td>Optional — A positive or negative integer count of bytes used to reposition the file pointer relative to the <code>relto</code> position. By default, <code>offset</code> is 0.</td>
</tr>
<tr>
<td><code>relto</code></td>
<td>Optional — A flag indicating the pointer position is determined relative to some location. The available values are: 0=relative to the beginning of the file; 1=relative to the current pointer position; 2=relative to the end of the file. The default is 0.</td>
</tr>
</tbody>
</table>

**Description**

The `SEEK` statement is used to position the sequential file pointer in a file that has been opened for sequential access using `OPENSEQ`.

By default, `SEEK` repositions the file pointer to the beginning of the file. `SEEK` can be used to increment or decrement the file pointer from its current position, or from the beginning or end of the file.

You can determine the current position of the file pointer using the `STATUS` statement.

You can optionally specify a `THEN` clause, an `ELSE` clause, or both a `THEN` and an `ELSE` clause. If the pointer reposition is successful, the `THEN` clause is executed. If pointer reposition fails (usually because the specified position is beyond the limits of the file), the `ELSE` clause is executed and the pointer position remains unchanged. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a `THEN`, `ELSE`, or `END` keyword on that line.

You can use the `STATUS` function to determine the status of the pointer reposition operation, as follows: 0=success; -1=pointer reposition failed because either position is beyond the limits of the file or the file is not open.

**See Also**

- `OPENSEQ` statement
- `READSEQ` statement
- `WRITESEQ` statement
- `STATUS` statement
- `STATUS` function
SEEK(ARG.)

Points to the next command line argument.

\[
\text{SEEK(ARG.[,n]) [THEN statements] [ELSE statements]}
\]

**Arguments**

| n | Optional — An integer specifying which command line argument to point to. The default is the first unread argument (the next argument). |

**Description**

The `SEEK(ARG.)` statement points to a command line argument. Each time you invoke `SEEK(ARG.)` it updates a command line pointer. Therefore, repeated invocation of `SEEK(ARG.)` without the \( n \) argument results in sequentially pointing to each command line argument in left-to-right order.

The keyword `ARG.` (note the period at end of this keyword) and the surrounding parentheses are mandatory.

You can use the optional \( n \) value to point to a command line argument by its integer position in the command line argument list. Command line arguments are counted from 1. If \( n = 0 \), `SEEK(ARG.)` points to the next command line argument.

`SEEK(ARG.)` considers all values following the program name to be command line arguments. Command line arguments are separated by blank spaces; a blank space within a quoted string is not treated as a command line argument separator.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If moving the pointer to the command line argument is successful, the THEN clause is executed. If there are no command line arguments, no more command line arguments, or if you specify a value of \( n \) that does not correspond to a command line argument, `SEEK(ARG.)` executes the ELSE clause. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

The `GET(ARG.)` statement both moves the command line argument pointer and retrieves the argument value. The `SEEK(ARG.)` statement just moves the command line argument pointer. The `EOF(ARG.)` function returns whether or not the command line argument pointer is past the end of the list of command line arguments.

**See Also**

- `GET(ARG.)` statement
- `EOF(ARG.)` function
SEELECT, SELECTN, SELECTV

Selects items into a select list.

**SELECT**

```
SELECT dynarray [TO listnum] [SETTING var] [ON ERROR statements]
SELECT [filevar] [TO listnum] [SETTING var] [ON ERROR statements]
SELECT dynarray TO listname [SETTING var] [ON ERROR statements]
SELECT [filevar] TO listname [SETTING var] [ON ERROR statements]
```

**SELECTN**

```
SELECTN dynarray [TO listnum] [ON ERROR statements]
SELECTN [filevar] [TO listnum] [ON ERROR statements]
```

**SELECTV**

```
SELECTV dynarray TO listname [ON ERROR statements]
SELECTV [filevar] TO listname [ON ERROR statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>Any valid <strong>dynamic array</strong> of Field Values.</td>
</tr>
<tr>
<td>filevar</td>
<td><strong>Optional</strong> — A local variable used as the file identifier of an open MultiValue file. This variable is set by the OPEN statement. If omitted, the default file variable is used.</td>
</tr>
<tr>
<td>TO listnum</td>
<td><strong>Optional</strong> — A numbered select list, specified as an integer from 0 through 10. You must specify a listnum from 1 through 10; listnum 0 is not valid for Caché MVBasic. If omitted, select list 0 is used.</td>
</tr>
<tr>
<td>TO listname</td>
<td>A named select list, specified as a local variable name. (See Emulation section below.)</td>
</tr>
<tr>
<td>SETTING var</td>
<td><strong>Optional</strong> — When an error occurs, sets the local variable var to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The **SELECT** statements select the field identifiers from a MultiValue file or a dynamic array and place them in a select list. You can then use **READNEXT** to read this select list, one field identifier at a time. Selecting to a select list overwrites any previous values for that select list.

- **SELECT** can select into a numbered select list or a named select list. (See “Emulation” section below.)
- **SELECTN** can only select into a numbered select list.
- **SELECTV** can only select into a named select list.

**Note:** You can use **SELECTE** to copy numbered Select List 0 to a named select list.

Unless otherwise stated, all documented **SELECT** behavior also applies to **SELECTN** and **SELECTV**.

**SELECT** statements sort the contents of a select list or file into Caché storage order: first the empty string, then canonical numbers in ascending numeric order, then strings in string collation order. They then place the results in a select list. **SELECT** does not sort the contents of a file system directory or the elements of a dynamic array. These are copied into a select list in the order listed. To sort dynamic array elements, first use **SELECT** to copy the elements into a select list, then use **SELECT** or **SSELECT** on that select list.

The optional ON ERROR clause specifies one or more MVBasic statements to execute if the **SELECT** operation fails. For example, if you specify an invalid listnum the ON ERROR statements are executed. The **statements** argument can be the
NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

When you are finished using an assigned select list, you can use the CLEARSELECT statement to reset the select list.

Note: SELECT and FORMLIST are functionally identical.

**SELECT filevar**

For SELECT filevar, you must specify a MultiValue file opened using the OPEN statement. The SELECT completes successfully even if filevar is not defined, but a subsequent READNEXT statement fails.

SELECT filevar places a direct reference to filevar in the newly created select list; the select list does not contain a copy of the file contents. Therefore, any subsequent change to the filevar file will immediately change the contents of this previously selected select list. To avoid this, you can specify OPTIONS FSELECT before invoking SELECT filevar. If the FSELECT flag option is activated, SELECT filevar creates a select list containing a copy of the indices from the file referenced by filevar; subsequent changes to the filevar file will have no effect on the contents of this previously selected select list. The FSELECT option is off (inactive) by default. Using the FSELECT option makes the length of the select list immediately available after executing the SELECT filevar statement. However, performing a SELECT filevar with the FSELECT option enabled has poorer performance than a SELECT filevar without FSELECT.

Note: Use of FSELECT only applies to a SELECT filevar executed directly as an MVBasic statement. Indirect execution of SELECT filevar, such as EXECUTE 'SELECT filevar', does not apply the FSELECT setting. Executing SELECT filevar from the MultiValue Shell does not apply the FSELECT setting.

**Selecting an Index**

You can use SELECT with a named select list to select an entire index. The index must have been opened using an OPENINDEX statement. After selecting the index, you can read individual index items using the READNEXT KEY statement.

If you wish to select only part of an index, you can use the SELECT ATKEY or SELECTINDEX statement.

**SELECT and SSELECT**

The SSELECT (sorted select) statements sort in ordinary string collation order. SSELECT filevar always creates a select list containing a copy of the indices from the file referenced by filevar, regardless of the $OPTIONS FSELECT setting. The SELECT statements are otherwise comparable to the corresponding SSELECT statements.

**Emulation**

By default, SELECT can select to a numbered select list or to a named select list. Any TO clause variable that resolves to an integer from 0 through 10 is treated as a numbered select list; any other value is treated as a named select list. SELECT uses select list 0 as the default select list for both internal and external use. These are the defaults for Caché, jBASE, and UniData emulation.

D3, IN2, MVBase, PICK, R83, POWER95, Reality, and Ultimate set $OPTIONS VAR.SELECT. This requires that the select list specified in the TO clause must be a named select list; SELECT behaves like SELECTV. These emulations return an error when you specify a numeric value for the TO clause. Select List 0 is used as the default when you omit the TO clause.

INFORMATION, PIOpen, Prime, and UniVerse set $OPTIONS SELECT.ANY This requires that the select list specified in the TO clause must be a numbered select list; SELECT behaves like SELECTN. These emulations return an error when you specify a non-numeric value for the TO clause.
D3, IN2, MVBase, R83, POWER95, and Reality set `OPTIONS PICK,SELECT`. This causes `SELECT` to use two distinct default select lists, one internal and one external. The default external select list is 0, and the default internal select list is 10.

UniData sets `OPTIONS FSELECT` by default; for Caché and all other emulations FSELECT is inactive by default. This causes `SELECT` to set both `@SELECTED` and `SYSTEM(11)` when using Select List 0. For any other select list, only `@SELECTED` is set. All other emulations only set `@SELECTED`.

D3, IN2, jBASE, MVBase, PICK, R83, POWER95, and Ultimate set `OPTIONS NO,RESELECT`. This prevents the reselecting of a select list; a second `SELECT` is ignored when referencing an active unused or partially used select list. For D3, jBASE, MVBase, R83, POWER95, and Ultimate, `OPTIONS ARRAY,RESELECT` is also set by default, overriding NO,RESELECT for a dynamic array.

**Examples**

The following example illustrates the use `SELECT dynarray`. `SELECT` copies all of the field mark identifiers into Select List 3. The `@SELECTED` system variable contains the number of elements selected (in this case, 4). Each iteration of `READNEXT` reads the next field mark identifier from Select List 3 into the `area` variable:

```plaintext
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO 3 ON ERROR PRINT "Select failed"
   PRINT @SELECTED
FOR x=1 TO 5
   READNEXT area FROM 3
   PRINT area
NEXT
```

The following example illustrates the use of the `SELECTV` statement. `SELECTV` copies all of the field mark identifiers into a Select List named `rfields`. Each iteration of `READNEXT` reads the next field mark identifier from Select List `rfields` into the `area` variable:

```plaintext
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECTV regions TO rfields ON ERROR PRINT "Select failed"
   PRINT @SELECTED
FOR x=1 TO 5
   READNEXT area FROM rfields
   PRINT area
NEXT
```

**See Also**

- `OPEN` statement
- `OPENINDEX` statement
- `READNEXT` statement
- `READNEXT KEY` statement
- `SELECTATKEY` statement
- `SELECTE` statement
- `SELECTINDEX` statement
- `CLEARSELECT` statement
- `FORMLIST` statement
- `@SELECTED` system variable
- Dynamic Arrays
SELECT ATKEY

Selects a specified key type into a select list.

```cacheml
SELECT ivar [TO varname] ATKEY keytype[,recID[,vmcount]] [ON ERROR statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ivar</td>
<td>A local variable used as the index identifier of an open MultiValue file. This variable is set by the OPENINDEX statement.</td>
</tr>
<tr>
<td>TO varname</td>
<td>Optional — Either a named select list for an index, specified as a variable name, or a select list number. If omitted, select list 0 is used.</td>
</tr>
<tr>
<td>keytype</td>
<td>The specified index key to select. You can specify the empty string (ATKEY '') if you wish MVBasic to ignore the ATKEY clause and take the recID and/or vmcount values.</td>
</tr>
<tr>
<td>recID</td>
<td>Optional — A specified record within the index key value at which to start processing.</td>
</tr>
<tr>
<td>vmcount</td>
<td>Optional — If the record specified in recID is a dynamic array, vmcount specifies which element to start from. Specified as an integer value, beginning with 1 (the default).</td>
</tr>
</tbody>
</table>

**Description**

The SELECT ATKEY statement selects the index identifiers of the specified type from an index file and places them in a select list. You can then use READNEXT KEY to read this select list, one index identifier at a time. Selecting to a select list overwrites any previous values for that select list.

There are three ways to select an index:

- **SELECT** selects the entire index into a named select list. You then use READNEXT KEY to read individual index items.
- **SELECT ATKEY** selects the specified index key into a named select list. You then use READNEXT KEY to read individual index items.
- **SELECTINDEX** selects all the unique index keys into a named select list. You then use READNEXT to read individual index items.

For all three types of index SELECT, you must specify an index file opened using the OPENINDEX statement.

The optional ON ERROR clause specifies one or more MVBasic statements to execute if the SELECT ATKEY operation fails. For example, if you specify an invalid ivar the ON ERROR statements are executed. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

When you are finished using an assigned select list, you can use the CLEARSELECT statement to reset the select list.

**Examples**

The following example used OPENINDEX to open an index to VOC on the attribute F1. The SELECT ATKEY selects S-type keys from this index to a select list. The READNEXT KEY reads an item from the select list:
OPENINDEX 'VOC','FL' TO IdxFp ELSE ABORT
SELECT IdxFp TO IdxList ATKEY "S"
READNEXT KEY Idx,Id FROM IdxList

See Also

- OPENINDEX statement
- SELECT statement
- SELECTINDEX statement
- READNEXT KEY statement
- CLEARSELECT statement
SELECTE

Copies select list 0 to a named select list.

```
SELECTE TO varname
```

### Arguments

<table>
<thead>
<tr>
<th>varname</th>
<th>A named select list, specified as a variable name.</th>
</tr>
</thead>
</table>

### Description

The `SELECTE` statement copies Select List 0 to a select list named `varname`. You can then use `READNEXT` to read this select list, one field identifier at a time.

Select List 0 is the default select list created by a `SELECT` or `SELECTN` statement.

**Note:** `SELECTE` enables you to copy Select List 0 to a named select list. You can create a named select list directly by using `SELECTV`.

### Examples

The following example illustrates the use of the `SELECTE` statement. Here `SELECT` copies all of the field mark identifiers into Select List 0. Then `SELECTE` copies Select List 0 to a select list named `rfields`. Each iteration of `READNEXT` reads the next field mark identifier from Select List `rfields` into the `area` variable:

```
regions="Northeast":@FM:"Southeast":@FM:"Northwest":@FM:"Southwest"
SELECT regions TO 0 ON ERROR PRINT "Select failed"
SELECTE TO rfields
FOR x=1 TO 5
   READNEXT area FROM rfields
   PRINT area
NEXT
```

### See Also

- `READNEXT` statement
- `SELECT` statement
- `SSELECT` statement
- Dynamic Arrays
SELECTINDEX

Selects an index.

```
SELECTINDEX indexname[,akey] FROM filevar TO varname
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>indexname</code></td>
<td>The name of a defined index, specified as a quoted string.</td>
</tr>
<tr>
<td><code>akey</code></td>
<td>Optional — A specific index key value, specified as a quoted string.</td>
</tr>
<tr>
<td><code>filevar</code></td>
<td>A local variable name assigned to the index file by the OPENINDEX statement.</td>
</tr>
<tr>
<td><code>varname</code></td>
<td>A named select list for an index, created by SELECTINDEX. varname is specified as a variable name.</td>
</tr>
</tbody>
</table>

### Description

The SELECTINDEX statement is used to select the unique keys of an index for use by the READNEXT statement. The index must already have been opened using the OPENINDEX statement.

There are three ways to select an index:

- **SELECT** selects the entire index into a named select list. You then use READNEXT KEY to read individual index items.
- **SELECT ATKEY** selects the specified index key into a named select list. You then use READNEXT KEY to read individual index items.
- **SELECTINDEX** selects all the unique index keys into a named select list. You then use READNEXT to read individual index items.

### Example

```
OPENINDEX 'VOC','F1' TO idxfp
SELECTINDEX 'F1' FROM idxfp TO idxlist
FOR x=1 TO 5
    READNEXT id FROM idxlist
    PRINT id
NEXT
```

### See Also

- OPENINDEX statement
- SELECT statement
- SELECT ATKEY statement
- READNEXT statement
- CLEARSELECT statement
SETREM

Positions the remove pointer in a dynamic array.

```
SETREM position ON dynarray
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>position</td>
<td>A positive integer specifying the number of bytes to increment the pointer in the dynamic array.</td>
</tr>
<tr>
<td>dynarray</td>
<td>A dynamic array in which the pointer is positioned.</td>
</tr>
</tbody>
</table>

**Description**

The `SETREM` statement positions a pointer within a dynamic array. This statement is commonly used to position a pointer for the `REMOVE` or `REVREMOVE` statements to extract data values from the dynamic array. You can use the `GETREM` function to return the character position in `dynarray` of the `SETREM` pointer. `REMOVE` and `REVREMOVE` also modify this internal pointer so that repeated calls return successive element values.

**See Also**

- `REMOVE` statement
- `REVREMOVE` statement
- `EXTRACT` function
- `GETREM` function
- `REMOVE` function
SLEEP

Suspends processing for a specified duration.

SLEEP [seconds]
SLEEP time

Arguments

<table>
<thead>
<tr>
<th>seconds</th>
<th>Optional — An integer count of seconds. If omitted, execution is suspended for 1 second.</th>
</tr>
</thead>
<tbody>
<tr>
<td>time</td>
<td>A wakeup time, specified in 24-hour format as hh:mm[ss], or in 12-hour format as hh:mm:ssAM or hh:mm:ssPM.</td>
</tr>
</tbody>
</table>

Description

The SLEEP statement has two formats. You can either specify the number of seconds to suspend program execution, or specify the time at which to resume execution. If you specify SLEEP with no argument, it suspends program execution for one second. You can specify seconds as an integer or a fraction. If seconds is a decimal number, it is rounded to the nearest whole second.

You can specify time in either 24-hour or 12-hour format. A 24-hour time is specified as hh:mm:ss. A 12-hour time is specified as hh:mm:ss[AM | PM]. In both formats, spaces are not permitted, leading zeros may be omitted, and the seconds component of the time is optional. The following are all valid 24-hour format time values: 02:34, 2:34:00, 14:34, 14:34:00. The following are all valid 12-hour format time values: 2:34PM, 02:34PM, 2:34:00PM, 2:34AM. Midnight can be represented by 24:00, 00:00, 12:00PM, 00:00PM, or 00:00AM. An invalid time argument generates a syntax error.

RQM is a synonym for SLEEP.

You can use NAP to suspend program execution for a specified number of milliseconds.

See Also

- NAP statement
- RQM statement
- SLEEP command in Caché MultiValue Commands Reference
SSELECT, SSELECTN, SSELECTV

Selects and sorts items into a select list.

SSELECT dynarray [TO listnum] [ON ERROR statements]
SSELECT [filevar] [TO listnum] [ON ERROR statements]
SSELECT dynarray TO listname [ON ERROR statements]
SSELECT [filevar] TO listname [ON ERROR statements]
SSELECTN dynarray [TO listnum] [ON ERROR statements]
SSELECTN [filevar] [TO listnum] [ON ERROR statements]
SSELECTV dynarray TO listname [ON ERROR statements]
SSELECTV [filevar] TO listname [ON ERROR statements]

Description

The SSELECT statements sort the contents of a select list or file into string collation order and place the results in a select list. The SSELECT statements sort the contents of a file system directory into string collation order and place the results in a select list. The SSELECT statements copy the elements of a dynamic array into a select list in the order listed; they do not sort dynamic array elements. To sort dynamic array elements, use SELECT to copy the elements into a select list, then use SSELECT on that select list.

When sorting the contents of a select list, SSELECT removes duplicate values. Therefore, an output select list may contain fewer items than the input select list.

The output select list can be a numbered select list or a named select list. The “N” and “V” command name suffixes specify whether the output select list is a numbered select list or a named select list.

The SSELECT statements sort in ordinary string collation order. The SELECT statements sort in Caché storage order: first the empty string, then canonical numbers in ascending numeric order, then strings in string collation order. The SSELECT statements are otherwise comparable to the corresponding SELECT statements.

The optional ON ERROR clause specifies one or more MVBasic statements to execute if the SSELECT operation fails. For example, if you specify an invalid listnum the ON ERROR statements are executed. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

See Also

• SELECT statement
• Dynamic Arrays
STATUS

Provides file status information.

```
STATUS dynarray FROM filevar [THEN statements] [ELSE statements]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>A dynamic array used by STATUS to hold file information as Field elements.</td>
</tr>
<tr>
<td>filevar</td>
<td>A file variable name specifying the file from which status information is to be returned. This filevar is obtained from OPEN or OPENSEQ.</td>
</tr>
</tbody>
</table>

**Description**

The STATUS statement is used to return status information about a file. This information is returned as Field Mark delimited elements of a dynamic array. You must open the file, using the OPEN or OPENSEQ statement, to obtain the filevar required to invoke STATUS.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If file status information is obtained, the THEN clause is executed. If file status information could not be obtained, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

To display individual status fields, use angle bracket syntax. The following example displays the 20th field, which is the full file path:

```
STATUS statdyn FROM filevar
PRINT statdyn<20>
```

Field 1 of dynarray contains the current position of the sequential file pointer, counting from 0. This count includes the two-character newline (carriage return + line feed) that appears at the end of each line of data in a sequential file. The same file pointer is used by WRITESEQ and READSEQ. You can reposition this pointer using the SEEK statement.

Field 20 of dynarray contains the full file path of the open file.

Field 21 of dynarray contains a numeric code for the file type, as follows: -2 sequential file; -1 dir-type file; 0 global with the full record in a single node; 1 global with each attribute in a separate subnode.

**Examples**

The following example opens a sequential file on a Windows system and determines its status. It prints out two status fields: the full pathname and the file type (in this case, -2):

```
myfile='c:\InterSystems\Cache\Dev\mv\samples\CommandExample'
OPENSEQ myfile TO filevar ELSE STOP 201,myfile
STATUS statdyn FROM filevar
  PRINT statdyn<20>
  PRINT statdyn<21>
CLOSESEQ filevar
```

The following example opens the VOC file and determines its status. It prints out two status fields: the file pathname (in this case, a global variable) and the file type (in this case, 0):

```
OPEN 'VOC' TO myvoc ELSE STOP 201,'VOC'
STATUS statdyn FROM myvoc
  PRINT statdyn<20>
  PRINT statdyn<21>
CLOSE myvoc
```
See Also

- OPEN statement
- OPENSEQ statement
- READSEQ statement
- SEEK statement
- WRITESEQ statement
STOP, STOPE, STOPM

Terminates program execution and returns to the calling environment.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP [errcode [,val1[,val2]]]</td>
<td>Terminates program execution and returns to the calling environment.</td>
</tr>
<tr>
<td>STOPE [errcode [,val1[,val2]]]</td>
<td>Terminates program execution and returns to the calling environment.</td>
</tr>
<tr>
<td>STOPM [message]</td>
<td>Terminates program execution and returns to the calling environment.</td>
</tr>
</tbody>
</table>

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>errcode</td>
<td>Optional — A MultiValue error code; commonly (but not always) specified as a positive integer. The error code can be specified as a literal or as an expression that resolves to a literal value. A non-numeric literal value must be specified as a quoted string.</td>
</tr>
<tr>
<td>val</td>
<td>Optional — A comma-separated list of one or more literal values to insert into the error message corresponding to errcode. These insert values can be specified as literals or as expressions that resolves to a literal value. A non-numeric literal value must be specified as a quoted string.</td>
</tr>
<tr>
<td>message</td>
<td>Optional — An expression that resolves to a literal error message text, specified as a quoted string.</td>
</tr>
</tbody>
</table>

**Description**

All forms of the STOP statement are used to terminate program execution and return control to the calling environment. If you specify an argument, these statements return an error message before terminating program execution.

STOP and STOPE return MultiValue error messages. They are nearly functionally identical; both return the specified error code and corresponding error message. STOPE always returns both the error code and the error message. This includes error messages missing val insert values. STOP always returns the error code; it only returns the error message if you have specified at least one of the val insert values required to complete the error message, or if the error message does not require any insert values. For a list of error codes and corresponding error messages, see Error Messages in the Caché MultiValue Commands Reference.

STOPM returns the literal message text specified in message.

When you call an MVBasic routine from a non-MultiValue environment, a STOP statement clears the entire execution stack and either terminates the process or returns to the Terminal prompt.

**Examples**

The following Windows example shows a common use of STOP as an ELSE clause statement:

```basic
foo="c:\foofile"
OPEN foo TO myfile ELSE STOP 201,foo
```

STOP returns the error message: [201] Unable to open file 'c:\foofile'.

The following examples show the difference between STOPE and STOP when the error message requires an insert value that the command does not provide:

```basic
OPEN foo TO myfile ELSE STOPE 201
```

STOPE returns: [201] Unable to open file ''.  

```basic
OPEN foo TO myfile ELSE STOP 201
```

STOP returns: [201]
**ABORT and STOP**

The **ABORT** command terminates all program execution and returns to the programming prompt. The **STOP** terminates the executing routine and returns control to the calling routine.

During debugging, **STOP** terminates the debugging session. The debugger treats an **ABORT** as an error condition; the debugger performs a break operation to allow for examination of the condition causing the **ABORT**.

**See Also**

- **ABORT** statement
- **ERRMSG** statement
- **BREAK** statement
- ObjectScript: **QUIT** command
SUBROUTINE

Defines an external subroutine.

SUBROUTINE [name][,(arglist)]
[statements]
RETURN

Arguments

<table>
<thead>
<tr>
<th>name</th>
<th>Optional — Any valid name to assign to the subroutine.</th>
</tr>
</thead>
<tbody>
<tr>
<td>arglist</td>
<td>Optional — List of variables specifying arguments that are passed to the SUBROUTINE when it is called. Multiple arguments are separated by commas. The arglist is enclosed with parentheses.</td>
</tr>
<tr>
<td>statements</td>
<td>A group of statements to be executed within the body of the SUBROUTINE.</td>
</tr>
</tbody>
</table>

Description

The SUBROUTINE statement defines an external subroutine. A SUBROUTINE is a separate procedure that can take arguments, perform a series of statements, and change the values of its arguments.

The SUBROUTINE statement is very similar to FUNCTION, except that FUNCTION always returns a value. A SUBROUTINE generally does not return a value. (You can use the SUBR function to call an external subroutine that returns a value.)

There cannot be a label on the SUBROUTINE statement line. There can only be one SUBROUTINE statement in an external subroutine (no nested subroutines). The SUBROUTINE statement must be the first line in the external subroutine, with the following exceptions: comment lines, $OPTIONS statements, $COPYRIGHT statements, and DIM statements that do not dimension a static array. For example, DIM Var() and DIM abc are permitted, but DIM Var(2) is not.

The name argument allows you to identify the external subroutine; it is not (strictly speaking) required to define or invoke an external subroutine. If name is omitted, either of the following syntactic forms are permitted: SUBROUTINE (arglist) or SUBROUTINE(arglist).

An external subroutine must be compiled and cataloged before it can be invoked. You can invoke an external subroutine with a CALL statement. The CALL statement invokes a subroutine by its name in the catalog; this is not necessarily the same as name.

When using CALL to invoke a subroutine, you can pass it arguments. The list of arguments passed by CALL must correspond in position and number to the number of arguments defined in SUBROUTINE to receive the passed values. The names of the arguments do not have to correspond.

The argument list can contain any combination of regular variables and array variables. In arglist, an array variable name must be preceded by the MAT keyword. The following is an argument list that specifies a regular variable and two array variables:

SUBROUTINE MySub(myvar,MAT myarray,MAT refarray)

By default, all arguments are passed by reference. If the subroutine changes the value of an argument passed by reference, this value is also changed in the calling program. You can specify in the CALL statement that an argument is to be passed by value. If the subroutine changes the value of an argument passed by value, the value of this argument in the calling program remains unchanged.

You can also use the COMMON statement to make specified variables available to all external subroutines.
You can terminate an external subroutine with a **RETURN** or with an **END** statement. Following a **RETURN**, program execution resumes with the line immediately following the invoking **CALL** statement.

**SUBR, CALL, and GOSUB**

The **SUBR** function is used to call an external subroutine that returns a value. The **CALL** statement is used to call an external subroutine that does not return a value. The **GOSUB** statement is used to call an internal subroutine.

**See Also**

- COMMON statement
- RETURN statement
- FUNCTION statement
- CALL statement
- GOSUB statement
- SUBR function
# SWAP

Replaces all instances of a substring in a variable.

```plaintext
SWAP oldstring WITH newstring IN variable
```

## Arguments

| **oldstring** | The substring to be replaced. An expression that resolves to a valid string or numeric. |
| **newstring** | The replacement substring. An expression that resolves to a valid string or numeric. To delete `oldstring`, specify the empty string (""). |
| **variable**  | An existing variable containing a string value. `variable` may be a dynamic array. `variable` accepts a single dynamic array reference (A<i>), a single substring reference (A[s,l]), or a substring reference nested inside a dynamic array reference (A<i>[s,l]). |

## Description

The **SWAP** statement edits the value of `variable` by replacing all instances of `oldstring` with `newstring`. The `oldstring` and `newstring` values may be of different lengths. Matching of strings is case-sensitive.

The values of `oldstring` and `newstring` can be a string or a numeric. If numeric, the value is converted to canonical form (plus sign, leading and trailing zeros removed) before performing the string replacement.

To remove all instances of `oldstring` from `variable`, specify the null string (""") as the `newstring` value. The null string ("") cannot be used as the `oldstring` value.

**Note:** Caché MVBasic supports the UniData **SWAP** statement for substring replacement. UniVerse implements a completely different **SWAP** statement for variable value exchange, which we do not support at this time. Caché MVBasic also supports the UniVerse **CHANGE** statement for substring replacement.

**SWAP** and **CHANGE** both perform string substitution, and are functionally identical. **CONVERT** performs character-for-character substitution.

## Examples

The following example illustrates use of the **SWAP** statement, replacing a substring value in all the elements of a dynamic array:

```plaintext
cities="Pittsburg Penn.":@VM:"Philadelphia Penn."
SWAP "Penn." WITH "PA" IN cities
```

See Also

- **CHANGE** function
- **CONVERT** statement
- **CONVERT** function
- **CHANGE** function
- Strings
TCLREAD

Copies the terminal command line into a variable.

TCLREAD variable

Arguments

| variable | A variable used to hold the command line. |

Description

The TCLREAD statement copies the Terminal Control Language (TCL) command line into variable. This allows parameters to be passed from TCL to the MVBasic program.
THROW

Throws an exception from a TRY block to a CATCH exception handler.

```
THROW [oref]
```

**Arguments**

| oref | Optional — A user-defined object reference. |

**Description**

The THROW statement explicitly issues an exception from within a block of code defined by a TRY statement. Issuing a THROW transfers execution from the TRY block to the corresponding CATCH exception handler.

THROW is used to issue an explicit exception. MVBasic issues an implicit exception when a runtime exception occurs. A runtime exception generates an exception object which it throws to a CATCH exception handler.

THROW has two forms:

- Without an argument
- With an argument

**THROW without an Argument**

Argumentless THROW transfers exception processing to the corresponding CATCH exception handler. No object is pushed on the stack, but the %New() method is called.

**THROW with an Argument**

THROW `oref` specifies a user-defined object reference, which it throws to the CATCH statement.

**Arguments**

- `expression`

A user-defined object reference (oref). For example, THROW "Sample.MyException"->%New("Example Error",45). The creation and population of this exception object is the responsibility of the programmer.

**Examples**

The following example shows the use of THROW:

```
TRY
    PRINT "about to issue a THROW statement"
    THROW "Sample.MyException"->%New("Example Error",45,"Sample Program")
    PRINT "this should not display"
CATCH myvar
    PRINT "this is the exception handler"
    PRINT :myvar->Name,"Error Name"
    PRINT :myvar->Code,"Error Code Number"
    PRINT :myvar->Location,"Error Location"
END TRY
PRINT "this is where the code falls through"
```

**See Also**

- CATCH statement
- TRY statement
TRANSACTION ABORT

Reverts all changes made during the current transaction.

**Description**

The TRANSACTION ABORT statement reverts all changes made during the current transaction initiated by a TRANSACTION START statement. All file changes issued during the transaction are undone, returning the data to the state prior to the TRANSACTION START.

To commit the changes made during the current transaction, issue a TRANSACTION COMMIT statement, rather than a TRANSACTION ABORT statement.

**Note:** Caché MVBasic supports two sets of transaction statements:
- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.
- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.

These two sets of transaction statements should not be combined.

**Locks and Transactions**

File locks and record locks that were taken out during a transaction are released at the end of a transaction. If there are nested transactions, the release of locks taken out during the inner transactions is delayed until the completion of the outermost transaction. This release of locks is part of a successful TRANSACTION COMMIT or TRANSACTION ABORT operation. Locks are described in the LOCK statement.

**See Also**

- TRANSACTION START statement
- TRANSACTION COMMIT statement
TRANSACTION COMMIT

Commits all changes made during the current transaction.

```
TRANSACTION COMMIT {THEN statements | ELSE statements }
```

Description

The `TRANSACTION COMMIT` statement ends the current transaction initiated by a `TRANSACTION START` statement. All file changes issued during the transaction are committed, and cannot be subsequently reverted.

You must specify either a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the transaction commit is successful, the THEN clause is executed. If the transaction commit fails, the ELSE clause is executed. The `statements` argument can be the `NULL` keyword, a single statement, or a block of statements terminated by the `END` keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

To revert the changes made during the current transaction, issue a `TRANSACTION ABORT` statement, rather than a `TRANSACTION COMMIT` statement.

Note: Caché MVBasic supports two sets of transaction statements:

- UniData-style `TRANSACTION START`, `TRANSACTION COMMIT`, and `TRANSACTION ABORT`.
- UniVerse-style `BEGIN TRANSACTION`, `COMMIT`, `ROLLBACK`, and `END TRANSACTION`.

These two sets of transaction statements should not be combined.

Locks and Transactions

File locks and record locks that were taken out during a transaction are released at the end of a transaction. If there are nested transactions, the release of locks taken out during the inner transactions is delayed until the completion of the outermost transaction. This release of locks is part of a successful `TRANSACTION COMMIT` or `TRANSACTION ABORT` operation. Locks are described in the `LOCK` statement.

See Also

- `TRANSACTION START` statement
- `TRANSACTION ABORT` statement
TRANSACTION START

Begins a transaction.

TRANSACTION START {THEN statements | ELSE statements}

Description

The TRANSACTION START statement initiates a transaction. There is no command to demarcate the end of a transaction. All subsequent statements are part of this transaction until the transaction is closed, either by a TRANSACTION COMMIT statement or a TRANSACTION ABORT statement. If neither a TRANSACTION COMMIT nor a TRANSACTION ABORT is issued, the transaction remains open until the end of the program, at which time it is automatically rolled back.

You must specify either a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the transaction start is successful, the THEN clause is executed. If the transaction start fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use multiple TRANSACTION START statements to create nested transactions.

Note: Caché MVBasic supports two sets of transaction statements:

- UniData-style TRANSACTION START, TRANSACTION COMMIT, and TRANSACTION ABORT.
- UniVerse-style BEGIN TRANSACTION, COMMIT, ROLLBACK, and END TRANSACTION.

These two sets of transaction statements should not be combined.

Locks and Transactions

File locks and record locks that were taken out during a transaction are released at the end of a transaction. If there are nested transactions, the release of locks taken out during the inner transactions is delayed until the completion of the outermost transaction. This release of locks is part of a successful TRANSACTION COMMIT or TRANSACTION ABORT operation. Locks are described in the LOCK statement.

See Also

- TRANSACTION COMMIT statement
- TRANSACTION ABORT statement
TRY

Identifies a block of code to monitor for exceptions during execution.

TRY statements
CATCH exceptionvar statements
END TRY

Description

The **TRY** statement takes no arguments. It is used to identify one or more Caché MVBasic code statements between the **TRY** keyword and the **CATCH** keyword. This block of code is protected code for structured exception handling. If an exception occurs within this block of code, Caché sets `exceptionvar` to an object describing the exception, then transfers execution to an exception handler, identified by the **CATCH** statement. This is known as throwing an exception. If no exception occurs, execution continues with the next Caché MVBasic statement after the **END TRY** statement.

An exception may occur as a result of a runtime exception, such as attempting to divide by 0, or it may be explicitly propagated by issuing a **THROW** statement.

A **TRY** block must be immediately followed by a **CATCH** block. The paired **TRY** and **CATCH** are terminated by an **END TRY** statement.

Examples

In the following examples, the **TRY** code block is executed. It attempts to set the local variable `a`. In the first example, the code completes successfully, and the **CATCH** statements are skipped over. In the second example, the code fails an `Err` error indicating division by zero, and execution is passed to the **CATCH** statement.

**TRY succeeds:**

```
TRY
  PRINT "about to divide by one"
  a=7/1
  PRINT "this line is executed"
CATCH myvar
  PRINT "this is the exception handler"
  PRINT "Error name: ",myvar->Name
END TRY
PRINT "this is where the code falls through"
```

**TRY fails:**

```
TRY
  PRINT "about to divide by zero"
  a=7/0
  PRINT "this should not display"
CATCH myvar
  PRINT "this is the exception handler"
  PRINT "Error name: ",myvar->Name
END TRY
PRINT "this is where the code falls through"
```

See Also

- **CATCH** statement
- **THROW** statement
UNLOCK

Releases a process lock.

UNLOCK expression

Arguments

| expression | A number or string, or an expression that evaluates to a number or string specifying an existing lock to be unlocked. |

Description

The UNLOCK statement releases a process lock on expression that was obtained by a LOCK statement. Each time a lock is obtained on an expression a lock count is incremented. UNLOCK decrements this count. Only when the lock count falls to zero will the logical lock be released. For this reason, you should balance each successful call to LOCK with a corresponding call to UNLOCK.

Unlike READU locks, process locks set in a program are not released automatically when the program terminates. The lock belongs to the process, and persists for the life of the process, unless unlocked explicitly.

Commonly, expression evaluates to an integer in the range 0 through 64. However, in Caché any number or string may be specified as a logical lock. UNLOCK "" is equivalent to UNLOCK 0.

Examples

The following example uses the LOCK statement to obtain a logical lock on an expression, and then uses the UNLOCK function to release the logical lock. Note that because the lock on a was taken twice, it must be unlocked twice.

```
a=45
LOCK a THEN PRINT "Got the lock"
   ELSE PRINT "Couldn't get the lock"
LOCK a THEN PRINT "Got the lock again"
   ELSE PRINT "Couldn't get the lock"
  .
  .
  UNLOCK a
UNLOCK a
```

See Also

- LOCK statement
**WEOFSEQ**

Writes an end-of-file to a sequential file.

```
WEOFSEQ filevar [ON ERROR statements]
```

**Arguments**

| filevar | A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ. |

**Description**

The **WEOFSEQ** statement is used to write an end-of-file indicator to a file that has been opened for sequential access using **OPENSEQ**. Placing an end-of-file indicator renders all data past that point inaccessible to **READSEQ** statements. Placing an end-of-file indicator has no effect on **WRITESEQ** statements, or on the pointer position count provided by the **STATUS** statement.

You can optionally specify an ON ERROR clause, which is executed if the end-of-file write fails. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can also use the **STATUS** function to determine the status of the write operation, as follows: 0=success; -1=operation failed because file not open (or opened by another process).

**See Also**

- **OPENSEQ** statement
- **READSEQ** statement
- **WRITESEQ** statement
- **STATUS** statement
- **STATUS** function
WRITE, WRITEU, WRITEV, WRITEVU

Writes data to a record in a MultiValue file.

```
WRITE data {ON | TO} filevar,recID
  [SETTING var] [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]]

WRITEU data {ON | TO} filevar,recID
  [SETTING var] [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]]

WRITEV data {ON | TO} filevar,recID,fieldno
  [SETTING var] [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]]

WRITEVU data {ON | TO} filevar,recID,fieldno
  [SETTING var] [ON ERROR statements] [LOCKED statements] [[THEN statements] [ELSE statements]]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>data</code></td>
<td>Data to write to the MultiValue file. Can be an expression or variable that resolves to a dynamic array or some other literal value.</td>
</tr>
<tr>
<td><code>filevar</code></td>
<td>A local variable used as the file identifier of an open MultiValue file. This variable is set by the <code>OPEN</code> statement. You can specify either ON or TO as the keyword.</td>
</tr>
<tr>
<td><code>recID</code></td>
<td>The record ID of the record to be written, specified as either a number or an alphanumeric string of up to 31 characters. Letters in a <code>recID</code> are case-sensitive. Additional naming conventions are described below.</td>
</tr>
<tr>
<td><code>fieldno</code></td>
<td>The field number of the field to write. Used with <code>WRITEV</code> and <code>WRITEVU</code>.</td>
</tr>
<tr>
<td><code>SETTING var</code></td>
<td>Optional — When an error occurs, sets the local variable <code>var</code> to the operating system's error return code. Successful completion returns 0; error return codes are platform-specific. The SETTING clause is executed before the ON ERROR, THEN, or ELSE clause. Provided for jBASE compatibility.</td>
</tr>
</tbody>
</table>

**Description**

The WRITE statements are used to write data to a record in a MultiValue file. You supply this data using the `data` variable.

- WRITE writes a record, then releases the update record lock
- WRITEU writes a record, retaining the update record lock
- WRITEV writes a field within a record, then releases the update record lock
- WRITEVU writes a field within a record, retaining the update record lock

You can optionally specify a LOCKED clause. This clause is executed if the write operation could not acquire an update record lock due to lock contention. The LOCKED clause is optional, but strongly recommended; if no LOCKED clause is specified, program execution waits indefinitely for the conflicting lock to be released. The `statements` argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the LOCKED keyword and the first line.
You can optionally specify an ON ERROR clause, which is executed when the operation fails and generates an error code. For example, attempting to write to a read-only file. If you do not specify an ON ERROR clause, the ELSE clause is taken for an error code condition, as well as for an unsuccessful write. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file write is successful, the THEN clause is executed. If file write does not complete successfully, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

If the WRITE has neither an ON ERROR clause nor an ELSE clause, a failed write operation generates a <WRITE> error and halts program execution.

You can use the STATUS function to determine the status of the write operation, as follows: 0=write successful; -1=write failed because file not open (or opened by another process).

Record Naming Conventions

The following are naming conventions for a valid MultiValue recID:

- A recID can be a number or an alphanumeric string.
- If a number, it is converted to canonical form: multiple plus and minus signs are resolved, and the plus sign, and leading and trailing zeros are removed. If the number is enclosed in single or double quotation marks, conversion to canonical form is not performed. Only a single period can be specified, which is used as the decimal separator character.
- If an alphanumeric string, the first character must be a letter, dollar sign ($), or percent sign (%). Subsequent characters may be letters, numbers, or percent characters. If the first character is a dollar sign ($), all subsequent characters must be letters.
- The period (.) character can appear within a recID. If the recID is alphabetic any number of periods can be specified; these periods are stripped out and are not part of the recID. If the recID is a mixed alphanumeric, no periods may be specified.
- The recID may be enclosed in single or double quotation marks, these become part of the record name, unless the recID is an integer in canonical form. Single and double quotes are equivalent. Thus: "4"='4'=4 and "rec1"='rec1' but not equal to rec1. Do not specify a blank space within a recID.
- A recID is case-sensitive.
- A recID is limited to 31 characters. You may specify a recID longer than 31 characters, but only the first 31 characters are used. Therefore, a recID must be unique within its first 31 characters.

Record Locks

RECORDLOCKU performs an update (exclusive) lock on a record. This update record lock is automatically released when you write data to the record using WRITE or WRITEV. The WRITEU and WRITEVU commands do not release the update record lock. You can check the status of an update record lock using the RECORDLOCKED function. You can explicitly release an update record lock using the RELEASE command.

Writing a Field to a Record

WRITEV and WRITEVU writes a field within a record. They search the record string for the delimited piece specified by the fieldno count, replace it, then rewrite the record. If the fieldno is higher than the number of field delimiters, these statements append the field to the end of the record. If the entire record consists of a single numeric value (and thus contains
no field delimiters), these statements convert the record value to a string before appending the specified field value. If the fieldno is 0, a new field is appended to the beginning of the record.

**WRITE and MATWRITE**

The various WRITE statements write a dynamic array (or a string value) to a MultiValue file record. The various MATWRITE statements write a dimensioned array to a MultiValue file record.

**Examples**

The following example writes a line of data to an existing sequential file on a Windows system:

```plaintext
OPEN "TEST.FILE" TO mytest
IF STATUS()=0
  THEN
    WRITE "John Doe" TO mytest,1
    CLOSE mytest
  END
ELSE
  PRINT "File open failed"
END
```

**See Also**

- OPEN statement
- READ statement
- CLOSE statement
- MATWRITE statement
- STATUS function
- Dynamic Arrays
WRITEBLK

Writes data to a sequential file.

| WRITEBLK data ON filevar [THEN statements] [ELSE statements] |
| WRITEBLK data TO filevar [THEN statements] [ELSE statements] |

**Arguments**

| data | Data to write to the sequential file. Can be an expression or variable that resolves to a literal value. |
| filevar | A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ. The ON and TO keywords are equivalent. |

**Description**

The WRITEBLK statement is used to write data to a file that has been opened for sequential access using OPENSEQ. You supply this data using the data variable. The data is written as a variable-length “block” (meaning that the data receives no special processing and no special characters are appended). The length of the block is determined by the length of the specified data; the data can be of any length. It has no necessary relationship to logical data units, such as lines or records.

When invoked, WRITEBLK increments a pointer to the end of the data just written, so that repeated invocations of WRITEBLK write sequential blocks of data to the file. The same file pointer is used by WRITEBLK and READBLK.

You can determine the current position of this pointer using the STATUS statement. You can reposition this pointer using the SEEK statement.

To write an end-of-file, use the WEOFSEQ statement.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file write is successful, the THEN clause is executed. If file write fails, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the STATUS function to determine the status of the write operation, as follows: 0=sequential write successful; -1=write failed because file not open (or opened by another process).

**WRITEBLK and WRITESEQ**

The WRITEBLK command writes a string of data to a sequential file. This string may have no relationship to a record within the file. The WRITESEQ command writes a single line of data (a data record) to a sequential file, ending the write by appending two newline characters (carriage return & linefeed) to the data.

Issuing a WRITESEQ creates a new file, if the file specified in OPENSEQ does not exist. Issuing a WRITEBLK does not create a new file. You must issue a CREATE statement to create a sequential file before invoking WRITEBLK.

**Examples**

The following example writes a block of data to an existing sequential file on a Windows system:
OPENSEQ "C:\myfiles\test1" TO mytest
IF STATUS()=0
THEN
  WRITEBLK "John Doe" TO mytest
  WEOFSEQ mytest
  CLOSESEQ mytest
END
ELSE
  PRINT "File open failed"
END

The following example creates a new sequential file and writes a block of data to it. The \texttt{CREATE} statement is mandatory with \texttt{WRITEBLK}:

OPENSEQ "C:\myfiles\test1" TO mytest
CREATE mytest
WRITEBLK "John Doe" TO mytest
WEOFSEQ mytest
CLOSESEQ mytest

\textbf{See Also}

- \texttt{OPENSEQ} statement
- \texttt{CREATE} statement
- \texttt{READBLK} statement
- \texttt{WRITESEQ} statement
- \texttt{WEOFSEQ} statement
- \texttt{CLOSESEQ} statement
- \texttt{SEEK} statement
- \texttt{STATUS} statement
- \texttt{STATUS} function
WRITELIST

Saves a select list.

```
WRITELIST dynarray ON listname [SETTING var]
WRITELIST dynarray TO listname [SETTING var]
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dynarray</code></td>
<td>A select list supplied by the SELECT statement. A dynamic array of elements separated by field mark delimiters.</td>
</tr>
<tr>
<td><code>listname</code></td>
<td>A name assigned to the saved select list.</td>
</tr>
<tr>
<td><code>SETTING var</code></td>
<td>Optional — a local variable used to receive a numeric error code if the operation fails.</td>
</tr>
</tbody>
</table>

**Description**

The WRITELIST statement saves a select list. Once you have saved a select list, you can use GETLIST to activate the saved select list so that it can be read by READNEXT.

The `listname` select list is saved in the &SAVEDLISTS& file. Caché stores this file using the ^SAVEDLISTS global.

You can use either the ON or TO keyword. The ON keyword is preferred; the TO keyword is provided for jBASE compatibility.

The optional SETTING clause is executed if the WRITELIST operation fails and an error code is generated. The `var` variable is set to this numeric error code. The SETTING clause is provided for jBASE compatibility.

**Emulation**

In jBASE emulation, if `listname` is 0 or '', WRITELIST creates a new select list 0, saves to select list 0, and makes this select list active. Caché and other emulations create select list 0 and save to select list 0, but do not retain it as an active select list.

**See Also**

- DELETELIST statement
- SELECT statement
WRITESEQ, WRITESEQF

Writes a line of data to a sequential file.

| WRITESEQ data ON filevar [ON ERROR statements] [THEN statements] [ELSE statements] |
| WRITESEQ data TO filevar [ON ERROR statements] [THEN statements] [ELSE statements] |
| WRITESEQF data ON filevar [ON ERROR statements] [THEN statements] [ELSE statements] |
| WRITESEQF data TO filevar [ON ERROR statements] [THEN statements] [ELSE statements] |

**Arguments**

| data       | Data to write to the sequential file. Can be an expression or variable that resolves to a literal value. |
| filevar    | A file variable name used to refer to the file in Caché MVBasic. This filevar is obtained from OPENSEQ. The ON and TO keywords are equivalent. |

**Description**

The WRITESEQ statement is used to write a line of data to a file that has been opened for sequential access using OPENSEQ. You supply this data using the data variable. WRITESEQ appends the two newline characters (carriage return & linefeed) to the data, defining it as a line of data.

By default, WRITESEQ begins writing at the beginning of the file, overwriting any existing file data. WRITESEQ increments a pointer to the end of the data it has just written (plus the two newline characters), so that repeated invocations of WRITESEQ write sequential lines of data to the file. The same file pointer is used by WRITESEQ and READSEQ.

You can determine the current position of this pointer using the STATUS statement. You can reposition this pointer using the SEEK statement.

To write an end-of-file, use the WEOFSEQ statement.

You can optionally specify an ON ERROR clause, which is executed when the operation fails and generates an error code. For example, specifying an invalid filevar, or attempting to write to a read-only file. If you do not specify an ON ERROR clause, the ELSE clause is taken for an error code condition, as well as for an unsuccessful write. The statements argument can be the NULL placeholder keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line; there must be a line break between the ON ERROR keyword and the first line.

You can optionally specify a THEN clause, an ELSE clause, or both a THEN and an ELSE clause. If the file write is successful, the THEN clause is executed. If file write does not complete successfully, the ELSE clause is executed. The statements argument can be the NULL keyword, a single statement, or a block of statements terminated by the END keyword. A block of statements has specific line break requirements: each statement must be on its own line and cannot follow a THEN, ELSE, or END keyword on that line.

You can use the STATUS function to determine the status of the write operation, as follows: 0=sequential write successful; -1=write failed because file not open (or opened by another process).

**I/O Buffering**

By default, WRITESEQ operations are written to an I/O buffer. This buffer is automatically assigned as part of the OPENSEQ operation. I/O buffering significantly improves overall performance, but means that write operations are not immediately applied to the sequential file.
**WRITESEQF** is identical to **WRITESEQ**, except that it does not use I/O buffering. **WRITESEQF** is useful for logging operations which must be immediately written to disk. However, because writing directly to a sequential file can significantly effect performance, **WRITESEQF** is not recommended for most data update operations.

Caché MVBasic provides two statements that override **WRITESEQ** I/O buffering. The **FLUSH** statement immediately writes the current contents of the I/O buffer to the sequential file. The **NOBUF** statement disables the I/O buffer for the duration of the sequential file open. That is, all subsequent **WRITESEQ** operations are immediately executed on the sequential file, exactly as if they were **WRITESEQF** operations.

**New Sequential File**

If you are creating a new file, issue an **OPENSEQ** and then issue a **WRITESEQ**. Issuing a **CREATE** is optional; the first **WRITESEQ** creates the file.

**WRITESEQ and WRITEBLK**

The **WRITEBLK** command writes a string of data to a sequential file. This string can be of any length, and may have no relationship to a record within the file. The **WRITESEQ** command writes a single line of data (a data record) to a sequential file, ending the write by appending two newline characters (carriage return & linefeed) to the data.

Issuing a **WRITESEQ** creates a new file, if the file specified in **OPENSEQ** does not exist. Issuing a **WRITEBLK** does not create a new file.

**Examples**

The following example writes a line of data to an existing sequential file on a Windows system:

```
OPENSEQ "C:\myfiles\test1" TO mytest
IF STATUS()=0
   THEN
      WRITESEQ "John Doe" TO mytest
      WEOFSEQ mytest
   END
ELSE
   PRINT "File open failed"
END
```

**See Also**

- **OPENSEQ** statement
- **READSEQ** statement
- **WRITEBLK** statement
- **WEOFSEQ** statement
- **CLOSESEQ** statement
- **FLUSH** statement
- **NOBUF** statement
- **SEEK** statement
- **STATUS** statement
- **STATUS** function
$XECUTE

Executes an ObjectScript command.

$XECUTE expression

Arguments

| expression | An expression that evaluates to one or more valid ObjectScript commands, specified as a quoted string. The expression string delimiter character cannot be used within expression. For example, if the expression string contains double quotation marks (delimiting an ObjectScript string literal), you must enclose expression with either single quote marks (') or backslash (\) characters. |

Description

$XECUTE is used to invoke an ObjectScript command from within Caché MVBasic. $XECUTE executes ObjectScript commands that result from the process of expression evaluation of the specified argument. Each $XECUTE argument must evaluate to a string containing ObjectScript commands. The string must not contain a tab character at the beginning or a <Return> at the end. The string must be no longer than a valid ObjectScript program line.

In effect, the $XECUTE argument is like calling a one-line subroutine. It is terminated when the end of the argument is reached or an ObjectScript QUIT command is encountered. After Caché executes the argument, it returns control to the point immediately after the $XECUTE argument.

Each invocation of $XECUTE places a new context frame on the call stack for your process. The ObjectScript $STACK special variable contains the current number of context frames on the call stack.

Local Variables

Variables in MVBasic are local, private variables. They are hidden from the ObjectScript code being executed by a $XECUTE statement. Therefore, $XECUTE can only be used for ObjectScript code that does not access MVBasic variables or expressions containing MVBasic variables.

If you wish to execute ObjectScript that uses MVBasic variables, your MVBasic code must pass those variables as actual parameters to an external ObjectScript routine.

Invoking Other Command Shells

You can use the EXECUTE, PERFORM, and CHAIN commands to issue MultiValue commands from within Caché MVBasic.

You can use the PCPERFORM command to issue an operating system command from within Caché MVBasic.

Examples

The following example executes the subroutine that is the value of CosSub.

```
CosSub="WRITE ! FOR I=1:1:5 { WRITE ?I*5,I+1 }"
$XECUTE CosSub
```

Returns:

```
2 3 4 5 6
```
$XECUTE and Objects

You can use $XECUTE to call object methods and properties and execute the returned value, as shown in the following examples:

$XECUTE patient.Name
$XECUTE "WRITE patient.Name"

$XECUTE and FOR

If the $XECUTE argument contains an ObjectScript FOR command, the scope of the FOR is the remainder of the argument. When the outermost FOR in an $XECUTE argument is terminated, the $XECUTE argument is also terminated.

$XECUTE and DO

If the $XECUTE argument contains an ObjectScript DO command, Caché executes the routine or routines specified in the DO argument or arguments. When it encounters a QUIT, it returns control to the point immediately following the DO argument.

For example, in the following commands, Caché executes the routine ROUT and returns to the point immediately following the DO argument to write the string “DONE”.

$XECUTE 'DO ^ROUT WRITE !,"DONE"'

$XECUTE and GOTO

A ObjectScript command specified in $XECUTE cannot specify an ObjectScript label. An ObjectScript command specified in $XECUTE cannot access an MVBasic label. Therefore the use of GOTO within $XECUTE is not supported.

$XECUTE and QUIT

There is an implied QUIT at the end of each $XECUTE argument.

Nested Invocation of $XECUTE

Caché supports the use of the ObjectScript XECUTE command within the $XECUTE argument. However, you should use nested invocation of $XECUTE with caution because it can be difficult to determine the exact flow of processing at execution time.

Execution Time for Commands Called by $XECUTE

The execution time for code called within $XECUTE can be slower than the execution time for the same code encountered in the body of a routine. This is because Caché compiles source code that is specified with the $XECUTE command or that is contained in a referenced global variable each time it processes the $XECUTE.

See Also

- CHAIN statement
- EXECUTE statement
- PERFORM statement
- PCPERFORM statement
- ObjectScript XECUTE command
Caché MultiValue Basic Functions
Sets screen cursor position or screen display option.

@@ (at sign)

@ (x[,y])
@ (code[,arg])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>An expression that resolves to a positive integer specifying the number of columns to indent the horizontal position of the screen cursor. 0=column 1 (no indent), 1=indent 1 column.</td>
</tr>
<tr>
<td>y</td>
<td>Optional — An expression that resolves to a positive integer specifying the vertical line position of the screen cursor. 0=top of screen. If omitted, defaults to the current line.</td>
</tr>
<tr>
<td>code</td>
<td>An expression that resolves to a negative integer specifying a screen display option code.</td>
</tr>
<tr>
<td>arg</td>
<td>Optional — An expression that resolves to an integer argument required by certain code values.</td>
</tr>
</tbody>
</table>

Description

The @ function has two forms. If the first argument is a positive integer or zero, it sets the cursor position. If the first argument is a negative integer, it sets a screen display option.

Cursor Positioning

The @ function (with a positive first argument) changes the horizontal and/or vertical position of the screen cursor. To change only the horizontal position, specify @ (x) . To change only the vertical position, specify @ (0, y).

The @ function does not change the ObjectScript SX and SY special variables.

Screen Display Options

The @ function (with a negative first argument) changes a screen display option. The following code options are supported:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>Clear screen and position cursor at home location (top left). For wyse terminals, -1 clears the screen, except for protected fields.</td>
</tr>
<tr>
<td>-2</td>
<td>Position cursor at home location (top left).</td>
</tr>
<tr>
<td>-3</td>
<td>Clear the screen from the current cursor position to the end of the screen.</td>
</tr>
<tr>
<td>-4</td>
<td>Clear the screen from the current cursor position to the end of the line.</td>
</tr>
<tr>
<td>-5</td>
<td>Start blinking text.</td>
</tr>
<tr>
<td>-6</td>
<td>Stop blinking text.</td>
</tr>
<tr>
<td>-7</td>
<td>Start protected field. (See -62)</td>
</tr>
<tr>
<td>-8</td>
<td>End protected field. (See -62)</td>
</tr>
<tr>
<td>-9</td>
<td>Back space. You can supply an optional 2nd argument specifying the number of backspaces to perform. The default is 1 backspace.</td>
</tr>
</tbody>
</table>
-10 Back line. Moves up a line without resetting cursor column. You can supply an optional 2nd argument specifying the number of lines to go back. The default is to go back one line (go to the previous line).

-13 Start reverse video. This displays white characters on a black background.

-14 Stop reverse video.

-15 Start underlining.

-16 Stop underlining.

-17 Insert line. Moves up a line and resets cursor to column 1. You can supply an optional 2nd argument specifying the number of lines to insert.

-18 Delete line. Resets cursor to column 1.

-20 Set insert (overtype) mode.

-21 Reset insert mode to normal mode (the default).

-23 Disable keyboard input and screen display.

-24 Reenable keyboard input and screen display (the default).

-29 Use 80–column line width (the default).

-30 Use 132–column line width.

-31 Turn off blinking cursor position indicator.

-32 Turn on blinking cursor position indicator (the default).

-34 Move cursor forward (insert blank space). You can supply an optional 2nd argument specifying the number of spaces to advance the cursor. 0 or 1 both advance the cursor 1 space. The default is to advance the cursor 1 space.

-37 Set foreground (text) color. You can supply an optional 2nd argument specifying the color, as follows: 0=black, 1=red, 2=green, 3=yellow, 4=blue, 5=magenta, 6=turquoise, 7=white, 8=no change, 9=black. Higher numbers have no effect. The default is red. The blinking cursor remains black.

-38 Set background color. You can supply an optional 2nd argument specifying the color, as follows: 0=black, 1=red, 2=green, 3=yellow, 4=blue, 5=magenta, 6=turquoise, 7=white, 8=no change, 9=white. Higher numbers have no effect. The default is red. The blinking cursor changes to a contrast color to the background color.

-42 Disable keyboard input.

-43 Reenable keyboard input (the default).

-50 Move cursor up (reverse line feed). You can supply an optional 2nd argument specifying the number of lines to move up. The default is 1.

-56 Enables arrow keys / numeric keypad (the default). Arrow keys can be used to move the cursor left and right within the command line, or to retrieve previous command lines.

-57 Disables arrow keys / numeric keypad. All arrow keys are equivalent to the Enter key.

-58 Start bold text.

-59 Stop bold text.

-62 Enable protected fields (see -7 and -8).
### Emulation

In D3 emulation, @(-11) enables protected fields and @(-12) disables protected fields. D3 also supports @(-57) through @(-64).

In jBASE and Reality emulation, @(-128) through @(-191) are supported. Start blinking text with -131, -138, -139, -142, or -143. Start reverse text with -140 or -141. Start underline text with -144, -145, -152, or -153. Start bold text with -160 or -161. Start blink/underline with -146, -147, -150, -151, -154, -155, -158, or -159. Start reverse/underline with -148, -149, -156, or -157. Start blink/bold with -162, -163, or -166. You can use -137 to turn off any combination of bold, blinking, reverse, or underline text.

In MVBase emulation, @(-57) through @(-64) are used for dimmed foreground colors.

In Ultimate emulation, @(-1) Clear screen; @(-2) Cursor home; @(-3) Clear to end of screen; @(-4) Clear to end of line; @(-5) Blink on; @(-6) Blink off; @(-7) Protected field on; @(-8) Protected field off; @(-9) Cursor left; @(-10) Cursor up; @(-11) Cursor down; @(-12) Cursor right; @(-13) Printer on; @(-14) Printer off; @(-15) Printer on (enable slave port in transparent mode); @(-16) Printer on (initiate slave local print); @(-17) Underline on; @(-18) Underline off; @(-19) Reverse on; @(-20) Reverse off; @(-21) Delete line; @(-22) Insert line; @(-23) Scroll up; @(-24) Bold on; @(-25) Bold off; @(-26) Delete character; @(-27) Insert character; @(-28) Insert on; @(-29) Insert off; @(-33) 80 column screen; @(-34) 132 column screen; @(-50) Graphics on; @(-51) Graphics off; @(-52) Blink on; @(-53) Blink off; @(-54) Reverse on; @(-55) Reverse off; @(-58) Underline on; @(-59) Underline off; @(-66) Dim (half intensity) on; @(-67) Dim (half intensity) off; @(-80) Set 80 column mode; @(-82) Set 132 column mode; @(-108) sounds the bell.

In UniData emulation, @(-19) sounds the bell.
ABS

Returns the absolute value of a number.

ABS(number)

Arguments

| number | An expression that resolves to a number or a numeric string. |

Description

The absolute value of a number is its unsigned magnitude. For example, ABS(-1) and ABS(1) both return 1. ABS returns a number in canonical form; it removes plus and minus signs and leading and trailing zeros from number. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If number is the empty string (“”) or a non-numeric value, ABS returns 0 (zero).

The ABS function gives the absolute value of a number: all numbers become positive. The NEG function inverts the sign of a number: negative numbers become positive and positive numbers become negative.

Examples

The following example uses the ABS function to compute the absolute value of a number:

PRINT ABS(0050.300);  ! Returns 50.3
PRINT ABS(-50.3);     ! Returns 50.3
PRINT ABS(+50.3);     ! Returns 50.3
PRINT ABS(0);         ! Returns 0
PRINT ABS(-0);        ! Returns 0

See Also

- ABSS function
- NEG function
ABSS

Returns the absolute value of each element in a dynamic array.

\[ \text{ABSS}(\text{dynarray}) \]

**Arguments**

- **dynarray**: An expression that resolves to a dynamic array containing numeric elements.

**Description**

The `ABSS` function returns a dynamic array containing the absolute value of each numeric element of `dynarray`. The absolute value of a number is its unsigned magnitude. `ABSS` returns numbers in canonical form; it removes signs, and leading and trailing zeros from the element values. If a `dynarray` element is a missing element, an empty string, or a non-numeric value, `ABSS` returns a value of 0 (zero) for that element.

**Examples**

The following example uses the `ABSS` function to return the absolute value of each of the numbers in a dynamic array:

```vbnet
a = 11:0VM:-22:0VM:-33:0VM:44
PRINT a;          ! returns 11ý-22ý-33ý44
PRINT ABSS(a);    ! returns 11ý22ý33ý44
```

The following example uses the `ABSS` function with a dynamic array that has missing and non-numeric elements:

```vbnet
b = -11:0VM:"":0VM:"-7dwarves":0VM:0VM:"dwarves"
PRINT ABSS(b);    ! returns 11ý0ý7ý0ý0
```

**See Also**

- [ABS function](#)
- [NEGS function](#)
- [Dynamic Arrays](#)
**ACCESS**

Returns information about the current MultiValue file called from a dictionary.

**ACCESS (code)**

<table>
<thead>
<tr>
<th>Arguments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>code</strong></td>
</tr>
</tbody>
</table>

**Description**

The `ACCESS` function returns information about the current Item being processed in CMQL when the routine is called from a DICTIONARY CALL conversion code. The called routine is called for every value in the DICT item attributes. If specified in DICT item attribute 7, the routine is also called each time a break-on occurs.

The information returned by `ACCESS` depends on the value of `code`. The following `code` values are supported:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The <code>filevar</code> for the data portion of the file. A <code>filevar</code> is assigned by the <code>OPEN</code> statement.</td>
</tr>
<tr>
<td>2</td>
<td>The <code>filevar</code> for the dictionary portion of the file. A dictionary <code>filevar</code> is assigned by the <code>OPEN</code> statement using the DICT keyword.</td>
</tr>
<tr>
<td>3</td>
<td>A dynamic array containing the current item from the file.</td>
</tr>
<tr>
<td>4</td>
<td>Counter of the number of items processed. Defaults to 0.</td>
</tr>
<tr>
<td>5</td>
<td>The attribute number specified in attribute 2 of the DICT item that is calling the current routine. Defaults to 0.</td>
</tr>
<tr>
<td>6</td>
<td>The current value number being processed. (1 is returned for single valued attributes.) Defaults to 0.</td>
</tr>
<tr>
<td>7</td>
<td>The current subvalue number being processed. (1 is returned if there are no subvalues.) Defaults to 0.</td>
</tr>
<tr>
<td>8</td>
<td>Number of detail lines processed since the last break. (This <code>code</code> is only valid if the DICT item attribute 7 is specified.) Defaults to 0.</td>
</tr>
<tr>
<td>9</td>
<td>The current break level. Set to 0 when processing a detail line. (This <code>code</code> is only valid if the DICT item attribute 7 is specified.) Defaults to 0.</td>
</tr>
<tr>
<td>10</td>
<td>Item ID.</td>
</tr>
<tr>
<td>11</td>
<td>File name.</td>
</tr>
</tbody>
</table>

`ACCESS` is provided for compatibility with the D3 (PICK) implementation of MultiValue Basic.

**See Also**

- `OPEN` statement
- `STATUS` statement
- `FILEINFO` function
- `STATUS` function
ACOS

Returns the arc-cosine of an angle.

ACOS(number)

Arguments

| number | An expression that resolves to a number in the range -1 to 1 (inclusive). Values outside of this range generate an <ILLEGAL VALUE> error. |

Description

The ACOS function returns the trigonometric arc-cosine of number. An arc-cosine is the inverse of a cosine. By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set $OPTIONS RADIANS.
To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example uses the ACOS function to return the arc-cosine of an angle:

```plaintext
PRINT ACOS(-0.5)" in degrees"
PRINT ACOS(-0.5)*(3.1415/180))" in radians"
```

See Also

- ATAN function
- COS function
- SIN function
- TAN function
- Derived Math Functions
- ObjectScript: $ZARCCOS function
ADDS

Adds the values of corresponding elements in two dynamic arrays.

ADDS(dynarray1,dynarray2)

Arguments

| dynarray | An expression that resolves to a dynamic array of numeric values. |

Description

The ADDS function adds the value of each element in dynarray1 to the corresponding element in dynarray2. It then returns a dynamic array containing the results of these additions. If a dynarray element value is a null string, missing, or a non-numeric value, ADDS parses its value as 0 (zero).

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the arithmetic operation. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the NUMS function to determine if the elements in a dynamic array are numeric. You can use the SUBS (subtraction), MULS (multiplication), DIVS or DIVSZ (division), MODS (modulo division), and PWRS (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

To add together the element values within a single dynamic array, use either the SUM function (for single-level dynamic arrays) or the SUMMATION function (for multi-level dynamic arrays).

Examples

The following example uses the ADDS function to add the elements of two dynamic arrays:

```
a=11:@VM:22:@VM:33:@VM:44
b=10:@VM:9:@VM:8:@VM:7
PRINT a; ! returns 11ý22ý33ý44
PRINT ADDS(a,b); ! returns 21ý31ý41ý51
```

See Also

- CATS function
- DIVS function
- DIVSZ function
- MODS function
- MULS function
- PWRS function
- SUM function
- SUMMATION function
- SUBS function
- Dynamic Arrays
ALPHA

Determines if a string is alphabetic or not.

**ALPHA**(string)

**Arguments**

| string | An expression that resolves to a string. |

**Description**

If *string* consists entirely of alphabetic characters, **ALPHA** returns 1. Otherwise, **ALPHA** returns 0. Note that blank spaces are non-alphabetic characters. Dynamic array separator characters are considered to be alphabetic characters. On a Unicode system **ALPHA** recognizes Unicode letters as alphabetic characters.

**Examples**

The following example uses the **ALPHA** function to determine if a string consists of only alphabetic characters:

```basic
PRINT ALPHA("abcdefg"); ! Returns 1
PRINT ALPHA("AbCdEfg"); ! Returns 1
PRINT ALPHA("my string"); ! Returns 0 (space not allowed)
PRINT ALPHA("half-wit"); ! Returns 0 (hyphen not allowed)
PRINT ALPHA("**"); ! Returns 0
PRINT ALPHA(123); ! Returns 0
```

**See Also**

- **NUM** function
ANDS

Returns the logical AND of corresponding elements of two dynamic arrays.

\[
\text{ANDS}(\text{dynarray1}, \text{dynarray2})
\]

**Arguments**

| dynarray | An expression that resolves to a dynamic array of boolean values. |

**Description**

The **ANDS** function performs a logical AND test on the corresponding element values of `dynarray1` and `dynarray2`. If both element values are non-zero numeric values, **ANDS** returns 1 for that element. Otherwise, **ANDS** returns 0. If a `dynarray` element value is an empty string, a missing element, or a string containing any non-numeric character, **ANDS** parses its value as 0.

A single leading plus or minus sign is parsed as a numeric character. Multiple leading plus and minus signs are treated as numeric characters in a number, but not in a numeric string. A numeric string with multiple leading plus and minus signs causes **ANDS** to treat the element value as non-numeric.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the logical comparison. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

Caché MVBasic also supports the logical operators & and AND.

**Examples**

The following example uses the **ANDS** function to compare two dynamic arrays. It returns 1 when both element values are non-zero:

```plaintext
a=1:@VM:0:@VM:33:@VM:0
b=10:@VM:9:@VM:1:@VM:0
PRINT ANDS(a,b)
! returns 1ý0ý1ý0
```

The following example performs an AND test on two dynamic arrays of different lengths:

```plaintext
a=1:@VM:0:@VM:1:@VM:0
b=1:@VM:1:@VM:1:@VM:1:@VM:1:@VM:0
PRINT ANDS(a,b)
! returns 1ý0ý1ý0ý0ý0ý0
```

**See Also**

- **ORS** function
- **NOTS** function
- Dynamic Arrays
- Operators
**ASCII**

Converts a string from EBCDIC to ASCII.

```
ASCII(string)
```

**Arguments**

| string | An expression that resolves to a string. |

**Description**

The `ASCII` function takes a string of characters and returns the EBCDIC code representation for each character. If you supply a string of EBCDIC code characters, `ASCII` returns the corresponding ASCII character(s). This is the inverse of the `EBCDIC` function. The `string` cannot contain Unicode characters.

The `CHAR` function takes an ASCII code and returns the corresponding character. The `SEQ` function takes a character and returns the corresponding ASCII code.

**Examples**

The following example uses the `ASCII` function to return the characters associated with the specified EBCDIC code string:

```c
estring=EBCDIC("ABCDEFG")
astring=ASCII(estring)
PRINT astring
! returns "ABCDEFG"
```

The following example shows the use of the `SEQ` and `CHAR` functions with the `ASCII` function:

```c
PRINT SEQ(EBCDIC("A"))
! returns 193
PRINT ASCII(CHAR(193))
! returns "A"
```

**See Also**

- `EBCDIC` function
- `CHAR` function
- `SEQ` function
- `Strings`
**ASIN**

Returns the arc-sine of an angle.

\[
\text{ASIN}(\text{number})
\]

**Arguments**

<table>
<thead>
<tr>
<th>number</th>
<th>An expression that resolves to a number or numeric string in the range -1 to 1 (inclusive). Values outside of this range generate an <code>&lt;ILLEGAL VALUE&gt;</code> error.</th>
</tr>
</thead>
</table>

**Description**

The ASIN function returns the trigonometric arc-sine of \textit{number}. An arc-sine is the inverse of a sine.

By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set `$OPTIONS RADIANS`.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

**Examples**

The following example uses the ASIN function to return the arc-sine of an angle:

```
PRINT ASIN(-0.5):" in radians"
PRINT ASIN(-0.5)*(180/ACOS(-1)):" in degrees"
```

**See Also**

- ATAN function
- COS function
- SIN function
- TAN function
- Derived Math Functions
- ObjectScript: `$ZARCSIN` function
**ASSIGNED**

Determines if a variable is assigned.

**ASSIGNED(var)**

**Arguments**

| var | A user variable. If var is not a valid variable name, MVBasic issues a syntax error. |

**Description**

The **ASSIGNED** function determines whether a user variable is assigned or not assigned. If *var* is assigned a value, **ASSIGNED** returns 1. If *var* is not assigned a value, **ASSIGNED** returns 0. An assigned value can be a single value or a dynamic array value. **ASSIGNED** also returns 1 if *var* is assigned the empty string (""), or is assigned an unassigned variable.

The input *var* can be a local variable, a global variable, or a process-private global variable. It can be with or without subscripts.

**Note:** **ASSIGNED** should not be used on system variables (@ variables). It always returns 0 for all @ variables, whether or not the @ variable currently has a value.

The **UNASSIGNED** function is the functional opposite of the **ASSIGNED** function.

The **COMMON** statement initializes variables as unassigned in Caché MVBasic. Array variable initialization varies with different MultiValue emulations.

You can use the **$KILL** statement to unassign variables.

**Examples**

The following example tests the assignment of several variables. **ASSIGNED** returns 1 (assigned) for variables *a* through *f*. **ASSIGNED** returns 0 (unassigned) for variable *g*.

```cachemv
a=123
b="fred"
c=1:VM:2:0VM:3
d=""
e=NULL
f=g
PRINT ASSIGNED(a)
PRINT ASSIGNED(b)
PRINT ASSIGNED(c)
PRINT ASSIGNED(d)
PRINT ASSIGNED(e)
PRINT ASSIGNED(f)
PRINT ASSIGNED(g)
```

Note that variable *f* is considered assigned, even though it is assigned to an unassigned variable.

**See Also**

- **COMMON** statement
- **$KILL** statement
- **UNASSIGNED** function
ATAN

Returns the arctangent of a number.

ATAN(number)

Arguments

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
</tr>
<tr>
<td>An expression that resolves to a number or a numeric string.</td>
</tr>
</tbody>
</table>

Description

The ATAN function takes the ratio of two sides of a right triangle (number) and returns the corresponding angle. The ratio is the length of the side opposite the angle divided by the length of the side adjacent to the angle.

By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set $OPTIONS RADIANS. The range of the result is -pi/2 to pi/2 radians.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example returns the arctangents of the integers from -4 through 4:

```
FOR x = -4 TO 4
PRINT "Arctangent of " + x + " is " + ATAN(x)
NEXT
```

The following example uses ATAN to calculate the value of pi:

```
PRINT ATAN(1)*4;  ! Calculate the value of pi.
```

Notes

Arctangent (ATAN) is the inverse trigonometric function of tangent (TAN), which takes an angle as its argument and returns the ratio of two sides of a right triangle. Do not confuse the arctangent with the cotangent; a cotangent is the simple inverse of a tangent (1/tangent).

See Also

- COS function
- SIN function
- TAN function
- Derived Math Functions
- ObjectScript: $ZARCTAN function
BITAND

Returns the bitwise AND for two bit strings.

\[
\text{BITAND(bitstring1,bitstring2)}
\]

**Arguments**

| bitstring | A bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 100000. The maximum bitstring value is 9223372036854775807. |

**Description**

The **BITAND** function compares two bit strings bit-by-bit, and returns a bitstring that is the logical AND bitwise comparison of the two strings. Both *bitstring* values are specified as positive integers. The returned value is also expressed as a positive integer.

The following is the truth table for **BITAND**:

<table>
<thead>
<tr>
<th>bitstring1 = 0</th>
<th>bitstring1 = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>bitstring2 = 0</td>
<td>0</td>
</tr>
<tr>
<td>bitstring2 = 1</td>
<td>0</td>
</tr>
</tbody>
</table>

A *bitstring* can be expressed as either a number or as a string. A number is converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

**Examples**

The following example specifies a *bitstring1* of 14 (binary 1110), and a *bitstring2* of 9 (binary 1001). Bitwise AND comparison results in the binary string 1000, the integer value of which is 8:

```
PRINT BITAND(14,9);  ! Returns 8
```

The following example specifies a *bitstring1* of 14 (binary 1110), and a *bitstring2* of 6 (binary 110). Bitwise AND comparison results in the binary string 0110, the integer value of which is 6:

```
PRINT BITAND(14,6);  ! Returns 6
```

The following example specifies a *bitstring1* of 65 (binary 1000001), and a *bitstring2* of 62 (binary 111110). Bitwise AND comparison results in the binary string 0000000, the integer value of which is 0:

```
PRINT BITAND(65,62);  ! Returns 0
```

The following example specifies two bitstrings with the same integer value. Bitwise AND comparison of a number with itself always results in the number:

```
PRINT BITAND(64,64);  ! Returns 64
```

**See Also**

- **BITOR** function
- **BITXOR** function
- **BITNOT** function
- **BITSET** function
- **BITRESET** function
- **BITTEST** function
**BITNOT**

Sets the specified bit in a bitstring to its opposite value.

<table>
<thead>
<tr>
<th>BITNOT(bitstring,bitno)</th>
</tr>
</thead>
</table>

**Arguments**

| bitstring | The bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 1000000. The maximum bitstring value is 9223372036854775807. |
| bitno | The bit position in bitstring to set to its opposite value. An expression that resolves to a positive integer. Bit positions are counted right to left, beginning with position 0. The maximum bitno value is 62. A fractional bitno is truncated to its integer portion. A negative bitno generates a <FUNCTION> error. |

**Description**

The **BITNOT** function defines a bit string using bitstring and changes (flips) one bit of that bit string at the location specified by bitno. Both values are specified as positive integers. If the bit specified by bitno has a value of 0, **BITNOT** sets it to 1. If the bit specified by bitno has a value of 1, **BITNOT** sets it to 0.

Both bitstring and bitno can be expressed as either numbers or as strings. These numbers are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

The **BITNOT** function always changes the specified bit. The **BITSET** function only sets the specified bit if its value is 0. The **BITRESET** function only sets the specified bit if its value is 1.

**Examples**

The following example specifies a bitstring of 64 (binary 1000000), and bitno sets bit position 0 to its opposite. This results in the binary string 1000001, the integer value of which is 65:

```plaintext
PRINT BITNOT(64,0);  ! Returns 65
```

The following example specifies a bitstring of 64 (binary 1000000), and bitno sets bit position 4 to its opposite. This results in the binary string 1010000, the integer value of which is 80:

```plaintext
PRINT BITNOT(64,4);  ! Returns 80
```

The following example specifies a bitstring of 65 (binary 1000001), and bitno specifies setting bit position 0 to its opposite. This results in the binary string 1000000, the integer value of which is 64:

```plaintext
PRINT BITNOT(65,0);  ! Returns 64
```

The following example specifies a bitstring of 8 (binary 1000), and bitno specifies setting bit position 4 to its opposite. The bitstring has an implicit bit position of 4 with a value of 0. Setting this bit to 1 returns the binary string 11000, the integer value of which is 24:

```plaintext
PRINT BITNOT(8,4);  ! Returns 24
```

The following example specifies a bitstring of 1 (binary 1), and bitno sets bit position 0 to its opposite. This results in the binary string 0, the integer value of which is 0:

```plaintext
PRINT BITNOT(1,0);  ! Returns 0
```
See Also

- BITSET function
- BITRESET function
- BITTEST function
BITOR

Returns the bitwise OR for two bit strings.

\[
\text{BITOR}(\text{bitstring1}, \text{bitstring2})
\]

**Arguments**

| bitstring | A bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 1000000. The maximum bitstring value is 9223372036854775807. |

**Description**

The BITOR function compares two bit strings bit-by-bit, and returns a bitstring that is the logical OR bitwise comparison of the two strings. Both bitstring values are specified as positive integers. The returned value is also expressed as a positive integer.

The following is the truth table for BITOR:

<table>
<thead>
<tr>
<th>bitstring1</th>
<th>bitstring1 = 0</th>
<th>bitstring1 = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>bitstring2 = 0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>bitstring2 = 1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

A bitstring can be expressed as either a number or as a string. A number are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

**Examples**

The following example specifies a bitstring1 of 14 (binary 1110), and a bitstring2 of 9 (binary 1001). Bitwise OR comparison results in the binary string 1111, the integer value of which is 15:

```
PRINT BITOR(14, 9);  ! Returns 15
```

The following example specifies a bitstring1 of 14 (binary 1110), and a bitstring2 of 6 (binary 110). Bitwise OR comparison results in the binary string 1110, the integer value of which is 14:

```
PRINT BITOR(14, 6);  ! Returns 14
```

The following example specifies a bitstring1 of 65 (binary 1000001), and a bitstring2 of 62 (binary 111110). Bitwise OR comparison results in the binary string 1111111, the integer value of which is 127:

```
PRINT BITOR(65, 62);  ! Returns 127
```

The following example specifies two bitstrings with the same integer value. Bitwise OR comparison of a number with itself always results in the number:

```
PRINT BITOR(64, 64);  ! Returns 64
```

**See Also**

- BITAND function
• BITXOR function
• BITNOT function
• BITSET function
• BITRESET function
• BITTEST function
**BITRESET**

Sets the specified bit in a bitstring to 0.

```
BITRESET(bitstring,bitno)
```

**Arguments**

<table>
<thead>
<tr>
<th>argument</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bitstring</td>
<td>The bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 1000000. The maximum bitstring value is 9223372036854775807.</td>
</tr>
<tr>
<td>bitno</td>
<td>The bit position in bitstring to set to 0. An expression that resolves to a positive integer. Bit positions are counted right to left, beginning with position 0. The maximum bitno value is 62. A fractional bitno is truncated to its integer portion. A negative bitno generates a &lt;FUNCTION&gt; error.</td>
</tr>
</tbody>
</table>

**Description**

The **BITRESET** function defines a bit string using *bitstring* and resets to 0 one bit of that bit string at the location specified by *bitno*. Both values are specified as positive integers. If the bit specified by *bitno* has a value of 1, **BITRESET** sets it to 0. If the bit specified by *bitno* already has a value of 0, **BITRESET** leaves it unchanged.

Both *bitstring* and *bitno* can be expressed as either numbers or as strings. These numbers are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

The **BITRESET** function sets a specified bit to 0. The **BITSET** function sets a specified bit to 1. The **BITNOT** function sets a specified bit to its opposite value.

**Examples**

The following example specifies a *bitstring* of 65 (binary 1000001), and *bitno* resets bit position 0 to the bit value 0. This results in the binary string 1000000, the integer value of which is 64:

```
PRINT BITRESET(65,0);  ! Returns 64
```

The following example specifies a *bitstring* of 64 (binary 1000000), and *bitno* resets bit position 6 to the bit value 0. This results in the binary string 0000000, the integer value of which is 0:

```
PRINT BITRESET(64,6);  ! Returns 0
```

The following example specifies a *bitstring* of 64 (binary 1000000), and *bitno* specifies resetting bit position 0 to the bit value 0. But because bit position 0 already has a bit value of 0, the binary string 1000000 (integer value 64) is returned unchanged:

```
PRINT BITRESET(64,0);  ! Returns 64
```

The following example specifies a *bitstring* of 8 (binary 1000), and *bitno* specifies resetting bit position 4 to the bit value 0. The *bitstring* has an implicit bit position of 4, which already has a value of 0. Thus the original binary string 1000 (integer value 8) is returned unchanged:

```
PRINT BITRESET(8,4);   ! Returns 8
```

The following example specifies a *bitstring* of 0 (binary 0), and *bitno* sets bit position 0 to the bit value 0. This results in the binary string 0, the integer value of which is 0:
PRINT BITRESET(0,0); ! Returns 0

See Also

- BITSET function
- BITNOT function
- BITTEST function
**BITSET**

Sets the specified bit in a bitstring to 1.

**BITSET(bitstring,bitno)**

**Arguments**

<table>
<thead>
<tr>
<th>bitstring</th>
<th>The bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 1000000. The maximum bitstring value is 9223372036854775807.</th>
</tr>
</thead>
<tbody>
<tr>
<td>bitno</td>
<td>The bit position in bitstring to set to 1. An expression that resolves to a positive integer. Bit positions are counted right to left, beginning with position 0. The maximum bitno value is 62. A fractional bitno is truncated to its integer portion. A negative bitno generates a &lt;FUNCTION&gt; error.</td>
</tr>
</tbody>
</table>

**Description**

The BITSET function sets a single bit of bitstring to 1 at the bit location specified by bitno. Both values are specified as positive integers. bitno always sets the specified bit to 1. If the bit specified by bitno has a value of 0, BITSET sets it to 1. If the bit specified by bitno already has a value of 1, BITSET sets it to 1 (leaves it unchanged).

Both bitstring and bitno can be expressed as either numbers or as strings. These numbers are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

If bitno is specified as a decimal fraction it is truncated to its integer component.

The BITSET function sets a specified bit to 1. The BITRESET function sets a specified bit to 0. The BITNOT function sets a specified bit to its opposite value.

**Examples**

The following example specifies a bitstring of either 0 or 1. It then sets the bit position specified in bitno to bit value 1:

```plaintext
PRINT BITSET(0,0);  ! Sets bit position 0 to 1; returns integer 1
PRINT BITSET(0,1);  ! Sets bit position 1 to 1; returns integer 2
PRINT BITSET(1,0);  ! Sets bit position 0 to 1; returns integer 1
PRINT BITSET(1,1);  ! Sets bit position 1 to 1; returns integer 3
```

The following example specifies a bitstring of 64 (binary 1000000), and bitno sets bit position 0 to the bit value 1. This results in the binary string 1000001, the integer value of which is 65:

```plaintext
PRINT BITSET(64,0);  ! Returns 65
```

The following example specifies a bitstring of 64 (binary 1000000), and bitno sets bit position 4 to the bit value 1. This results in the binary string 1010000, the integer value of which is 80:

```plaintext
PRINT BITSET(64,4);  ! Returns 80
```

The following example specifies a bitstring of 65 (binary 1000001), and bitno specifies setting bit position 0 to the bit value 1. But because bit position 0 already has a bit value of 1, the binary string 1000001 (integer value 65) is returned unchanged:

```plaintext
PRINT BITSET(65,0);  ! Returns 65
```
The following example specifies a *bitstring* of 8 (binary 1000), and *bitno* specifies setting bit position 4 to the bit value 1. The *bitstring* has an implicit bit position of 4 with a value of 0. Setting this bit to 1 returns the binary string 11000, the integer value of which is 24:

```
PRINT BITSET(8,4);  ! Returns 24
```

The following example specifies *bitstring* and *bitno* with null string values. The null string is parsed as 0:

```
PRINT BITSET(“”,1);   ! Returns 2; same as BITSET(0,1)
PRINT BITSET(1,””);   ! Returns 1; same as BITSET(1,0)
PRINT BITSET(“”,“”);  ! Returns 1; same as BITSET(0,0)
```

**See Also**

- [BITRESET function](#)
- [BITNOT function](#)
- [BITTEST function](#)
**BITTEST**

Tests the value of the specified bit in a bitstring.

```
BITTEST(bitstring,bitno)
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bitstring</td>
<td>The bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring <code>1000000</code>. The maximum <code>bitstring</code> value is 9223372036854775807.</td>
</tr>
<tr>
<td>bitno</td>
<td>The bit position in <code>bitstring</code> to return the value of. An expression that resolves to a positive integer. Bit positions are counted right to left, beginning with position 0. The maximum <code>bitno</code> value is 62. A fractional <code>bitno</code> is truncated to its integer portion. A negative <code>bitno</code> generates a <code>&lt;FUNCTION&gt;</code> error.</td>
</tr>
</tbody>
</table>

### Description

The **BITTEST** function defines a bit string using `bitstring` and tests the value of one bit of that bit string at the location specified by `bitno`. If the bit specified by `bitno` has a value of 0, **BITTEST** returns 0. If the bit specified by `bitno` has a value of 1, **BITTEST** returns 1.

Both `bitstring` and `bitno` are specified as positive integers. These arguments can be expressed as either numbers or as strings. Numbers are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

You can use the **BITSET** function to set individual bits.

### Examples

The following examples specify a `bitstring` of 14 (binary 1110), and use `bitno` to specify each bit in turn, returning the value of the bit:

```
x = BITSET(14,3);     ! Returns 14
PRINT BITTEST(x,0);   ! Returns 0
PRINT BITTEST(x,1);   ! Returns 1
PRINT BITTEST(x,2);   ! Returns 1
PRINT BITTEST(x,3);   ! Returns 1
```

The following example specifies a `bitstring` of 8 (binary 1000), and `bitno` specifies bit position 4. The `bitstring` has an implicit bit position of 4 with a value of 0.

```
PRINT BITTEST(8,4);   ! Returns 0
```

### See Also

- **BITRESET** function
- **BITSET** function
BITXOR

Returns the bitwise XOR for two bit strings.

\[
\text{BITXOR}(\text{bitstring1}, \text{bitstring2})
\]

**Arguments**

| bitstring | A bit string, specified as an expression that resolves to a positive integer. For example, the integer 64 specifies the bitstring 1000000. The maximum bitstring value is 9223372036854775807. |

**Description**

The **BITXOR** function compares two bit strings bit-by-bit, and returns a bitstring that is the logical exclusive or (XOR) bitwise comparison of the two strings. Both bitstring values are specified as positive integers. The returned value is also expressed as a positive integer.

The following is the truth table for **BITXOR**:

<table>
<thead>
<tr>
<th>bitstring1</th>
<th>bitstring2</th>
<th>bitstring1 = 0</th>
<th>bitstring1 = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

A bitstring can be expressed as either a number or as a string. A number are converted to canonical form, with leading plus signs and leading and trailing zeros omitted. If either argument evaluates to the null string or a non-numeric string it is assumed to have a value of 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

**Examples**

The following example specifies a bitstring1 of 14 (binary 1110), and a bitstring2 of 9 (binary 1001). Bitwise XOR comparison results in the binary string 0111, the integer value of which is 7:

```
PRINT BITXOR(14, 9);  ! Returns 7
```

The following example specifies a bitstring1 of 14 (binary 1110), and a bitstring2 of 6 (binary 110). Bitwise XOR comparison results in the binary string 1000, the integer value of which is 8:

```
PRINT BITXOR(14, 6);  ! Returns 8
```

The following example specifies a bitstring1 of 65 (binary 1000001), and a bitstring2 of 62 (binary 111110). Bitwise XOR comparison results in the binary string 1111111, the integer value of which is 127:

```
PRINT BITXOR(65, 62);  ! Returns 127
```

The following example specifies two bitstrings with the same integer value. Bitwise XOR comparison of a number with itself always results in 0:

```
PRINT BITXOR(64, 64);  ! Returns 0
```

**See Also**

- **BITAND** function
- BITOR function
- BITNOT function
- BITSET function
- BITRESET function
- BITTEST function
BYTE

Returns the character corresponding to the specified character code.

\[ \text{BYTE}(\text{charcode}) \]

**Arguments**

| charcode | An expression that resolves to an integer code that identifies a character. For 8-bit characters, the value in `charcode` must evaluate to a positive integer in the range 0 to 255. For 16-bit characters, specify integers in the range 256 through 65534. |

**Description**

The `BYTE` function takes a character code and returns the corresponding character. The `SEQ` function takes a character and returns the corresponding ASCII character code. The `charcode` must be a positive, base-10 integer. A fractional number is truncated to its integer portion. A negative number, empty string, or non-numeric value returns the empty string.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, `BYTE(10)` returns a linefeed character.

**Note:** `BYTE`, `CHAR`, and `UNICHAR` are functionally identical. On Unicode systems both can be used to return 16-bit Unicode characters. On 8-bit systems, these functions return a null string for character codes beyond 255.

The Caché MVBasic `BYTE` function returns a single character. The corresponding ObjectScript `$CHAR` function can return a string of multiple characters by specifying a comma-separated list of ASCII codes. The Caché MVBasic `CHARS` function takes a dynamic array of ASCII codes and returns the corresponding single characters as a dynamic array.

**Examples**

The following example uses the `BYTE` function to return the character associated with the specified character code:

```plaintext
PRINT BYTE(65);  ! Returns A.
PRINT BYTE(97);  ! Returns a.
PRINT BYTE(37);  ! Returns %.
PRINT BYTE(62);  ! Returns >.
```

The following example uses the `BYTE` function to return the lowercase letter characters of the Russian alphabet on a Unicode version of Caché. On an 8-bit version of Caché it returns a null string for each letter:

```plaintext
letter=1072
FOR x=1 TO 32
  PRINT BYTE(letter)
  letter=letter+1
NEXT
```

**See Also**

- `CHAR` function
- `UNICHAR` function
- `CHARS` function
- `SEQ` function
- ObjectScript: `$CHAR` function
BYTELEN

Returns the number of bytes in a string.

**BYTELEN**(string)

### Arguments

| string | An expression that resolves to a string or number. |

### Description

The **BYTELEN** function returns the number of bytes in a specified string. **BYTELEN** counts bytes. Therefore, on a Unicode implementation of Caché each character is counted as 2 bytes; a Unicode instance of Caché counts two bytes per character even when string contain no Unicode characters. Use the **LEN** function to count characters, rather than bytes.

For numerics, prior to determining the length MVBasic performs all arithmetic operations and converts numbers to canonical form, with leading and trailing zeroes, a trailing decimal point, and all signs removed except a single minus sign. Note that **BYTELEN** does count the decimal point and the minus sign. Numeric strings are not converted to canonical form. An empty string ("") returns a length of 0.

### Examples

The following example uses the **BYTELEN** function to return the number of bytes in a string on a Unicode system:

```caché
PRINT BYTELEN("InterSystems"); ! Returns 24
PRINT BYTELEN(+0099.900); ! Returns 8
PRINT BYTELEN("0099.900"); ! Returns 16
PRINT BYTELEN(CHAR(960)); ! Returns 2
PRINT BYTELEN(""); ! Returns 0
```

### See Also

- **COUNT** function
- **LEN** function
CALCULATE

Returns the results of an I-type calculation.

CALCULATE(ITypeDictItem)

**Arguments**

| ITypeDictItem | A valid virtual attribute. Must be a compiled I-type in the dictionary opened as @DICT. |

**Description**

The CALCULATE function evaluates an itype expression defined in a dictionary item against data in an MVBasic program and returns the result.

CALCULATE reads the dictionary item ITypeDictItem from the file opened to the @DICT variable. It then evaluates the itype expression defined in attribute 2 of the dictionary item, using the data in @ID and @RECORD. Calculate also sets the @CONV, @FORMAT, and @HEADER system variables to attributes 3, 5, and 4 of the dictionary item respectively. These can be used with the OCONV and FMT functions to format the results of CALCULATE.

Before using CALCULATE you must open a file to the @DICT system variable, and assign values to @ID and @RECORD. If the itype expression uses other @variables (for example @FILE.NAME) then these need to be set as well.

**CALCULATE and ITYPE Compared**

The CALCULATE function is similar to the ITYPE function:

- The ITYPE function argument is a variable into which a dictionary item has already been read, or an itype expression assigned. The ITYPE function allows on-the-fly creation of itype expressions
- The CALCULATE function argument must be the name of an existing dictionary item which will be read by the function.

**Example**

The following example opens the Myfile file to the item variable, and the Myfile dictionary to the @DICT special variable. It then reads through the item variable by @ID, and uses CALCULATE to calculate a total of the records in item. CALCULATE also sets values for the @CONV and @FORMAT system variables used by the OCONV and FMT functions.

```mvb
OPEN 'Myfile' TO item ELSE STOP 201,'MyFile'
OPEN 'DICT','Myfile' TO @DICT ELSE STOP 201,'DICT MyFile'
SELECT item TO 0
LOOP WHILE READNEXT @ID FROM 0
  DO
    READ @RECORD FROM item,@ID
    total += CALCULATE(amt_due)
  END
  REPEAT
  convtotal = OCONV(total,@CONV)
  fmttotal = FMT(convtotal,@FORMAT)
  PRINT fmttotal
END
```

**See Also**

- System Variables
CATS

Concatenates the values of corresponding elements in two dynamic arrays.

**CATS(dynarray1,dynarray2)**

### Arguments

| dynarray | An expression that resolves to a dynamic array. |

### Description

The CATS function concatenates the value of each element in `dynarray1` to the corresponding element in `dynarray2`. It then returns a dynamic array containing the results of these concatenations. If a dynamic array element contains an empty string or an element is missing, no concatenation is performed for that element, and the element value from the other dynamic array is returned.

For two elements to be concatenated, they must be on the same dynamic array level. For example, you cannot concatenate a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

Caché MVBasic converts numbers to canonical form (resolving signs, removing leading and trailing zeros, removing a leading plus sign, removing a trailing decimal point) before concatenating. Caché MVBasic does not convert numeric strings to canonical form before concatenating.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with null string ("") value elements for the purpose of the concatenation operation. You can use the REUSE function to concatenate a default value (instead of the null string) when the dynamic arrays differ in length.

You can use the REUSE function with CATS to concatenate the same value to all of the elements of a dynamic array. You can use the SPLICE function to concatenate the elements of two dynamic arrays, supplying a separator character (or string of characters) that is inserted between the components of each element.

### Examples

The following example uses the CATS function to concatenate the elements of two dynamic arrays:

```plaintext
ucase="A":@VM:"B":@VM:"C":@VM:"D"
lcase="aa":@VM:"bb":@VM:"cc":@VM:"dd"
PRINT CATS(ucase,lcase)
! returns AaaýBbbýCccýDdd
```

The following example concatenates two dynamic arrays of different lengths containing empty strings and missing elements:

```plaintext
ucase="A":@VM:"":@VM:"D"
lcase="aa":@VM:"":@VM:"cc":@VM:"":@VM:"ff"
PRINT CATS(ucase,lcase)
! returns AaaýCccýDdýff
```

### See Also

- REUSE function
- SPLICE function
- Dynamic Arrays
**CHANGE**

Replaces a substring in a string.

```plaintext
CHANGE(string, subout, subin[, occurrences[, begin]])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>string</code></td>
<td>The string in which substring substitutions are made. An expression that resolves to a string or numeric. <code>string</code> may be a dynamic array.</td>
</tr>
<tr>
<td><code>subout</code></td>
<td>The substring to be replaced. An expression that resolves to a string or numeric.</td>
</tr>
<tr>
<td><code>subin</code></td>
<td>The substring to be inserted in place of <code>subout</code>. An expression that resolves to a string or numeric.</td>
</tr>
<tr>
<td><code>occurrences</code></td>
<td>Optional — The number of occurrences of <code>subout</code> to replace with <code>subin</code>. An expression that resolves to a positive integer. If omitted, all occurrences are replaced. If used with <code>begin</code>, you can specify an <code>occurrences</code> value of -1 indicating that all occurrences of <code>subout</code> from the <code>begin</code> point to the end of the string are to be replaced.</td>
</tr>
<tr>
<td><code>begin</code></td>
<td>Optional — Which occurrence of <code>subout</code> to begin replacement with. An expression that resolves to a positive integer. If omitted, or specified as 0 or 1, replacement begins with the first occurrence of <code>subout</code>.</td>
</tr>
</tbody>
</table>

**Description**

The `CHANGE` function edits the value of `string` by replacing some or all instances of `subout` with `subin`. The `subout` and `subin` values may be of different lengths. Matching of strings is case-sensitive.

The value of `subout` and `subin` can be a string or a numeric. If numeric, the value is converted to canonical form (plus sign, leading and trailing zeros removed) before performing the `CHANGE` operation.

To remove all instances of `subout` from `string`, specify the null string (“”) as the `subin` value. The null string (“”) cannot be used as the `subout` value.

The value of `occurrences` may be larger than the actual number of occurrences. If `occurrences` is omitted, or set to a value of 0, a negative number, the null string, or a non-numeric string, all occurrences are replaced. If `occurrences` is set to a decimal number, it is truncated to an integer; if set to a mixed numeric string, it resolves to the numeric portion of the string.

**Note:** Caché MVBasic supports both the UniVerse `CHANGE` function and the UniData `SWAP` statement, both of which perform substring replacement.

You can use the `CONVERT` function to perform character-for-character substitutions.

**Examples**

The following example illustrates use of the `CHANGE` function, replacing a substring value in all the elements of a dynamic array:

```plaintext
cities="Pittsburg Penn.":@VM:"Philadelphia Penn."
CHANGE(cities, "Penn.", "PA")
```

The following example illustrates use of the `CHANGE` function, replacing the third and fourth occurrences of a substring value:

```plaintext
teststr=123test123test123test123test123test123test
CHANGE(teststr, "test", "RETRY", 2, 3)
  ! Returns "123test123test123RETRY123RETRY123test123test"
```
See Also

- SWAP statement
- CONVERT function
CHAR

Returns the character corresponding to the specified character code.

CHAR(charcode)

Arguments

| charcode | An expression that resolves to a base-10 integer that identifies a character. For 8-bit characters, charcode must be a positive integer in the range 0 through 255. For 16-bit characters, charcode must be a positive integer in the range 256 through 65534. |

Description

The CHAR function takes a character code and returns the corresponding character. The SEQ function takes a character and returns the corresponding ASCII code.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, CHAR(10) returns a linefeed character.

Note: CHAR, BYTE, and UNICHAR are functionally identical. On Unicode systems both can be used to return 16-bit Unicode characters. On 8-bit systems, these functions return a null string for character codes beyond 255.

The Caché MVBasic CHAR function returns a single character. The corresponding ObjectScript $CHAR function can return a string of multiple characters by specifying a comma-separated list of ASCII codes. The Caché MVBasic CHARS function takes a dynamic array of ASCII codes and returns the corresponding single characters as a dynamic array.

Examples

The following example uses the CHAR function to return the character associated with the specified character code:

```
PRINT CHAR(65);  ! Returns A.
PRINT CHAR(97);  ! Returns a.
PRINT CHAR(37);  ! Returns %.
PRINT CHAR(62);  ! Returns >.
```

The following example uses the CHAR function to return the lowercase letter characters of the Russian alphabet on a Unicode version of Caché. On an 8-bit version of Caché it returns a null string for each letter:

```
letter=1072
FOR x=1 TO 32
  PRINT CHAR(letter)
  letter=letter+1
NEXT
```

See Also

- BYTE function
- UNICHAR function
- CHARS function
- SEQ function
- ObjectScript: $CHAR function
CHARS

Returns the character corresponding to the specified character code for each element of a dynamic array.

CHARS(dynarray)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to a dynamic array of base-10 integers that identify characters. For 8-bit characters, each element value must be a positive integer in the range 0 through 255. For 16-bit characters, each element value must be a positive integer in the range 256 through 65534.</td>
</tr>
</tbody>
</table>

Description

The CHARS function takes a dynamic array of character codes and returns the corresponding characters. It returns these values as a dynamic array. The SEQS function takes a dynamic array of characters and returns the corresponding character codes.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, CHARS(10) returns a linefeed character.

Note: CHARS and UNICHARS are functionally identical. On Unicode systems both can be used to return 16-bit Unicode characters. On 8-bit systems, these functions return a null string for character codes greater than 255.

The Caché MVBasic CHARS function returns a dynamic array of characters. The corresponding ObjectScript $CHAR function returns a string of characters by specifying a comma-separated list of character codes.

Examples

The following example uses the CHARS function to return the characters associated with each specified character code:

```plaintext
a=65:0VM:66:0VM:67:0VM:68
PRINT CHARS(a);  ! returns AýBýCýD
```

The following example uses the CHARS function to return the first four letters of the Greek alphabet. On a Unicode version of Caché it returns the Greek letters in a dynamic array; on an 8-bit version of Caché it returns a dynamic array with a null string for each letter:

```plaintext
b=945:0VM:946:0VM:947:0VM:948
PRINT CHARS(b)
```

See Also

- UNICHARS function
- CHAR function
- SEQS function
- Dynamic Arrays
- ObjectScript: $CHAR function
CHECKSUM

Returns a checksum number for a string.

CHECKSUM(string)

Arguments

| string | An expression that resolves to a string. |

Description

The CHECKSUM function generates a cyclic redundancy code (also called a checksum) corresponding to string. It returns this checksum as a positive 5-digit integer. A checksum can be used to determine if data has been modified or if it was incompletely transmitted. CHECKSUM uses an 8-bit byte sum mode to calculate the checksum.

CHECKSUM returns the same checksum number for a numeric and the corresponding numeric string. However, numerics are converted to canonical form before checksum processing, whereas numeric strings are not converted to canonical form. Canonical and non-canonical forms of the same number have different checksums.

All string and numeric values, including zero, return a 5-digit checksum. However, if string is a null string a checksum of 0 is returned.

Examples

The following examples all return the same checksum:

```
PRINT CHECKSUM(123.4)
PRINT CHECKSUM("123.4")
PRINT CHECKSUM(+00123.400)
```

The following examples do not return the same checksum:

```
PRINT CHECKSUM(123.400)
PRINT CHECKSUM("123.400")
```

See Also

- Strings
- $ZCRC function in ObjectScript
COL1

Returns the FIELD substring start position.

| COL1 () |

Arguments

The COL1 function takes no arguments. The parentheses are mandatory.

Description

The COL1 function returns the starting position for the most recently called FIELD function. FIELD extracts a substring from a string by specifying a delimiter character. The specified delimiter immediately precedes the extracted substring. COL1 returns the string position (counting from 1) of this delimiter character.

If the FIELD count is 1, COL1 returns 0. If the FIELD count is greater than the number of delimited substrings, COL1 returns 0. If the FIELD delimiter is not located in string, COL1 returns 0.

The initial COL1 value is 0. The COL1 value is preserved until it is overwritten by the next FIELD function call.

COL1 returns a substring’s start delimiter position. COL2 returns a substring’s end delimiter position.

Examples

The following example shows the use of the COL1 function:

colors="Red^Green^Blue^Yellow^Orange^Black"
FOR x=1 TO 5
  PRINT FIELD(colors, "^", x)
  PRINT "Start delimiter position: " :COL1()
! Returns: 0, 4, 10, 15, 22
NEXT

See Also

- FIELD function
- COL2 function
COL2

Returns the FIELD substring end position.

| COL2 () |

Arguments

The COL2 function takes no arguments. The parentheses are mandatory.

Description

The COL2 function returns the ending position for the most recently called FIELD function. FIELD extracts a substring from a string by specifying a delimiter character. This substring is limited by encountering the next delimiter character. COL2 returns the string position (counting from 1) of this substring-ending delimiter character.

If the FIELD delimiter is not located in string and count=1, COL2 returns the full length of string. If FIELD returns a null string, COL2 returns 0.

The initial COL2 value is 0. The COL2 value is preserved until it is overwritten by the next FIELD function call.

COL2 returns a substring’s end delimiter position. COL1 returns a substring’s start delimiter position.

Examples

The following example shows the use of the COL2 function:

colors="Red^Green^Blue^Yellow^Orange^Black"
FOR x=1 TO 5
  PRINT FIELD(colors,"^",x)
  PRINT "End delimiter position: ":COL2()
! Returns: 4, 10, 15, 22, 29
NEXT

See Also

- FIELD function
- COL1 function
CONVERT

Replaces single characters in a string.

CONVERT(remove, replace, string)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>remove</td>
<td>One or more characters to be removed and replaced. An expression that resolves to a string or numeric.</td>
</tr>
<tr>
<td>replace</td>
<td>One or more characters to be inserted in place of the corresponding characters in remove. An expression that resolves to a string or numeric.</td>
</tr>
<tr>
<td>string</td>
<td>The string in which character substitutions are made. An expression that resolves to a string or numeric. string may be a dynamic array.</td>
</tr>
</tbody>
</table>

Description

The CONVERT function edits the value of string by replacing all instances of each single character in remove with the corresponding single characters in replace and returning the resulting string. CONVERT performs a character-for-character substitution. Matching of characters is case-sensitive.

CONVERT can be used as follows:

• To remove all instances of a character from a string, specify the character to be removed in remove and a null string in replace. For example, to remove the # character from mystring: CONVERT("#","",mystring)

• To replace all instances of a character in a string with another character, specify the character to be replaced in remove and the replacement character in replace. For example, to replace all instances of the # character with the * character in mystring: CONVERT("#","*",mystring)

• To replace all instances of a list of single characters with corresponding other single characters, specify those characters to be replaced in remove and the corresponding replacement characters in replace. For example, to replace all instances in mystring of the each lowercase letter a, b, c, and d with the corresponding uppercase letter: CONVERT("abcd","ABCD",mystring)

• To both replace some single characters and remove others, specify those characters to be replaced or removed in remove. First specify those to be replaced, then those to be removed. Specify the corresponding replacement characters in replace, and nothing for the characters to be removed. For example, to replace all instances of + with &, and to remove all instances of # in mystring: CONVERT("+#","&",mystring)

The value of remove and replace can be a string or a numeric. If numeric, the value is converted to canonical form (plus sign, leading and trailing zeros removed) before performing the CONVERT operation.

If remove contains more characters than replace, the unpaired characters are deleted from the returned string. If replace contains more characters than remove, the unpaired characters are ignored and have no effect.

Note: CONVERT performs single character one-for-one substitution for all instances in a string. The CHANGE function performs substring replacement, and can specify how many instances to replace and where to begin replacement.

The CONVERT statement and the CONVERT function perform the same operation, with the following difference: the CONVERT statement changes the supplied string; the CONVERT function returns a new string with the specified changes and leaves the supplied string unchanged.
Emulation
The order of the CONVERT arguments differs in different emulation modes. In Caché MVBasic, the order is remove, replace, string. In MultiValue emulation modes, the argument order is as follows:

- remove, replace, string: for UniVerse, UniData, PICK, Prime, INFORMATION, PiOpen.
- string, remove, replace: for jBASE, Reality, Ultimate, MVBase, D3, POWER95, IN2, R83.

Examples
The following example illustrates use of the CONVERT function in converting a string to a dynamic array by replacing the # character with a Value Mark level delimiter character:

```csh
cities="New York#Chicago#Boston#Los Angeles"
dynacities=CONVERT("#",CHAR(253),cities)
PRINT cities
PRINT dynacities
```

See Also

- CONVERT statement
- CHANGE function
- SWAP statement
- Strings
COS

Returns the cosine of an angle.

COS(number)

Arguments

| number | An expression that resolves to a number that expresses an angle in degrees. |

Description

The COS function takes an angle in degrees and returns the ratio of two sides of a right triangle. The ratio is the length of the side adjacent to the angle divided by the length of the hypotenuse. This ratio is in the range of 1 to -1 (inclusive).

Examples

The following example uses the COS function to return the cosine of an angle:

```c#
Dim MyAngle
MyAngle = 1.3;         ! Define angle in degrees.
PRINT COS(MyAngle);    ! Returns cosine ratio.
```

The following example uses the COS function to return the secant of an angle:

```c#
Dim MyAngle, MySecant
MyAngle = 1.3;                ! Define angle in degrees.
MySecant = 1 / Cos(MyAngle);  ! Calculate secant.
Print MySecant;               ! Secant in radians.
```

See Also

- ATAN function
- COSH function
- SIN function
- TAN function
- Derived Math Functions
- ObjectScript: $ZCOS function
COSH

Returns the hyperbolic cosine of an angle.

COSH(number)

Arguments

| number | An expression that resolves to a number that expresses an angle in degrees. |

Description

The COSH function takes an angle in degrees and returns the ratio of two sides of a right triangle. The ratio is the length of the side adjacent to the angle divided by the length of the hypotenuse. This ratio is in the range of 1 to -1 (inclusive).

Examples

The following example uses the COSH function to return the hyperbolic cosine of an angle:

```
Dim MyAngle
MyAngle = 1.3;        ! Define angle in degrees.
PRINT COSH(MyAngle);  ! Returns hyperbolic cosine ratio.
```

See Also

- ATAN function
- COS function
- SIN function
- TAN function
- Derived Math Functions
**COUNT**

Returns the number of instances of a substring in a string.

```
COUNT(string,substring)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to search for instances of substring. An expression that resolves to a string.</td>
</tr>
<tr>
<td>substring</td>
<td>A substring to match against string. An expression that resolves to a string.</td>
</tr>
</tbody>
</table>

**Description**

The `COUNT` function returns the number of times a specified `substring` appears in `string`.

String matching is case-sensitive. Numbers are converted to canonical form, with leading and trailing zeroes and plus signs removed. Numeric strings are not converted to canonical form.

If `string` is an empty string ("") `COUNT` returns a count of 0. If `substring` is an empty string, `COUNT` returns a count equal to the number of characters in `string`.

**Examples**

The following example uses the `COUNT` function to return the number of appearance of a substring in a string:

```
PRINT COUNT("InterSystems","s");  ! Returns 2
PRINT COUNT("InterSystems","S");  ! Returns 1
PRINT COUNT("InterSystems","te"); ! Returns 2
PRINT COUNT(+0099.900,0);          ! Returns 4
PRINT COUNT("InterSystems","")); ! Returns 12
```

The following example shows that overlapping substrings are only counted once:

```
PRINT COUNT("AAAAA","AA");        ! Returns 2
```

**See Also**

- `LEN` function
- `DCOUNT` function
- `COUNTS` function
**COUNTS**

Returns the number of instances of a substring in each element of a dynamic array.

`COUNTS(dynarray, substring)`

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dynarray</code></td>
<td>The array of elements that are to be searched for instances of <code>substring</code>. An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td><code>substring</code></td>
<td>A substring to match against each element in <code>dynarray</code>. An expression that resolves to a string.</td>
</tr>
</tbody>
</table>

**Description**

The `COUNTS` function returns the number of times a specified `substring` appears in each element of `dynarray`. These values are returned as a dynamic array of integer counts. A missing `dynarray` element or an element containing the empty string ("") always returns a count of 0.

String matching is case-sensitive. Numbers are converted to canonical form, with leading and trailing zeroes and plus signs removed. Numeric strings are not converted to canonical form.

If a dynamic array element is an empty string ("") or a missing element, `COUNTS` returns a count of 0 for that element. If `substring` is an empty string, `COUNTS` returns a count for each element equal to the number of characters in that element.

**Examples**

The following example uses the `COUNTS` function to return the number of appearance of a substring in each element of a dynamic array:

```plaintext
    citystate="Springfield IL":@VM:Springfield MA":@VM:
    "Somerville MA":@VM:Somerville NJ":@VM:Somerville ME"
    PRINT COUNTS(citystate,"Somerville")
    PRINT COUNTS(citystate,"Springfield")
    PRINT COUNTS(citystate,"MA")
    PRINT COUNTS(citystate,"VA")
```

The following example returns the count of the zeros in each element. Conversion of numbers to canonical form eliminates leading and trailing zeros. Numeric strings are not converted to canonical form. The missing element and the null string element return 0 regardless of the `substring` value:

```plaintext
    nums=000.1:@VM:0:@VM:"":@VM:0123.00:@VM:1230:@VM:"007.00"
    PRINT COUNTS(numsa,0); ! Returns 0ý0ý0ý0ý0ý4
```

The following example specifies the null string as the `substring` value. It returns the count of characters in each element. Conversion of numbers to canonical form eliminates leading and trailing zeros. Numeric strings are not converted to canonical form. The missing element and the null string element return 0:

```plaintext
    nums=000.1:@VM:0:@VM:"":@VM:0123.00:@VM:1230:@VM:"007.00"
    PRINT COUNTS(numsa,""); ! Returns 2ý1ý0ý0ý3ý4ý6
```

**See Also**

- `COUNT` function
- `LENS` function
- Dynamic Arrays
$DATA ($D)

Checks if a variable contains data.

$DATA(variable,target)
$D(variable,target)

**Parameters**

<table>
<thead>
<tr>
<th>parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable</td>
<td>The variable whose status is to be checked. <code>variable</code> may be specified as a variable or an object property with the syntax <code>obj-&gt;property</code>. If <code>variable</code> is not a valid variable or property name, MVBasic issues a syntax error.</td>
</tr>
<tr>
<td>target</td>
<td>Optional — A variable into which $DATA returns the current value of <code>variable</code>. <code>target</code> may be specified as a variable or an object property with the syntax <code>obj-&gt;property</code>. If <code>target</code> is not a valid variable or property name, MVBasic issues a syntax error.</td>
</tr>
</tbody>
</table>

**Description**

You can use $DATA to test whether a variable contains data before attempting an operation on it. $DATA returns status information about the specified variable. The `variable` parameter can be the name of any variable (local variable, process-private global, or global), and can include a subscript (an array element).

The possible status values that may be returned are as follows:

<table>
<thead>
<tr>
<th>Status Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The variable is undefined and has no descendents.</td>
</tr>
<tr>
<td>1</td>
<td>The variable contains data and has no descendents. Note that the null string (&quot;&quot;&quot;) qualifies as data.</td>
</tr>
<tr>
<td>10</td>
<td>The variable is undefined, but has descendents that contain data. Status 10 identifies an array element that has descendents (contains a downward pointer to another array element) but does not itself contain data.</td>
</tr>
<tr>
<td>11</td>
<td>The variable contains data and has descendents. Status 11 identifies a defined array element that has descendents (contains a downward pointer to another array element that also contains data). Variables of this type can be referenced in expressions.</td>
</tr>
</tbody>
</table>

**Note:** Status values 1 and 11 indicate only the presence of data, not the type of data.

If $DATA(var) returns either 0 or 10, any direct reference to `var` will result in an `<UNDEFINED>` error. For more information on `<UNDEFINED>` errors, refer to the $ZERROR special variable.

You can also use the EXIST$ function to determine if a variable is defined and whether a dimensioned array element has descendents (subnodes).

**Parameters**

**variable**

The `variable` can be a local variable, a process-private global, or a global, with or without subscripts. It can be a multidimensional object property. If a global variable, it can include an extended global reference. If a subscripted global variable, it can be a naked global reference.
Note: $DATA should not be used on system variables (@ variables). It always returns 0 for all @ variables, whether or not the @ variable currently has a value.

**target**

An optional parameter. Specify the name of a local variable, a process-private global, or a global variable, with or without subscripts. This target variable does not need to be defined.

- If variable contains data and target is defined, $DATA copies the variable value to target.
- If variable contains data and target is undefined, $DATA creates the target variable and copies the variable value to target.
- If variable does not contain data and target is undefined, target remains undefined.
- If variable does not contain data and target is defined, the existing target value remains unchanged.

variable and target may be the same variable.

**Examples**

In the following example, a multidimensional property is used as the variable value. This example returns the names of all defined namespaces to the target parameter:

```caché
obj = "%ResultSet"->%New("%SYS.Namespace:List")
obj->Execute()
crt $DATA(obj->Data)               ! returns 0
obj->Next()
crt $DATA(obj->Data)               ! returns 10
obj->Next()
crt $DATA(obj->Data("Nsp"),targ)   ! returns 1
      ! returns namespace name
obj->Next()
crt $DATA(obj->Data("Nsp"),targ)   ! returns 1
      ! returns namespace name
```

A similar program returns the same information using the $GET function.

**Notes**

**Naked Global References**

$DATA sets the naked indicator when used with a global variable. The naked indicator is set even if the specified global variable is not defined (Status Value = 0).

Subsequent references to the same global variable can use a naked global reference.

For further details on using $DATA with global variables and naked global references, see Using Multidimensional Storage (Globals) in Using Caché Globals.

**Global References in a Networked Environment**

Using $DATA to repeatedly reference a global variable that is not defined (for example, $DATA (^x(1)) where ^x is not defined) always requires a network operation to test if the global is defined on the ECP server.

Using $DATA to repeatedly reference undefined nodes within a defined global variable (for example, $DATA (^x(1)) where any other node in ^x is defined) does not require a network operation once the relevant portion of the global (^x) is in the client cache.

For further details, refer to Developing Distributed Applications in the Caché Distributed Data Management Guide.

**$DATA and $ORDER**

For related information, see $ORDER. Since $ORDER selects the next element in an array that contains data, it avoids the need to perform $DATA tests when looping through array subscripts.
See Also

- ASSIGNED function
- EXISTS function
- SORDER function
- UNASSIGNED function
- Using Multidimensional Storage (Globals) in Using Caché Globals
DATE

Returns the current local system date in internal format.

**DATE ()**

**Arguments**

None. The parentheses are mandatory.

**Description**

The `DATE` function returns the current date in a format such as the following:

```
14122
```

This represents the elapsed number of days since December 31, 1967. `DATE` returns the current date at the moment when the function is executed.

Caché MultiValue determines local time (and date) as follows:

- It determines the current Coordinated Universal Time (UTC) from the system clock.
- It adjusts UTC to the local time zone by using the value of the Caché special variable `$ZTIMEZONE`.
- It applies local time variant settings (such as Daylight Saving Time) for that time zone from the host operating system.

Caché MVBasic also supplies `@DATE`, `@DAY`, `@MONTH`, `@YEAR`, and `@YEAR4` system variables. These values are set when the process is initialized, and are only updated when a program is initiated from the MV shell. For further details, see the Variables page of this manual.

**Examples**

The following example calls the `DATE` function to return the current date in internal format, then uses the `OCONV` function to convert date from internal format to display format.

```
PRINT DATE()
PRINT OCONV(DATE(), "D")
```

**See Also**

- `TIMEDATE` function
- `OCONV` function
- System Variables
- ObjectScript: `$HOROLOG` special variable
- SQL: `NOW` function
DCOUNT

Returns the number of delimited substrings in a string.

DCOUNT(string,delimiter)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to search for instances of delimiter. An expression that resolves to a string.</td>
</tr>
<tr>
<td>delimiter</td>
<td>One or more characters used as a delimiter in string. An expression that resolves to a string.</td>
</tr>
</tbody>
</table>

Description

The DCOUNT function returns the number of delimited substrings that appears in string.

String matching is case-sensitive. Numbers are converted to canonical form, with leading and trailing zeroes and plus signs removed. Numeric strings are not converted to canonical form.

If delimiter doesn't appear in string, DCOUNT returns 1. If delimiter is the null string, DCOUNT returns the number of characters in the string, plus 1.

If string is an empty string (""), DCOUNT returns a count of 0.

Examples

The following example uses the DCOUNT function to return the number of Value Mark delimited substrings in a dynamic array:

colors="Red":@VM:"Green":@VM:"Blue":@VM:"Yellow"
PRINT DCOUNT(colors,CHAR(253));  ! Returns 4

See Also

- LEN function
- COUNT function
DELETE

Deletes an element from a dynamic array.

\[
\text{DELETE}(\text{dynarray},f[,v[,s]])
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dynarray</code></td>
<td>An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td><code>f</code></td>
<td>An expression that resolves to an integer. Specifies the Field level of the dynamic array on which to perform the deletion. Fields are counted from 1.</td>
</tr>
<tr>
<td><code>v</code></td>
<td>Optional — An expression that resolves to an integer. Specifies the Value level of the dynamic array on which to perform the deletion. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td><code>s</code></td>
<td>Optional — An expression that resolves to an integer. Specifies the Subvalue level of the dynamic array on which to perform the deletion. Subvalues are counted from 1 within a Value.</td>
</tr>
</tbody>
</table>

**Description**

The `DELETE` function returns a dynamic array with one element deleted. It deletes both the data and the dynamic array delimiter. Which element to delete is specified by the `f`, `v`, and `s` integers. For example, if `f=2` and `v=3`, this means delete the third value from the second field. If `f=2` and `v` is not specified, this means to delete the entire second field.

The `DELETE` function and the `DEL` statement perform the same operation, with the following difference: `DEL` changes the supplied dynamic array; `DELETE` creates a new dynamic array with the specified change and leaves the supplied dynamic array unchanged.

**Examples**

The following example uses the `DELETE` function to delete the second value from the first field of a dynamic array:

```plaintext
cities="New York":@VM:"London":@VM:
"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT cities
! Returns: "New YorkýLondonýChicagoýBostonýLos Angeles"
PRINT DELETE(cities,1,2)
! Returns: "New YorkýChicagoýBostonýLos Angeles"
```

**Emulation**

UniData systems differ in how they handle `f`, `v`, and `s` arguments set to 0. The `SOPTIONS ATTR.0IS1 (“zero is one”)` provides support for this UniData feature. UniData systems ignore `v` and `s` arguments that are set to a negative number.

**See Also**

- `DEL` statement
- `COUNTS` function
- `EXTRACT` function
- Dynamic Arrays
DIV

Integer division of two values.

DIV(numstr1,numstr2)

**Arguments**

<table>
<thead>
<tr>
<th>numstr1</th>
<th>The dividend. An expression that resolves to a number or numeric string.</th>
</tr>
</thead>
<tbody>
<tr>
<td>numstr2</td>
<td>The divisor. An expression that resolves to a non-zero number or numeric string.</td>
</tr>
</tbody>
</table>

**Description**

The DIV function divides the value of numstr1 by numstr2, and returns the integer quotient. It discards the fractional remainder. If a numstr value is a null string or a non-numeric value, DIV parses its value as 0 (zero).

Attempting to divide by zero generates a <DIVIDE> error, ending execution of the function and invoking an error trap handler, if available.

To perform exact division with a fractional quotient, use the division operator (/). To perform modulo division, use the MOD or REM function.

To perform division on the elements of a dynamic array, use the DIVS (divide corresponding elements, generate error on a zero divisor value), DIVSZ (divide corresponding elements, return 0 for a zero divisor value), and MODS (modulo division of corresponding elements) functions. The DIVS and DIVSZ functions can return fractional numbers as the result (quotient) of a division operation.

**Examples**

The following examples use the DIV function to return the integer quotient of a division operation:

```plaintext
PRINT DIV(10,5);          ! returns 2
PRINT DIV(10,4);          ! returns 2
PRINT DIV(10,3.3);        ! returns 3
PRINT DIV(10,3.4);        ! returns 2
PRINT DIV(10.2,3.4);      ! returns 3
PRINT DIV(-10,3);         ! returns -3
PRINT DIV(-10,-3);        ! returns -3
```

**See Also**

- MOD function
- REM function
- DIVS function
- DIVSZ function
- MODS function
- Operators
DIVS

Divides the corresponding elements in two dynamic arrays (zero divide not allowed).

DIVS(dynarray1,dynarray2)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray1</td>
<td>The dividend. An expression that resolves to a dynamic array of numeric values.</td>
</tr>
<tr>
<td>dynarray2</td>
<td>The divisor. An expression that resolves to a dynamic array of non-zero numeric values.</td>
</tr>
</tbody>
</table>

Description

The DIVS function divides the value of each element in dynarray1 by the corresponding element in dynarray2. It then returns a dynamic array containing the results of these divisions. If an element value is an empty string or a non-numeric value, DIVS parses its value as 0 (zero).

DIVS can return fractional numbers as the result (quotient) of a division operation. The DIV function can only return the integer portion of the result (quotient) of a division operation; the fractional portion is truncated.

The DIVS and DIVSZ functions are identical, with one difference:

- When DIVS encounters a 0 divisor, attempting to divide by zero generates a <DIVIDE> error, ending execution of the function and invoking an error trap handler, if available.
- When DIVSZ encounters a 0 divisor, it returns 0 for that element.

If the two dynamic arrays have different numbers of elements, by default the shorter dynamic array is padded so that the returned dynamic array has the number of elements of the longer dynamic array. If the shorter dynamic array is the dividend (dynarray1), it is padded with the required number of elements with the value of 0. If the shorter dynamic array is the divisor (dynarray2), it is padded with the required number of elements with the value of 1. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the NUMS function to determine if the elements in a dynamic array are numeric. You can use the ADDS (addition), SUBS (subtraction), MULS (multiplication), MODS and MODSZ (modulo division), and PWRS (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

Examples

The following example uses the DIVS function to divide the elements of two dynamic arrays:

```plaintext
a=11:@VM:22:@VM:0:@VM:-7
b=10:@VM:.5:@VM:10:@VM:42
PRINT DIVS(a,b)
! returns 1.1y44y0y-.1666666666667
```

See Also

- ADDS function
- DIVSZ function
- MODS function
- MODSZ function
- MULS function
- PWRS function
• SUBS function
• Dynamic Arrays
DIVSZ

Divides the corresponding elements in two dynamic arrays (zero divide allowed).

DIVSZ (dynarray1, dynarray2)

Arguments

- **dynarray1**: The dividend. An expression that resolves to a dynamic array of numeric values.
- **dynarray2**: The divisor. An expression that resolves to a dynamic array of numeric values.

Description

The DIVSZ and DIVS functions are identical, with one difference:

- When DIVSZ encounters a 0 divisor, it returns 0 for that element.
- When DIVS encounters a 0 divisor, it generates a <DIVIDE> error, ending execution of the function.

The DIVSZ function divides the value of each element in `dynarray1` by the corresponding element in `dynarray2`. It then returns a dynamic array containing the results of these divisions. If an element value is an empty string or a non-numeric value, DIVSZ parses its value as 0 (zero).

DIVSZ and DIVS can return fractional numbers as the result (quotient) of a division operation. The DIV function can only return the integer portion of the result (quotient) of a division operation; the fractional portion is truncated.

If the two dynamic arrays have different numbers of elements, by default the shorter dynamic array is padded so that the returned dynamic array has the number of elements of the longer dynamic array. If the shorter dynamic array is the dividend (`dynarray1`), it is padded with the required number of elements with the value of 0. If the shorter dynamic array is the divisor (`dynarray2`), it is padded with the required number of elements with the value of 1. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the NUMS function to determine if the elements in a dynamic array are numeric. You can use the ADDS (addition), SUBS (subtraction), MULS (multiplication), MODS and MODSZ (modulo division), and PWRS (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

Examples

The following example uses the DIVSZ function to divide the elements of two dynamic arrays:

```plaintext
a=11:@VM:22:@VM:0:@VM:-7
b=10:@VM:.5:@VM:10:@VM:42
PRINT DIVSZ (a, b)
! returns 1.1ý44ý0ý-.1666666666667
```

The following example uses DIVSZ to divide the elements of two dynamic arrays, when the divisor array contains zero values:

```plaintext
a=11:@VM:22:@VM:0:@VM:-7:@VM:6
b=10:@VM:0:@VM:10:@VM:**:@VM:2
PRINT DIVSZ (a, b)
! returns 1.1ý0ý0ý0ý3
```

See Also

- ADDS function
- DIVS function
• MODS function
• MODSZ function
• MULS function
• PWRS function
• SUBS function
• Dynamic Arrays
DOWNCASE

Converts alphabetic characters to lowercase.

**DOWNCASE**(string)

**Arguments**

| string | An expression that resolves to a string. |

**Description**

The **DOWNCASE** function returns a string of characters with all uppercase letters converted to lowercase. Characters other than uppercase letters are passed through unchanged. If you specify a null string, **DOWNCASE** returns a null string.

By default, **DOWNCASE** performs case conversion on ANSI Latin-1 letters. By default it does not convert Unicode letters on a Unicode Caché instance; it passes Unicode letters through unmodified. To perform case conversion on letters in other character sets, you must set the appropriate locale.

The **OCONV** function with the “MCL” option is functionally identical to the **DOWNCASE** function. To convert lowercase to uppercase, use the **UPCASE** function.

**Examples**

The following example uses the **DOWNCASE** function to return a string in all lowercase:

```
PRINT DOWNCASE("InterSystems");   ! Returns "intersystems"
```

**See Also**

- **UPCASE** function
- **OCONV** function
DQUOTE

Encloses a value in double quotation marks.

DQUOTE(string)

Arguments

| string | An expression that resolves to a string or a numeric. string may be a dynamic array. |

Description

The DQUOTE function returns string enclosed in double quotation marks. The quotation marks are part of the resulting string. Therefore, using DQUOTE increases the length of string by 2 characters. If string is the null string (""), DQUOTE returns a string consisting of two quotation mark characters, a string with a length of 2. This should not be confused with the null string (""), which has a length of 0.

The DQUOTE function converts a numeric to canonical form before enclosing it in quotation marks. DQUOTE does not convert a numeric string to canonical form.

The QUOTE function is functionally identical to DQUOTE. The SQUOTE function is similar, except that it encloses string with single quotation marks, rather than double quotation marks.

Note: Some MultiValue Basic implementations (D3, for example) use DQUOTE and SQUOTE to extract quoted substrings from within a string. The Caché MVBasic quote functions do not support this functionality. Use the FIELD function or the [ ] operator to extract quoted substrings.

Examples

The following example uses the DQUOTE function to convert a numeric to a string enclosed in double quotation marks:

```cachemv
quoted = DQUOTE(007.000)
PRINT quoted;   ! Returns "7"
PRINT LEN(quoted); ! Returns 3
```

The following example uses the DQUOTE function to enclose a string in double quotation marks:

```cachemv
str1 = "Hello"
str2 = 'Hello'
str3 = Hello
PRINT str1:str2:str3;  ! Returns HelloHelloHello
PRINT LEN(str1),LEN(str2),LEN(str3);  ! Returns 5  5  5
q1 = DQUOTE(str1)
q2 = DQUOTE(str2)
q3 = DQUOTE(str3)
PRINT q1;q2;q3;  ! Returns "Hello""Hello""Hello"
PRINT LEN(q1),LEN(q2),LEN(q3);  ! Returns 7  7  7
```

Note that the quote marks are not simply string delimiters, but are part of the returned string.

See Also

- QUOTE function
- SQUOTE function
- LEN function
- PRINT statement
DTX

Converts a number from decimal to hexadecimal.

```
DTX(decnum[,width])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>decnum</code></td>
<td>An expression that resolves to an integer.</td>
</tr>
<tr>
<td><code>width</code></td>
<td>Optional — An expression that resolves to a positive integer. <code>width</code> specifies the number of digits of the returned value, for the purpose of zero-padding.</td>
</tr>
</tbody>
</table>

**Description**

The **DTX** function returns a decimal integer converted to hexadecimal. The `decnum` value can be a positive or negative integer. If `decnum` is a positive integer, **DTX** returns the number of hexadecimal digits needed to express it. If `decnum` is a negative integer, **DTX** returns high values. For example, `DTX(-1)` returns `FFFFFFFFFFFFFFFF`. If you specify `decnum` as a fractional number, **DTX** generates a `<FUNCTION>` error.

The optional `width` argument pads the return value with leading zeros. If `width` is equal to or smaller than the number of hexadecimal digits in the return value, `width` is ignored. If `width` is larger than the needed number of hexadecimal digits, **DTX** pads the returned hexadecimal number with leading zeros. With a negative `decnum`, if `width` is larger than 16, it pads the returned hexadecimal number with leading zeros. If you specify `width` as a fractional number, **DTX** truncates it to the integer portion. If you specify `width` as a negative number, `width` is ignored.

If `decnum` is zero, the null string, or a non-numeric string, **DTX** returns 0; `width` padding is applied. If `decnum` is a mixed numeric string, the numeric part is parsed until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

Use **XTD** to convert from hexadecimal to decimal.

**Examples**

The following examples return positive integers converted to hexadecimal:

```
PRINT DTX(12);        ! Returns "C"
PRINT DTX(12,4);      ! Returns "000C"
PRINT DTX(199);       ! Returns "C7"
PRINT DTX(199,1);     ! Returns "C7"
```

The following examples return negative integers converted to hexadecimal:

```
PRINT DTX(-199);        ! Returns "FFFFFFFFFFFFFFF39"
PRINT DTX(-199,4);      ! Returns "FFFFFFFFFFFFFFF39"
PRINT DTX(-199,17);     ! Returns "0FFFFFFFFFFFFFFF39"
```

The following examples all return zero. Zero padding is provided, if specified:

```
PRINT DTX(0);       ! Returns "0"
PRINT DTX(-0);      ! Returns "0"
PRINT DTX(0,4);     ! Returns "0000"
PRINT DTX("",4);    ! Returns "0000"
PRINT DTX("foo",4); ! Returns "0000"
```

**See Also**

- **XTD** function
**EBCDIC**

Converts a string from ASCII to EBCDIC.

```
EBCDIC(string)
```

**Arguments**

| string | An expression that resolves to a string. |

**Description**

The `EBCDIC` function takes a string of characters and returns the ASCII code representation for each character. If you supply a string of ASCII code characters, `EBCDIC` returns the corresponding EBCDIC character(s). This is the inverse of the `ASCII` function. The `string` cannot contain Unicode characters.

If `string` is a number, it is converted to canonical representation before `EBCDIC` processing. If `string` is a quoted numeric string, no conversion is performed before `EBCDIC` processing.

The `CHAR` function takes an ASCII code and returns the corresponding character. The `SEQ` function takes a character and returns the corresponding ASCII code.

**Examples**

The following example uses the `EBCDIC` function to return the characters associated with the specified ASCII code string:

```
astring=ASCII("ABCDEFG")
estring=EBCDIC(astring)
PRINT estring
  ! returns "ABCDEFG"
```

The following example shows the use of the `SEQ` and `CHAR` functions with the `EBCDIC` function:

```
PRINT SEQ(ASCII("A"))
  ! returns 159
PRINT EBCDIC(CHAR(159))
  ! returns "A"
```

**See Also**

- ASCII function
- CHAR function
- SEQ function
- Strings
EOF(ARG.)

Returns whether the command line pointer is past the last argument.

Arguments

None. The keyword ARG. (note the period at end of this keyword) is the only allowed value, and is mandatory. The ARG. keyword is not case-sensitive.

Description

The EOF(ARG.) function returns a boolean value indicating whether the command line pointer is positioned beyond the last command line argument. It returns 1 if the command line pointer is positioned beyond the last command line argument. Otherwise, it returns 0.

The GET(ARG.) statement moves the command line argument pointer and retrieves the argument value. The SEEK(ARG.) statement moves the command line argument pointer without retrieving a value.

See Also

- GET(ARG.) statement
- SEEK(ARG.) statement
**EQT**

Performs an equality comparison on elements of two dynamic arrays.

\[
\text{EQT}(\text{dynarray1}, \text{dynarray2})
\]

### Arguments

| dynarray | An expression that resolves to a dynamic array of numeric values. |

### Description

The **EQT** function compares each corresponding numeric element from two dynamic arrays for equality. It returns a dynamic array of boolean values, in which each element comparison is represented by a 1 (equal) or a 0 (not equal). **EQT** converts numeric values to canonical form, removing signs and leading and trailing zeros, before making the comparison. **EQT** does not convert numeric strings to canonical form before making the comparison. If an element is missing, or has a null string value or a non-numeric value, **EQT** assigns it a value of 0 for the purpose of this comparison.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, unmatched elements return 0 (not equal). That is, the **EQT** comparison of each element in the longer dynamic array that has no corresponding element in the shorter dynamic array always returns 0 (not equal), even when the value of the longer array element is 0 or the null string, or is a missing element within the dynamic array. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

The **EQT** function is the functional opposite of the **NES** function.

### Examples

The following example uses the **EQT** function to return an equality comparison for each of the elements in dynamic arrays \( a \) and \( b \):

\[
\begin{align*}
\text{a} &= 11: @VM: -22: @VM: -33: @VM: 44 \\
\text{b} &= 11: @VM: -24: @VM: 0: @VM: 44 \\
\text{PRINT EQT(a, b)} & ! \text{ returns 1\text{y}0\text{y}0\text{y}1} \\
\end{align*}
\]

The following example compares various element values to 0:

\[
\begin{align*}
\text{a} &= 0: @VM: 0: @VM: 0: @VM: 0: @VM: 0 \\
\text{b} &= "": @VM: -0.00: @VM: @VM: "foo" \\
\text{PRINT EQT(a, b)} & ! \text{ returns 1\text{y}l\text{y}l\text{y}l} \\
\end{align*}
\]

### See Also

- **GES** function
- **GTS** function
- **LES** function
- **LTS** function
- **NES** function
- Dynamic Arrays
EREPLACE

Replaces a substring in a string.

```
EREPLACE(string,substring,replacement[,occurrence[,begin]])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string.</td>
</tr>
<tr>
<td>substring</td>
<td>An expression that resolves to a substring found within string.</td>
</tr>
<tr>
<td>replacement</td>
<td>An expression that resolves to the substring used to replace substring.</td>
</tr>
<tr>
<td>occurrence</td>
<td>Optional — An expression that resolves to an integer count specifying how many occurrences of substring to replace. The default is to replace all occurrences. A value of 0 replaces all occurrences. When using begin, you must specify an occurrence value.</td>
</tr>
<tr>
<td>begin</td>
<td>Optional — An integer count specifying the instance of substring with which to begin replacement. The default is to begin with the first instance of substring.</td>
</tr>
</tbody>
</table>

**Description**

The **EREPLACE** function replaces each occurrence of substring in a string with a new value. Whether to replace all instances of substring is specified by the optional occurrence and begin arguments. If these are omitted, all occurrences of substring are replaced by replacement. The replacement string can be longer or shorter than the substring it replaces.

If substring is not found in string, **EREPLACE** returns string unchanged. If substring is the empty string (""), the replacement string is appended to the beginning of string.

If replacement is the empty string (""), **EREPLACE** removes instances of substring from string.

**Examples**

The following example uses the **EREPLACE** function to replace all instances of a substring:

```plaintext
x="The slow brown fox slowly leapt"
PRINT EREPLACE(x,"slow","quick")
  ! Returns "The quick brown fox quickly leapt"
```

The following example also replaces the specified instances of a substring:

```plaintext
x="The slow brown fox slowly leapt"
PRINT EREPLACE(x,"slow","quick",1)
  ! Returns "The quick brown fox slowly leapt"
PRINT EREPLACE(x,"slow","quick",0,2)
  ! Returns "The slow brown fox quickly leapt"
```

The following example appends the replacement value to the string:

```plaintext
x="there was a slow brown fox"
PRINT EREPLACE(x,"","Once upon a time ")
  ! Returns "Once upon a time there was a slow brown fox"
```

**See Also**

- REMOVE statement
- EXTRACT function
- Strings
EXISTS

Returns the existence status of variables and their dimensioned array subnodes.

**EXISTS(varname)**

**Arguments**

| varname | Name of a variable to test for existence, and/or the presence of dimensioned array subnodes. |

**Description**

The EXISTS function returns an integer code indicating whether a variable is defined (1) or not defined (0). It can also indicate that the specified variable is not defined, but that the variable has defined subscripts. The varname parameter can be the name of any variable (local variable, process-private global, or global), and can include a subscript (an array element).

EXISTS returns an integer code indicating that the specified variable is:

- 0: undefined and has no subnodes.
- 1: defined and has no subnodes.
- 2: undefined but has defined subnodes.
- 3: defined and has defined subnodes.

Similar information can be returned using the $DATA function.

**Note:** EXISTS should not be used on system variables (@ variables). It always returns 0 for all @ variables, whether or not the @ variable currently has a value.

**Example**

The following example shows the four possible EXISTS return values. The specified variables are all process-private globals:

```
^ | a="salt"
^ | b(1)="carrot"
^ | c="fruit"
^ | c(1)="apple"
PRINT EXISTS(^ | a); ! returns 1
PRINT EXISTS(^ | b); ! returns 2
PRINT EXISTS(^ | c); ! returns 3
PRINT EXISTS(^ | z); ! returns 0
```

**See Also**

- DIM statement
- ASSIGNED function
- $DATA function
- ISOBJECT function
- Variables
EXP

Returns e (the base of natural logarithms) raised to a power.

EXP(number)

Arguments

| number | An expression that resolves to a number within the following range: On a Windows system, if the value of number is greater than 335.601, a <MAXNUMBER> error occurs; if the value of number is less than -295.424, EXP returns zero (0). |

Description

The EXP function takes the natural log constant e and raises it to the power specified by the number argument. The constant e (EXP(1)) is approximately 2.718282. If number is 0, the null string (""), or a non-numeric value, EXP parses number as 0 and returns 1.

The EXP function complements the action of the LN function and is sometimes referred to as the antilogarithm.

In ObjectScript, the corresponding function is $ZEXP.

Examples

The following example uses the EXP function to calculate e raised to the power of each of the integers -10 through 10:

```
FOR x = -10 TO 10
PRINT "Natural log to the power of ",x," = ",EXP(x)
NEXT
```

The following example uses the EXP function to return the hyperbolic sine of an angle:

```
MyAngle = 1.3
! Define angle in radians.
MyHSin = (EXP(MyAngle) - EXP(-1 * MyAngle)) / 2
! Calculate hyperbolic sine.
PRINT MyHSin
```

See Also

- LN function
- Derived Math Functions
**EXTRACT**

Finds the data value of an element of a dynamic array by delimiter position.

```
EXTRACT(dynarray,f[,v[,s]])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dynarray</code></td>
<td>An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td><code>f</code></td>
<td>An expression that resolves to an integer specifying the Field level of the dynamic array from which to access the data. Fields are counted from 1.</td>
</tr>
<tr>
<td><code>v</code></td>
<td>Optional — An expression that resolves to an integer specifying the Value level of the dynamic array from which to access the data. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td><code>s</code></td>
<td>Optional — An expression that resolves to an integer specifying the Subvalue level of the dynamic array from which to access the data. Subvalues are counted from 1 within a Value.</td>
</tr>
</tbody>
</table>

**Description**

The **EXTRACT** function returns the data value from one element of a dynamic array. Which element to access is specified by the `f`, `v`, and `s` integers. For example, if `f=2` and `v=3`, this means access the third value from the second field. If `f=2` and `v` is not specified, this means to access the entire second field.

If lower level delimiters exist in `dynarray`, setting an upper level to 0, the null string, or a non-numeric value is equivalent to setting it to 1.

If lower level delimiters do not exist in `dynarray`, setting this non-existent lower level to 1, 0, the null string, or a non-numeric value has no effect on retrieving the data value in the level above it.

You can also use the `< >` operator to extract an element value from a dynamic array. For further details, see the Dynamic Arrays page of this manual.

**Examples**

The following example uses the **EXTRACT** function to access the second value from the first field of a dynamic array:

```
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT EXTRACT(cities,1,2)  ! Returns: "London"
```

The following examples all return “London”, because the higher level Field Mark value is equivalent to 1:

```
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT EXTRACT(cities,1,2)
PRINT EXTRACT(cities,0,2)
PRINT EXTRACT(cities,"",2)
```

The following examples all return “London”, because the lower Subvalue Mark level does not exist:

```
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT EXTRACT(cities,1,2,0)
PRINT EXTRACT(cities,1,2,"")
```
Emulation

UniData systems differ in how they handle $f$, $v$, and $s$ arguments set to 0. The $OPTIONS$ ATTR.0IS1 ("zero is one") provides support for this UniData feature. UniData systems ignore $v$ and $s$ arguments that are set to a negative number.

See Also

- FIND statement
- FINDSTR statement
- REMOVE statement
- REPLACE function
- Dynamic Arrays
- Variables
**FADD**

Adds two floating point numbers.

FADD(num1,num2)

**Arguments**

<table>
<thead>
<tr>
<th>num</th>
<th>An expression that resolves to a numeric value.</th>
</tr>
</thead>
</table>

**Description**

The FADD function adds two numbers and returns the result. If a num value is a null string or a non-numeric value, FADD parses its value as 0 (zero).

You can perform the same operation using the addition operator (+). Refer to the Operators page of this manual.

**Arithmetic Operations**

- To perform arithmetic operations on floating point numbers, use the FADD, FSUB, FMUL, and FDIV functions, or use the standard arithmetic operators.
- To perform arithmetic operations on numeric strings, use the SADD, SSUB, SMUL, and SDIV functions.
- To perform integer division, use the DIV function. To perform modulo division, use the MOD function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the ADDS, SUBS, MULS, DIVS, and MODS functions.
- To add together the element values within a single dynamic array, use either the SUM function (for single-level dynamic arrays) or the SUMMATION function (for multi-level dynamic arrays).
- To perform numeric comparison operations, use the SCMP function, or use the standard comparison operators.

**Examples**

The following example uses the FADD function to add two floating point numbers:

```plaintext
a=11.95
b=10.25
PRINT FADD(a,b);  ! returns 22.2
```

**See Also**

- SADD function
- ADDS function
- SUM function
- SUMMATION function
- Operators
FDIV

Divides two floating point numbers.

**FDIV(num1,num2)**

<table>
<thead>
<tr>
<th>Arguments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>num1</strong></td>
</tr>
<tr>
<td><strong>num2</strong></td>
</tr>
</tbody>
</table>

**Description**

The **FDIV** function divides the value of **num1** by **num2**, and returns the quotient. If a value is 0, a null string, or a non-numeric value, **FDIV** parses it as 0 (zero). If **num1** is 0, **FDIV** returns a result of 0. If **num2** is 0, **FDIV** generates a <DIVIDE> error.

You can perform the same operation using the Division operator (/). Refer to the Operators page of this manual.

**Arithmetic Operations**

- To perform arithmetic operations on floating point numbers, use the **FADD**, **FSUB**, **FMUL**, and **FDIV** functions, or use the standard arithmetic operators.
- To perform arithmetic operations on numeric strings, use the **SADD**, **SSUB**, **SMUL**, and **SDIV** functions.
- To perform integer division, use the **DIV** function. To perform modulo division, use the **MOD** function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the **ADDS**, **SUBS**, **MULS**, **DIVS**, and **MODS** functions.
- To perform numeric comparison operations, use the **SCMP** function, or use the standard comparison operators.

**Examples**

The following example uses the **FDIV** and the **DIV** functions to divide the same two floating point numbers:

```plaintext
a=11.95  
b=10.25  
PRINT FDIV(a,b);  ! returns 1.165853658536585366  
PRINT DIV(a,b);   ! returns 1
```

**See Also**

- **SDIV** function
- **DIVS** function
- **DIV** function
- **MOD** function
- **MODS**
- Operators
FIELD

Returns the specified substring, based on a delimiter.

FIELD(string, delimiter, count[,range])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string. The target string from which a substring is to be returned. If you specify a null string (&quot;&quot;) as the target string, FIELD always returns a null string.</td>
</tr>
<tr>
<td>delimiter</td>
<td>An expression that resolves to a single character, specified as a number or a string. This character is used as a delimiter to identify substrings. This character cannot also be used as a data value within string. The delimiter characters used in dynamic arrays are listed in the Dynamic Arrays general concepts page of this manual.</td>
</tr>
<tr>
<td>count</td>
<td>An expression that resolves to an integer that specifies which substring to return from the target string. Substrings are separated by a delimiter, and counted from 1. A decimal number is truncated to an integer. A string is parsed as a number until a non-numeric character is encountered. Thus &quot;7dwarves&quot; is parsed as 7. A count value of 0, a negative number, the null string, or a non-numeric string is the same as count=1.</td>
</tr>
<tr>
<td>range</td>
<td>Optional — An expression that resolves to an integer specifying the number of delimited substrings to return, starting with count. If omitted, the default is 1.</td>
</tr>
</tbody>
</table>

Description

The FIELD function returns the substring which is the nth piece of string, where the integer n is specified by the count parameter, and substrings are separated by a delimiter character. The delimiter itself is not returned.

If count is 1, FIELD returns the first piece of the string. This is the piece of the string from the beginning of the string to the first delimiter. If the first character of the string is a delimiter, count=1 returns the null string.

You can follow the FIELD function with the COL1 function to determine the string position of the start delimiter for the returned substring. If count is 1, COL1 returns 0. You can determine the end delimiter position by calling the COL2 function.

If count is greater than the number of delimited substrings, FIELD returns the null string. In this case, COL1 and COL2 both return 0.

If you specify a delimiter that is not located in string and count=1, FIELD returns the entire string. If count>1, FIELD returns the null string.

If you specify the null string as a delimiter, FIELD returns the entire string, regardless of the value of count.

If the optional range argument is set to an integer value greater than 1, that number of sequential delimited substrings is returned as a single string. Delimiters within the string are included. If range is a decimal number, it is truncated to its integer value. Setting range to any value other than a numeric 2 or greater is treated as setting it to 1. If range is larger than the number of remaining substrings in the string, the remaining substrings are returned.

Note: The FIELD and GROUP functions are functionally identical.

Emulation

By default Caché MVBasic permits only a single-character delimiter. jBASE emulation permits a multi-character delimiter. This option is set using the FULL.DELIM option.
Examples

The following example uses the **FIELD** function to return the first five delimited items in a string:

```caché
colors="Red^Green^Blue^Yellow^Orange^Black"
FOR x=1 TO 5
  PRINT FIELD(colors,"^",x)
NEXT
```

The following example uses the **FIELD** function to return the first three elements in a dynamic array:

```caché
colors="Red":@VM:"Green":@VM:"Blue":@VM:"Yellow"
FOR x=1 TO 3
  PRINT FIELD(colors,CHAR(253),x)
NEXT
```

The following example uses `count` and `range`:

```caché
colors="Red^Green^Blue^Yellow^Orange^Black"
PRINT FIELD(colors,"^",2,3)
```

Returns “Green^Blue^Yellow”.

See Also

- **FIELDS** function
- **GROUP** function
- **COL1** function
- **COL2** function
- **Strings**
- **Dynamic Arrays**
FIELDS

Returns a dynamic array of substrings, based on a delimiter.

\[ \text{FIELDS(dynarray, delimiter, count[, range])} \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{dynarray} )</td>
<td>An expression that resolves to a dynamic array. The source dynamic array from which a dynamic array of substrings is to be extracted.</td>
</tr>
<tr>
<td>( \text{delimiter} )</td>
<td>An expression that resolves to a single character, specified as a number or a string. This character is used as a delimiter to identify substrings within elements. This character cannot also be used as a data value within ( \text{dynarray} ). The delimiter characters used in dynamic arrays are listed in the Dynamic Arrays general concepts page of this manual.</td>
</tr>
<tr>
<td>( \text{count} )</td>
<td>An expression that resolves to an integer that specifies which substring to return from each element of ( \text{dynarray} ). Substrings are separated by a ( \text{delimiter} ), and counted from 1. A decimal number is truncated to an integer. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. A ( \text{count} ) value of 0, a negative number, the null string, or a non-numeric string is the same as ( \text{count}=1 ).</td>
</tr>
<tr>
<td>( \text{range} )</td>
<td>Optional — An expression that resolves to an integer specifying the number of delimited substrings to return for each element, starting with ( \text{count} ). If omitted, the default is 1.</td>
</tr>
</tbody>
</table>

**Description**

The FIELDS function returns a dynamic array of substrings. Each substring is the \( n \)th piece of each element, where the integer \( n \) is specified by the \( \text{count} \) parameter, and substrings are separated by a \( \text{delimiter} \) character. The delimiter itself is not returned.

If \( \text{count} \) is 1, FIELDS returns the first piece of each element. This is the piece of the string from the beginning of the element to the first delimiter. If the first character of the element is a delimiter, \( \text{count}=1 \) returns the null string.

If \( \text{count} \) is greater than the number of delimited substrings in an element, FIELDS returns the null string for that element.

If you specify a \( \text{delimiter} \) that is not located in \( \text{dynarray} \) and \( \text{count}=1 \), FIELDS returns the entire \( \text{dynarray} \) as a single element. If \( \text{count}>1 \), FIELDS returns the null string.

If you specify the null string as a \( \text{delimiter} \), FIELDS returns the entire \( \text{dynarray} \), regardless of the value of \( \text{count} \).

If the optional \( \text{range} \) argument is set to an integer value greater than 1, that number of sequential delimited substrings is returned as a single string. Delimiters within the string are included. If \( \text{range} \) is a decimal number, it is truncated to its integer value. Setting \( \text{range} \) to any value other than a numeric 2 or greater is treated as setting it to 1. If \( \text{range} \) is larger than the number of remaining substrings in the element, the remaining substrings are returned.

The FIELDS function returns delimited substrings from a dynamic array. The FIELD and GROUP functions can be used to return a delimited substring from a string.

**Examples**

The following example uses the FIELDS function to return the area code from each telephone number element in an array, using the hyphen (-) as a delimiter:

```cacheml
\text{tele}="617-123-4567":@VM:"401-555-4321":@VM:"603-987-6543":@VM:"508-246-8024"
\text{areacodes} = \text{FIELDS(tele,"-",1)}
\text{PRINT areacodes}
\quad \! \text{Returns: 617y401y603y508}
```

Caché MultiValue Basic Functions
See Also

- FIELD function
- GROUP function
- Strings
- Dynamic Arrays
FIELDSTORE

Replaces data in a delimited string.

FIELDSTORE (string, delimiter, count, multiple, newval)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string. The source string to be modified. string can be a dynamic array.</td>
</tr>
<tr>
<td>delimiter</td>
<td>An expression that resolves to a single character that serves as a delimiter within string</td>
</tr>
<tr>
<td>count</td>
<td>An expression that resolves to an integer that specifies which delimited string to use as the starting point for the replacement operation.</td>
</tr>
<tr>
<td>multiple</td>
<td>An expression that resolves to an integer specifying how many delimited strings to replace with newval.</td>
</tr>
<tr>
<td>newval</td>
<td>An expression that resolves to a string. The data to be inserted.</td>
</tr>
</tbody>
</table>

Description

The FIELDSTORE replaces one or more delimited substrings in string with a specified newval, then returns the resulting string. The source string remains unchanged. FIELDSTORE adds and removes delimiters as needed.

- To replace a delimited substring with another substring, specify a count that corresponds to an existing delimited string and multiple=1.
- To replace more than one delimited substrings with a single delimited substring, specify a count that corresponds to an existing delimited string and a multiple greater than one. Both the replaced substrings and their delimiters are removed.
- To append a delimited substring to the end of string, specify a count greater than the number of existing delimited strings. FIELDSTORE adds the appropriate number of delimiter characters, if necessary, before the newval substring.
- To prepend a delimited substring to the beginning of string, specify a count=1 and multiple=0. FIELDSTORE appends a delimiter character and the newval substring.
- To delete a delimited substring, specify a count that corresponds to an existing delimited string and specify newval as the empty string.

If delimiter is not found in string, and count is 1, 0, or the null string, newval replaces string and is returned with no delimiters. If delimiter is not found in string, and count is > 1, the specified delimiter and newval are appended to string. The number of delimiters appended being count minus 1.

Examples

The following example uses the FIELDSTORE function to return a string that replaces the first delimited substring in the string:

cities="New York^London^Chicago^Boston^Los Angeles"
PRINT FIELDSTORE(cities,"^",1,1,"Providence")
! Returns: "Providence^London^Chicago^Boston^Los Angeles"

The following example uses the FIELDSTORE function to return a string that replaces the second Value Mark delimited substring in the dynamic array:
The following example uses the `FIELDSTORE` function to replace the second Value Mark delimited substring and the next two substrings in a dynamic array:

```
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT cities
! Returns: "New YorkýLondonýChicagoýBostonýLos Angeles"
PRINT FIELDSTORE(cities,CHAR(253),2,3,"Providence")
! Returns: "New YorkýProvidenceýChicagoýBostonýLos Angeles"
```

See Also

- INS statement
- COUNTS function
- DELETE function
- INSERT function
- EXTRACT function
- Dynamic Arrays
FILEINFO

Returns information about an open file.

FILEINFO(filevar,key)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>An expression that resolves to a file variable name used to refer to the file in Caché MVBasic.</td>
</tr>
<tr>
<td>key</td>
<td>An expression that resolves to an integer code used to specify what file information to return. Available values are 0 through 3.</td>
</tr>
</tbody>
</table>

Description

The FILEINFO function returns various types of information about an open file. You must specify a filevar supplied by an open statement, such as OPEN or OPENSEQ. You can use FILEINFO(filevar,0) to determine if filevar is valid. If filevar is not valid and key is 1 through 3 (inclusive), FILEINFO returns the empty string.

The following are the available key options and return values:

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>File variable: 1 if filevar is valid. Otherwise 0.</td>
</tr>
<tr>
<td>1</td>
<td>VOC name: The VOC name of a MultiValue file. For example, myfile. If filevar does not refer to a MultiValue file, returns a null string.</td>
</tr>
<tr>
<td>2</td>
<td>Pathname or global name: For a MultiValue file, the name of a Caché global variable. For example, ^&quot;USER&quot;</td>
</tr>
<tr>
<td>3</td>
<td>File storage type: 0=unknown. 1=top level global (static hashed file) the default for MultiValue data files. 2=subscripted global subnode. 4=directory. 5=sequential file.</td>
</tr>
</tbody>
</table>

Other MultiValue implementations may support higher key option values; these are not supported by Caché MVBasic.

Examples

The following example opens a sequential file, tests the file variable, then uses the file variable to return the file's pathname and the file type (in this case, type 5):

```
OPENSEQ "C:\temp\file1" TO myfile
IF FILEINFO(myfile,0)=1
   THEN PRINT "valid file variable"
   ELSE PRINT "file variable not valid"
ELSE PRINT "file variable not valid"
END
PRINT "File pathname is:"|FILEINFO(myfile,2)
PRINT "File type is:"|FILEINFO(myfile,3)
CLOSESEQ myfile
```

See Also

- OPEN statement
- OPENSEQ statement
FIX

Returns a floating point number with the specified number of decimal digits.

\[
\text{FIX}(\text{number[,precision[,mode]]})
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>number</strong></td>
<td>An expression that resolves to a number or a numeric string.</td>
</tr>
<tr>
<td><strong>precision</strong></td>
<td>Optional — An expression that resolves to an integer specifying the number of decimal digits of precision. The default is 4.</td>
</tr>
<tr>
<td><strong>mode</strong></td>
<td>Optional — An expression that resolves to a boolean flag that specifies whether to round or truncate number. 0=round; 1=truncate. The default is 0.</td>
</tr>
</tbody>
</table>

**Description**

The FIX function takes a floating point number and returns this number rounded or truncated to the specified number of fractional digits. The precision is the maximum number of fractional digits. FIX does not pad a number with trailing zeros, and removes trailing zeros that result from the rounding process. Thus FIX(12.99, 1) returns 13, not 13.0.

The precision argument is optional. If not specified, FIX either takes its precision from a preceding PRECISION command, or takes the default precision of 4. A value of 0, the null string, or a non-numeric string does not set precision, and the default precision is taken. You must specify a precision value to specify a mode value.

**Examples**

The following example shows the uses of the FIX function:

```
PRINT FIX(123.987654);       ! Returns 123.9877
PRINT FIX(123.987654,2);     ! Returns 123.99
PRINT FIX(123.987654,1);     ! Returns 124
PRINT FIX(123.987654,0);     ! Returns 123.9877
PRINT FIX(123.987654,2,0);   ! Returns 123.99
PRINT FIX(123.987654,2,1);   ! Returns 123.98
```

**See Also**

- PRECISION command
FMT

Formats a value for display.

FMT(string,format)

Arguments

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string or number to be formatted for display.</td>
</tr>
<tr>
<td>format</td>
<td>An expression that resolves to a string consisting of positional letter and number codes specifying the display format for string.</td>
</tr>
</tbody>
</table>

Description

The FMT function returns the string value formatted as specified by format. This formatting may include padding or rounding/truncating of string. The most common use for FMT is to provide a uniform display format for decimal numbers.

The format string has the following format:

```
w|f|R|n|m
```

- **w** Optional — The overall width of the display field, specified as a positive integer. Used to impose a uniform width (number of characters) on string. Different operations are performed if w is larger or smaller than the length of string, as described below.
- **f** Optional — A fill character, specified as a single character. (Certain fill characters, as described below, must be specified as a quoted string.) You must specify w to use f. If you specify w, but do not specify f, it defaults to the space character.
- **R** Optional — The letter “R” or “L” specifying right or left justification. This letter code is not case-sensitive. If you do not specify a letter code, FMT defaults to left justification. (The letters “T” and “U” are synonyms for “L”).
- **n** Optional — A positive integer in the range 0 through 9 that specifies the number of fractional digits to the right of the decimal place. If you specify n, it must either be the only code in format, or it must be preceded by the letter “R” or “L”. If you do not specify n, FMT defaults to number of fractional digits in string. Zero-padding and rounding are applied as needed.
- **m** Optional — A positive integer in the range 0 through 9 that specifies the repositioning of the decimal point. Both n and m must be specified. The number 4 specifies do not reposition the decimal point (the default). Integers higher than 4 move the decimal point to the left; integers lower than 4 move the decimal point to the right. Zero-padding and rounding are applied as needed.

There are two basic uses of format:

- To return fractional numbers in a standard form.
- To return strings in a standard form.

FMT also supports a different format to support other legacy platform styles: Rfw.
**Formatting Numbers**

For fractional numbers, the most basic format is "R\(n\)", where “R” is either the letter “R” specifying right justification or the letter “L” specifying left justification, and \(n\) is the number of digits to the right of the decimal point to display. If \(str\) is an integer or has fewer fractional digits than \(n\), zero padding is added. If \(str\) has more digits than \(n\), the number is rounded to the specified number of fractional digits. If \(n\) is zero, the number is rounded to an integer and the decimal point is removed. If \(str\) is less than 1, specifying \(n\) supplies a zero (0) to the left of the decimal point. If \(str\) contains any character other than a number, the decimal point character, or a plus or minus sign, \(FMT\) does no zero padding or rounding.

A more complex example of format is "10^#R5", where “10” is the overall width of the display field elements, “#” is the fill character to use to fill out a display field element. Because “R” indicates right justification, these fill characters will appear to the left of the \(str\) value. The \(n\) value of 5 indicates that the \(str\) value is to have 5 digits to the right of the decimal place. When an \(n\) value is present, \(FMT\) only formats a number; a non-numeric string is returned unchanged.

If \(str\) is 0, \(FMT\) applies numeric formatting; it returns the value zero with \(n\) fractional digits and \(m\) shifting of the decimal point. If \(str\) is the null string (“”), \(FMT\) numeric formatting returns the null string. This null string behavior is CEMU dependent: Caché, jBASE, and UniData emulations treat a null \(str\) as null. The other MultiValue emulations treat a null \(str\) as zero, and apply numeric formatting.

**Formatting Strings**

For strings, the most basic format is "wf\(f\)", where “\(w\)” is an integer specifying width and \(f\) is a literal fill character (for example "0^*"). You can use \(w\) (width) and \(f\) (fill) formatting to make a display field a standard width. By default, the justification is “L” (left); you can, of course, specify “R” for right justification.

The \(w\) (width) value may be larger than, equal to, or smaller than the number of characters (including the decimal point) of \(str\). If \(str\) is a fractional number, \(w\) is applied after \(FMT\) adjusts the number of fractional digits (by rounding or zero padding).

- If \(w\) is greater than the length of \(str\), \(FMT\) appends \(f\) fill characters to \(str\) making the resulting string \(w\) characters in length. If “L” (left justification) fill characters are applied to the end of the string; if “R” (right justification) fill characters are applied to the beginning of string.
- If \(w\) is equal to the length of \(str\) (after rounding or zero padding of fractional digits), no operation is performed.
- If \(w\) is less than the length of \(str\), \(FMT\) inserts a Text Mark (@TM, CHAR(251)) character after every \(w\) count of characters. If “L” (left justification), characters are counted forward from the beginning of the string; if “R” (right justification), characters are counted backward from the end of the string. \(FMT\) then appends \(f\) fill characters so that all Text Mark delimited substring elements are \(w\) characters long (the Text Mark itself is not counted). If “L” (left justification) fill characters are applied to the end of the string; if “R” (right justification) fill characters are applied to the beginning of string.

For example:

- In wfRnm format: \(FMT\) ("ABC","15,R"), where ‘15’ is the Width, and ‘.’ is the Fill character.
- In Rfw format: \(FMT\) ("ABC",".15"), where ‘15’ is the Width, and ‘.’ is the Fill character.

The fill character is optional; if omitted, filling is done with blank spaces. The fill character cannot be the same as the format string delimiter character. If the fill character is a number, the backslash (\), or the letters “L”, “R”, “T”, or “U” it must be enclosed in string delimiter quotes that are different than the format string. For example: "10'0'R2". You cannot use the backslash as a string delimiter for the fill character.

\(FMT\) is CEMU dependent. So, for example, for CEMU ULTIMATE, the fill character must be one of the following: ‘#%’.

**Implicit Formatting**

The same formatting codes can be used with the CRT, PRINT, or DISPLAY commands. This is known as implicit formatting, because the \(FMT\) function is not specified. For example:
PRINT 1.2 "R4";;;;! Returns 1.2000

Which is exactly equivalent to:

PRINT FMT(1.2,"R4");;;;! Returns 1.2000

The formatting codes apply only to the argument that they immediately precede. For example, the following two statements are functionally identical:

CRT "Over":"There" "R#20"
CRT "Over":FMT("There","R#20")

Implicit formatting is just one of the ways that these commands can interpret a second argument. Many of the OCONV function conversion codes can also be used with implicit (or explicit) formatting. For example, date conversion:

PRINT OCONV(14100,"D"); ! "08 AUG 2006"
PRINT 14100 "D"; ! "08 AUG 2006"
PRINT FMT(14100,"D"); ! "08 AUG 2006"

Because the letter codes "R" and "L" are used as formatting (FMT) codes, the corresponding OCONV conversion codes cannot be used for implicit formatting.

An expression can be used to specify an implicit formatting string, with the following limitation: a Caché global variable cannot be used for implicit formatting. This is because the caret (^) that Caché uses to indicate a global is often interpreted in these contexts as the exponentiation operator. A Caché global can be used for explicit formatting in the FMT function.

**Examples**

The following examples use “Rn” formatting to format a numeric values so that it displays 4 decimal digits. Note that both zero padding and rounding are performed as needed:

PRINT FMT(1.2,"R4"); ! Returns 1.2000
PRINT FMT(1.77777,"R4"); ! Returns 1.7778
PRINT FMT(.4,"R4"); ! Returns 0.4000
PRINT FMT(0,"R4"); ! Returns 0.0000

**See Also**

- FMTS function
- LEN function
- OCONV function
- RIGHT function
- DISPLAY statement
- CRT statement
- PRINT statement
- ObjectScript $MVFMT function, described in the *Caché ObjectScript Reference*
**FMTS**

Formats each element of a dynamic array for display.

FMTS(dynarray, format)

**Arguments**

<table>
<thead>
<tr>
<th>dynarray</th>
<th>An expression that resolves to a dynamic array to be formatted for display.</th>
</tr>
</thead>
<tbody>
<tr>
<td>format</td>
<td>An expression that resolves to a string consisting of positional letter and number codes specifying the display format for the elements of dynarray.</td>
</tr>
</tbody>
</table>

**Description**

The FMTS function returns the dynarray value with each element formatted as specified by format. This formatting may include justification, character filling, and the rounding or zero padding of numeric element values. The most common use for FMTS is to provide a uniform display format for fractional numbers.

The format string has the following format:

`w|fRn`

- **w** (Optional) — The overall width of the display field, specified as a positive integer. Used to impose a uniform width (number of characters) for each element of dynarray. Different operations are performed if `w` is larger or smaller than the length of an element, as described in the FMT function.

- **f** (Optional) — A fill character, specified as a single character. If the fill character is a number, the backslash (\), or the letters “L,” “R”, or “T” it must be enclosed in string delimiter quotes. You must specify `w` to use `f`. If you specify `w`, but do not specify `f`, it defaults to the space character.

- **R** (Optional) — The letter “R” or “L” specifying right or left justification. This letter code is not case-sensitive. If you do not specify a letter code, FMTS defaults to left justification.

- **n** (Optional) — The number of fractional digits to the right of the decimal place, specified as a positive integer. If you specify `n`, it must either be the only code in format, or it must be preceded by the letter “R” or “L”. If you do not specify `n`, FMTS defaults to number of fractional digits in string.

There are two basic uses of format:

- To return fractional numbers in a standard form. FMTS can be used to round a fractional number to an integer or to a specified number of fractional digits. If the specified number of fractional digits is larger than the number of fractional digits in the element value, FMTS zero pads the additional digits.

- To return strings in a standard form. FMTS can left justify or right justify a string and add a fill character before or after to make each element contain the same number of characters.

For further details on format codes, refer to the FMT function.

**Examples**

The following example uses “Rn” formatting to format the elements of a dynamic array so that all elements display 4 decimal digits. Note that both zero padding and rounding are performed as needed:
The following example uses “wfl” formatting to format the elements of a dynamic array so that all elements display seven characters. Note that the ^ character is used as the fill character:

```
flints="FRED":@VM:"BARNEY":@VM:"WILMA":@VM:"PEBBLES"
PRINT FMTS(flints,"7^L")
  ! Returns: FRED^^^ýBARNEY^ýWILMA^^ýPEBBLES
PRINT FMTS(flints,"7^R")
  ! Returns: ^^^FREDý^BARNEYý^^WILMAýPEBBLES
```

**See Also**

- FMT function
- LEN function
- RIGHT function
- Dynamic Arrays
FMUL

Multiplies two floating point numbers.

FMUL(num1,num2)

**Arguments**

| num | An expression that resolves to a number or numeric string. |

**Description**

The **FMUL** function multiplies two numbers and returns the product. If a `num` value is a null string or a non-numeric value, **FMUL** parses its value as 0 (zero).

You can perform the same operation using the multiplication operator (*). Refer to the **Operators** page of this manual.

**Arithmetic Operations**

- To perform arithmetic operations on floating point numbers, use the **FADD**, **FSUB**, **FMUL**, and **FDIV** functions, or use the standard arithmetic operators.
- To perform arithmetic operations on numeric strings, use the **SADD**, **SSUB**, **SMUL**, and **SDIV** functions.
- To perform integer division, use the **DIV** function. To perform modulo division, use the **MOD** function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the **ADDS**, **SUBS**, **MULS**, **DIVS**, and **MODS** functions.
- To perform numeric comparison operations, use the **SCMP** function, or use the standard comparison operators.

**Examples**

The following examples use the **FMUL** function to multiply two floating point numbers:

```plaintext
PRINT FMUL(3.33,78.0);   ! returns 259.74
```

**See Also**

- **SMUL** function
- **MULS** function
- **Operators**
**FOLD**

Divides a string into substring units separated by a delimiter.

```
FOLD(string, length[, delim])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>string</code></td>
<td>An expression that resolves to a string or numeric expression.</td>
</tr>
<tr>
<td><code>length</code></td>
<td>An expression that resolves to an integer specifying the maximum number of characters per substring. If you specify a fractional value, <code>FOLD</code> truncates it to its integer portion. By default, any value less than 1 returns the empty string (see Emulation section below).</td>
</tr>
<tr>
<td><code>delim</code></td>
<td>Optional — An expression that resolves to the delimiter character to use. If omitted or set to the empty string (&quot;&quot;), the default is @FM. This argument is provided for D3 compatibility. (Note that in D3 the default delimiter is @VM.)</td>
</tr>
</tbody>
</table>

**Description**

The `FOLD` function returns the specified string as a string divided into subunits by delimiter characters. This delimiter character by default is the @FM (also known as @AM) field mark character. `FOLD` places field mark delimiters as follows:

- If a space character is encountered within `length` number of characters, `FOLD` replaces the space character with a field mark delimiter, then begins counting `length` characters from that point. If there are multiple space characters within `length`, `FOLD` only replaces the last space character prior to reaching the `length` character count. If the `length` character is a space character, `FOLD` replaces it with a field mark delimiter.

- If a space character is *not* encountered within `length` number of characters, `FOLD` inserts a field mark delimiter, then begins counting `length` characters from that point.

`FOLD` does not place a field mark delimiter before the first character or after the last character of `string`, unless the first or the last character is a space character. If the input string contains a field mark delimiter character, it is counted as an ordinary character. Note that because field mark delimiters replace spaces, but are inserted between non-space characters, the returned string can be vary from being the same length to being significantly longer than the input string.

`FOLD` counts characters, not bytes. You can use the `LEN` function to determine the number of characters in a string. You can use the `LENS` function to determine the number of characters in each delimited substring.

The `string` argument can be a quoted string or a numeric expression. If `string` is the empty string, `FOLD` returns the empty string.

If `length` is equal to or larger than the number of characters in `string`, `string` is returned unchanged. If `length` is less than 1 or a non-numeric string, `FOLD` returns the empty string.

If `string` is a numeric expression, prior to performing the `FOLD` operation MVB Basic performs all arithmetic operations and converts numbers to canonical form, with leading and trailing zeroes, a trailing decimal point, and all signs removed except a single minus sign. Numeric strings are not converted to canonical form.

**Emulation**

You can change the behavior of `FOLD` by setting the following `$OPTIONS` statement values:

- `FOLD.DELIM.VM` sets the delimiter character to @VM (value mark) rather than @FM (field mark). This provides compatibility with D3 applications.

- `FOLD.LEN.1` sets the behavior for a `length` of less than 1, by having `FOLD` default to a `length` of 1. Otherwise, a value less than 1 (for example, 0, .5, or –1) returns the empty string. This provides compatibility with jBASE applications.
Examples

The following example uses the `FOLD` function to return a string delimited by Field Marks (þ) into fixed-length units specified by `length`:

```plaintext
PRINT FOLD(“InterSystems”,3);  ! Returns "IntþerSþystþems"
PRINT FOLD(+0099.900,2);       ! Returns "99þ.9"
PRINT FOLD(*+0099.900*,2);     ! Returns "+0099.900"
```

The following example uses the `FOLD` function to return a string delimited according to the spaces in the source string and the `length` count:

```plaintext
PRINT FOLD(“The quick brown fox”,19);  ! Returns "The quick brown fox"
PRINT FOLD(“The quick brown fox”,16);  ! Returns "The quick brownþfox"
    ! (þ delimiter replaces the last space;
    ! character 16 is a space)
PRINT FOLD(“The quick brown fox”,15);  ! Returns "The quick brownþfox"
    ! (þ delimiter inserted at count=15)
PRINT FOLD(“The quick brown fox”,14);  ! Returns "The quickþbrown fox"
    ! (þ delimiter replaces the last space prior
    ! to count=14)
PRINT FOLD(“The quick brown fox”,5);   ! Returns "Theþquickþbrownþfox"
PRINT FOLD(“The quick brown fox”,4);   ! Returns "Theþquickþbrownþfox"
PRINT FOLD(“The quick brown fox”,3);   ! Returns "Theþquickþbrownþfox"
PRINT FOLD(“The quick brown fox”,2);   ! Returns "Theþquickþbrownþfox"
```

See Also

- `BYTELEN` function
- `LEN` function
- `LENS` function
FSUB

Subtracts two floating point numbers.

\[ \text{FSUB}(\text{num1}, \text{num2}) \]

**Arguments**

<table>
<thead>
<tr>
<th>num1</th>
<th>The minuend. An expression that resolves to a number or numeric string.</th>
</tr>
</thead>
<tbody>
<tr>
<td>num2</td>
<td>The subtrahend. An expression that resolves to a number or numeric string.</td>
</tr>
</tbody>
</table>

**Description**

The FSUB function subtracts \( \text{num2} \) from \( \text{num1} \), expressed as either numbers or as strings, and returns the result. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If a \( \text{num} \) value is a null string or a non-numeric value, FSUB parses its value as 0 (zero).

The FSUB function performs a subtraction on two numbers and returns the result. You can perform the same operation using the subtraction operator (-). Refer to the [Operators](#) page of this manual.

**Arithmetic Operations**

- To perform arithmetic operations on floating point numbers, use the FADD, FSUB, FMUL, and FDIV functions, or use the standard arithmetic operators.
- To perform arithmetic operations on numeric strings, use the SADD, SSUB, SMUL, and SDIV functions.
- To perform integer division, use the DIV function. To perform modulo division, use the MOD function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the ADDS, SUBS, MULS, DIVS, and MODS functions.
- To perform numeric comparison operations, use the SCMP function, or use the standard comparison operators.

**Examples**

The following example uses the FSUB function to subtract two floating point numbers:

```plaintext
a=11.95
b=10.25
PRINT FSUB(a,b);  ! returns 1.7
```

**See Also**

- SSUB function
- SUBS function
- Operators
GES

Performs a greater than or equal to comparison on elements of two dynamic arrays.

GES(dynarray1,dynarray2)

Arguments

dynarray An expression that resolves to a dynamic array.

Description

The GES function compares each corresponding numeric element from two dynamic arrays and determines if the first value is greater than or equal to the second. It returns a dynamic array of boolean values in which each element comparison is represented. It returns a 1 if the dynarray1 element value is greater than or equal to the dynarray2 element value. It returns a 0 if the dynarray1 element value is less than the dynarray2 element value.

GES converts numbers to canonical form, resolving multiple signs and removing leading and trailing zeros from element values before making the comparison. If an element value is a missing element, a null string, or a non-numeric value, GES assigns it a value of 0 for the purpose of this comparison.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of comparison. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

Examples

The following example uses the GES function to return a greater than comparison for each of the elements in dynamic arrays a and b:

```caché
a=10:@VM:-22:@VM:-33:@VM:45
b=10:@VM:-23:@VM:0:@VM:44
PRINT GES(a,b)
! returns 1ý1ý0ý1
```

The following example compares dynamic arrays of different lengths. Note that missing elements within the dynamic array (@VM:@VM) are compared, but unmatched elements from the longer array always return 1:

```caché
a=11:@VM:21:@VM:3VM:41
b=10:@VM:@VM:30:@VM:40:@VM:50:@VM:60
PRINT GES(a,b)
! returns 1ý1ý0ýý1ý1
PRINT GES(b,a)
! returns 0ý0ýý0ýý1ý1
```

See Also

- EQS function
- GTS function
- LES function
- LTS function
- Dynamic Arrays
$GET

Returns the data value of a specified variable.

$GET(variable[,default])

**Parameters**

<table>
<thead>
<tr>
<th>parameter</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable</td>
<td>A local, global, or process-private global variable, subscripted or unsubscripted. The variable may be undefined. variable may be specified as an object property with the syntax obj-&gt;property.</td>
</tr>
<tr>
<td>default</td>
<td>Optional — An expression that resolves to a value to be returned if the variable is undefined. If default is a variable it must be defined, even when not used.</td>
</tr>
</tbody>
</table>

**Description**

$GET returns the data value of a specified variable. The handling of undefined variables depends on whether you specify a default parameter.

- $GET(variable) returns the value of the specified variable, or the null string if the variable is undefined. The variable parameter value can be the name of any variable, including a subscripted array element (either local or global).
- $GET(variable,default) provides a default value to return if the variable is undefined. If the variable is defined, $GET returns its value.

**Handling Undefined Variables**

$GET defines handling behavior if a specified variable is undefined. The basic form of $GET returns a null string (""") if the specified variable is undefined.

$DATA tests if a specified variable is defined. It returns 0 if the variable is undefined.

The Undefined property of the Config.Miscellaneous class defines handling behavior for all undefined variables system-wide. The Undefined() method of the %SYSTEM.Process class defines handling behavior for all undefined variables for the current process. Setting this property or method has no effect on $GET or $DATA handling of specified variables.

**Parameters**

**variable**

The variable whose data value is to be returned. It can be a local variable, a global variable, or a process-private global variable. It can be either subscripted or unsubscripted. It can be a multidimensional object property. The variable does not need to be a defined variable. The variable can be defined and set to the null string ("""). If a global variable, it can contain an extended global reference. If a subscripted global variable, it can be specified using a naked global reference. Even when referencing an undefined subscripted global variable, variable resets the naked indicator, affecting future naked global references, as described below.

$GET should not be used on system variables (@ variables). It always returns the null string for all @ variables, whether or not the @ variable currently has a value.

**default**

The data value to be returned if variable is undefined. It can be any expression, including a local variable, a global variable, or a process-private global variable, either subscripted or unsubscripted. default can be a system variable (@ variable), with or without a non-null value.
If \textit{default} is a local variable, a global variable, or a process-private global variable, it must be defined variable. If \textit{default} is an undefined variable, $\texttt{GET}$ issues an \texttt{<UNDEFINED>} error, even when \textit{variable} is defined.

If \textit{default} is a global variable, it can contain an \texttt{extended global reference}. If a subscripted global variable, it can be specified using a \texttt{naked global reference}. If present, \textit{default} resets the naked indicator, affecting future naked global references.

**Examples**

In the following example, the variable \textit{test} is defined and the variable \textit{xtest} is undefined:

\begin{verbatim}
  test="banana"
tdef=$GET(test)
tundef=$GET(xtest)
  PRINT tdef       ! $GET returned value of test
  PRINT tundef     ! $GET returned null string for xtest
  PRINT $GET(xtest,"none")
                     ! $GET returns default of "none" for undefined xtest
\end{verbatim}

In the following example, a multidimensional property is used as the \textit{variable} value. This example returns the names of defined namespaces:

\begin{verbatim}
  obj = "%ResultSet"->%New("%SYS.Namespace:List")
  obj->Execute()
crt $GET(obj->Data,"none")   ! returns "none"
  obj->Next()
crt $GET(obj->Data("Nsp"))  ! returns "%SYS"
  obj->Next()
crt $GET(obj->Data("Nsp"))  ! returns next namespace
  obj->Next()
crt $GET(obj->Data("Nsp"))  ! returns next namespace
\end{verbatim}

A similar program returns the same information using the \texttt{DATA} function.

**Notes**

$\texttt{GET}$ Compared to $\texttt{DATA}$

$\texttt{GET}$ provides an alternative to \texttt{DATA} tests for both undefined variables ($\texttt{DATA}=0$) and array nodes that are downward pointers without data ($\texttt{DATA}=10$). If the variable is either undefined or a pointer array node without data, $\texttt{GET}$ returns a null string ("") without an undefined error.

Note that \texttt{DATA} tests are more specific than $\texttt{GET}$ tests because they allow you to distinguish between undefined elements and elements that are downward pointers only.

**See Also**

- $\texttt{DATA}$ function
- $\texttt{ZUTIL(18)}$ Set Undefined Variable Handling function in \textit{Caché ObjectScript Reference}
- $\texttt{ZUTIL(69,0)}$ Set Undefined Variable Handling System-wide function in \textit{Caché ObjectScript Reference}
- Using Multidimensional Storage (Globals) in \textit{Using Caché Globals}
GETENV

Returns the value of the specified environment variable.

GETENV(name)

Arguments

| name       | An expression that resolves to the name of an environment variable, specified as a quoted string. |

Description

The GETENV function returns the current value of the specified environment variable. Environment variable names are not case-sensitive.

If the specified name is a literal or a defined variable that is not an environment variable, GETENV returns an empty string. If name is a system variable (@ variable) that has a current value, GETENV returns an empty string; if name is an @ variable that does not have a current non-null value, GETENV generates an <ILLEGAL VALUE> error.

On a Windows system, you can display a list of all of your environment variables by issuing the SH MultiValue command from the MultiValue Shell prompt, as follows:

USER:SH set

To create a file containing this list, you can use the following MultiValue command:

USER:{ WRITE $ZF(-1,"set>c:\temp\myenvset.txt")

Examples

The following example returns the PATH environment variable:

PRINT GETENV("PATH")

The following example returns the operating system environment variable:

PRINT GETENV("OS")

The following example returns the current username environment variable:

PRINT GETENV("USERNAME")

See Also

• SYSTEM function
GETPTR

Returs print channel details.

GETPTR(channel)

Arguments

| channel | An expression that resolves to an integer specifying an existing print channel. Valid values are 0 through 255. |

Description

The GETPTR function returns a string consisting of a comma-separated list of channel settings. These are the same settings defined using the SETPTR command, as described in *The Caché MultiValue Spooler*.

The *channel* can be specified as an integer from 0 through 255 (inclusive). Integers outside this range return the empty string. Fractional values are truncated to the integer portion. If *channel* is the empty string ("") or a non-numeric value, GETPTR returns channel settings for Channel 0.

Example

The following example uses the GETPTR function to return the channel settings for *channel* 1:

PRINT GETPTR(1)

It returns a string such as the following: 0, 132, 66, 3, 3, 1, EJECT. For an explanation of these values, refer to SETPTR in *The Caché MultiValue Spooler*.

See Also

- GETPU function
- SETPTR command, in *The Caché MultiValue Spooler*. 
**GETPU**

Returns the name of the output device for a print channel.

```
GETPU(channel)
```

**Arguments**

| channel | An expression that resolves to an integer specifying an existing print channel. Valid values are 0 through 255. |

**Description**

The `GETPU` function returns the name of the output device most recently used by the specified print channel. `GETPU` can be used both for `SETPTR` mode 1 (spooler) and `SETPTR` mode 3 (&HOLD& file) channel assignments.

- For mode 1 (spooler) output, the returned value is a Caché global name, such as `^%MV.SPOOL(13)`. This global is the spooler to which the job is being spooled. `GETPU` in this mode only returns a value when a print job is open; otherwise, it returns a null string, with one exception. If the print job is closed, but the previous print job was marked as a HOLD job using the `SETPTR` HOLD option, `GETPU` returns the global name for that print job.

- For mode 3 (&HOLD&) output, the returned value is the full path name of a file that `GETPU` creates to contain the spooler output. For example, a Windows file such as: `c:\InterSystems\cache\mgr\user\&hold\P#0000_0025`. If a print job is currently open, `GETPU` returns details about the print job. If there is no print job open and the application executed a `SETPTR` command, `GETPU` returns the job ID that will be created when the next print job is created. If there is neither an open print job nor a `SETPTR` setting, `GETPU` returns the last job created.

If the `channel` value is a nonexistent print channel or an invalid value, `GETPU` returns the empty string.

**See Also**

- `GETPTR` function
- `SETPTR` command in the “Spooler Commands” chapter of *The Caché MultiValue Spooler*. 
GETREM

Returns the position of the Remove pointer in a dynamic array.

\[ \text{GETREM(dynarray)} \]

**Arguments**

| dynarray | An expression that resolves to a dynamic array. dynarray must be a variable, it cannot be a literal dynamic array string. |

**Description**

The `GETREM` function returns a positive integer indicating the current position of the remove pointer within a dynamic array. This remove pointer can be explicitly incremented by the `SETREM` statement, and is automatically incremented/decremented by the `REMOVE` function, the `REMOVE` statement, and the `REVREMOVE` statement. `GETREM` returns this pointer value. This value is an integer count character position within `dynarray`.

`REMOVE` and `REVREMOVE` extract successive data elements from a dynamic array. They establish a pointer specifying the position for the next extract from that dynamic array. Following a `REMOVE` operation, `GETREM` returns the character position, counting from 1, of the delimiter following the extracted data. If the `REMOVE` attempts to extract data past the end of the dynamic array, `GETREM` returns the length of the dynamic array, plus 1. Subsequent `REMOVE` operations do not change this end-of-dynamic-array pointer value.

A `REVREMOVE` operation decrements this pointer to the delimiter preceding the extracted data. If the `REVREMOVE` attempts to extract data past the beginning of the dynamic array, `GETREM` returns 0.

If `dynarray` has never been accessed by these operations, `GETREM` returns 0. If `dynarray` is changed, its pointer is reset to 0. If `dynarray` is a literal string, `GETREM` issues a syntax error.

**Examples**

The following example uses the `GETREM` function to return the Remove pointer position:

```vbnet
cities="Newark":@VM:"New York":@VM:"Boston"
PRINT cities;
! returns NewarkvNew YorkvBoston
REMOVE val FROM cities SETTING 3
  PRINT val;
! Returns "Newark"
PRINT GETREM(cities);
! returns 7
REMOVE val FROM cities SETTING 3
  PRINT val;
! Returns "New York"
PRINT GETREM(cities);
! returns 16
REMOVE val FROM cities SETTING 3
  PRINT val;
! Returns "Boston"
PRINT GETREM(cities);
! returns 23
REMOVE val FROM cities SETTING 3
  PRINT val;
! Returns ""
PRINT GETREM(cities);
! returns 23
```

**See Also**

- `SETREM` statement
- `REMOVE` statement
- `REVREMOVE` statement
- `REMOVE` function
- Dynamic Arrays
GROUP

Returns the specified substring, based on a delimiter.

GROUP(string,delimiter,count[,range])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to the target string from which a substring is to be returned. If you specify a null string (&quot;&quot;), GROUP always returns a null string.</td>
</tr>
<tr>
<td>delimiter</td>
<td>An expression that resolves to a single character, specified as a number or a quoted string. This character is used as a delimiter to identify substrings. This character cannot also be used as a data value within string. The delimiter characters used in dynamic arrays are listed in the Dynamic Arrays general concepts page of this manual.</td>
</tr>
<tr>
<td>count</td>
<td>An expression that resolves to an integer that specifies the substring to return from the target string. Substrings are separated by a delimiter, and counted from 1. A decimal number is truncated to an integer. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. A count value of 0, a negative number, the null string, or a non-numeric string is the same as count = 1.</td>
</tr>
<tr>
<td>range</td>
<td>Optional — An expression that resolves to an integer specifying the number of delimited substrings to return, starting with count. If omitted, the default is 1.</td>
</tr>
</tbody>
</table>

Description

The GROUP function returns the substring which is the nth piece of string, where the integer n is specified by the count parameter, and substrings are separated by a delimiter character. The delimiter itself is not returned.

If count is 1, GROUP returns the first piece of the string. This is the piece of the string from the beginning of the string to the first delimiter. If the first character of the string is a delimiter, count = 1 returns the null string.

You can follow the GROUP function with the COL1 function to determine the string position of the start delimiter for the returned substring. If count is 1, COL1 returns 0. You can determine the end delimiter position by calling the COL2 function.

If count is greater than the number of delimited substrings, GROUP returns the null string. In this case, COL1 and COL2 both return 0.

If you specify a delimiter that is not located in string and count = 1, GROUP returns the entire string. If count > 1, GROUP returns the null string.

If you specify the null string as a delimiter, GROUP returns the entire string, regardless of the value of count.

If the optional range argument is set to an integer value greater than 1, that number of sequential delimited substrings is returned as a single string. Delimiters within the string are included. If range is a decimal number, it is truncated to its integer value. Setting range to any value other than a numeric 2 or greater is treated as setting it to 1. If range is larger than the number of remaining substrings in the string, the remaining substrings are returned.

Note: The GROUP and FIELD functions are functionally identical.

Emulation

By default Caché MVBasic permits only a single-character delimiter. jBASE emulation permits a multi-character delimiter. This option is set using the FULL.DELIM option.
Examples

The following example uses the GROUP function to return the first five delimited items in a string:

```
colors="Red^Green^Blue^Yellow^Orange^Black"
FOR x=1 TO 5
  PRINT GROUP(colors,"^",x)
NEXT
```

The following example uses the GROUP function to return the first three elements in a dynamic array:

```
colors="Red":@VM:"Green":@VM:"Blue":@VM:"Yellow"
FOR x=1 TO 3
  PRINT GROUP(colors,CHAR(253),x)
NEXT
```

The following example uses count and range:

```
colors="Red^Green^Blue^Yellow^Orange^Black"
PRINT GROUP(colors,"^",2,3)
```

Returns “Green^Blue^Yellow”.

See Also

- FIELD function
- COL1 function
- Strings
- Dynamic Arrays
GTS

Performs a greater than comparison on elements of two dynamic arrays.

GTS(dynarray1,dynarray2)

Arguments

| dynarray | An expression that resolves to a dynamic array. |

Description

The GTS function compares each corresponding numeric element from two dynamic arrays and determines which value is greater. It returns a dynamic array of boolean values in which each element comparison is represented. It returns a 1 if the dynarray1 element value is greater than the dynarray2 element value. It returns a 0 if the dynarray1 element value is equal to or less than the dynarray2 element value.

GTS converts numbers to canonical form, resolving multiple signs and removing leading and trailing zeros from element values before making the comparison. If an element value is a missing element, a null string, or a non-numeric value, GTS assigns it a value of 0 for the purpose of this comparison.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of comparison. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

Examples

The following example uses the GTS function to return a greater than comparison for each of the elements in dynamic arrays a and b. It also performs a GES (greater than or equal) comparison on the same dynamic arrays:

```plaintext
a=10:@VM:-22:@VM:-33:@VM:45
b=10:@VM:-23:@VM:0:@VM:44
PRINT GTS(a,b)
! returns 0ý1ý0ý1
PRINT GES(a,b)
! returns 1ý1ý0ý1
```

The following example compares dynamic arrays of different lengths. Note that missing elements within the dynamic array (@VM:@VM) are compared, but unmatched elements from the longer array always return 1:

```plaintext
a=11:@VM:21:@VM:30:@VM:0:0:51
b=10:@VM:@VM:30:@VM:40:@VM:50:@VM:60:@VM:70
PRINT GTS(a,b)
! returns 1ý1ý0ý0ý1ý1ý1
PRINT GTS(b,a)
! returns 0ý0ý1ý1ý0ý1ý1
```

See Also

- EQS function
- GES function
- LES function
- LTS function
• Dynamic Arrays
ICONV

Converts a value from external format to internal format.

ICONV(ostring, code)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ostring</td>
<td>An expression that resolves to a string or an integer. It specifies a value in external (output) format.</td>
</tr>
<tr>
<td>code</td>
<td>An expression that resolves to a conversion code string. This conversion code specifies the type of conversion to perform. Conversion is from external format to internal format. Conversion codes are not case-sensitive. For a complete list of conversion codes, refer to the Conversion Codes table in the MultiValue Basic Quick Reference.</td>
</tr>
</tbody>
</table>

Description

The ICONV function is a general-purpose conversion function used to convert from external (output) format to internal (storage) format. The type of conversion is specified by a code string that is specific to the type of data to be converted. These conversion codes are as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;MT&quot;</td>
<td>Time conversion: Internal times are stored as the number of seconds elapsed since midnight. ICONV accepts fractional seconds. You can specify the time in 24-hour format (22:45:33) or 12-hour format with the AM/PM suffixes specified for your locale (10:45:33PM). These suffixes are not case-sensitive. In 12-hour format, you can specify noon or midnight as either 0 or 12. You can specify a number of hours greater than 23 (27:45:33) and ICONV calculates the total number of elapsed seconds; you cannot specify a number of minutes or seconds greater than 59. You can use any non-numeric character as a time delimiter (22.45.33); however, you cannot use a period (.) for both the time delimiter and to indicate fractional seconds. You can prefix a time value with a minus sign; ICONV prefixes the returned internal time with a minus sign.</td>
</tr>
</tbody>
</table>

"MT"
Date conversion: Takes as input date strings in both numeric formats (9/22/2010, 2010-09-22) and text formats (Oct 22, 2010). If you omit the year portion of the date, it defaults to the current year. If you input a six-digit numeric string without separators, the string is parsed as YYMMDD. These external dates are converted to an internal date integer. Internal dates are stored as the number of days elapsed since December 31, 1967. Dates prior to this are stored using a negative number of days. The earliest permitted date is December 31, 1840 which is represented internally as -46385.

The expansion of two-digit years to four digits is governed by the MultiValue CENTURY.PIVOT verb, described in Operational Differences Between Multi-Value and Caché; by default, all two-digit years are expanded to years in the range 1900 through 1999.

"DI" can be used to convert dates in numeric format or dates in text format using the NLS locale settings. For example “Feb 22, 2010” or “22 FEBRUARY 2010”. OCONV and implicit conversion can convert numeric dates using “DI”, but cannot convert text format dates.

Letter case conversion: “MCL” converts all letters to lower case. “MCU” converts all letters to upper case. You can also use OCONV to perform letter case conversions.

Mask Character Alphabetic: converts ostring by removing all non-alphabetic characters, returning only the alphabetic characters.

Mask Character Both Alphabetic and Numeric: converts ostring by removing all punctuation characters, returning only the alphabetic and numeric characters.

Mask Character Numeric: converts ostring by removing all non-numeric characters, returning only the number characters 0 through 9. (Note that plus and minus signs and the decimal point are removed.)

Decimal-to-hexadecimal conversion.

Hexadecimal-to-decimal conversion.

Character-to-code conversion: all characters in the input string are converted to their corresponding hexadecimal integer codes. Use “MCXA” or “MCX” to output 8-bit code values; use “MCXW” to output 16-bit (wide) code values.
**Code-to-character conversion:** one or more hexadecimal codes in the input string are converted to their corresponding characters. Use “MCAX” or “MX” for two-byte code input values; use “MCWX” for four-byte (wide) code input values.

**Masked decimal conversion:** Converts a fractional number to an integer by moving the decimal point to the right, rounding remaining fractional digits, and resolving numeric display characters such as currency symbols. The returned value is either a positive integer or a negative integer with a leading minus sign.

If only $n$ is specified, this positive integer value shifts the decimal point that number of places to the right. Any remaining fractional digits are rounded to the resulting integer value. Right side zero padding is added as needed. If both $n$ and $m$ are specified, it is the $m$ value that specifies the number of places to shift the decimal place. (In fact, the $m$ value always specifies the decimal shift; when $m$ is omitted it defaults to the $n$ value.)

Masked decimal conversion automatically removes the following formatting characters: leading zeros; a single leading or trailing + sign; a leading $\$ currency symbol; commas used as numeric group separators (any comma appearing between two number characters); a trailing decimal point. Masked decimal conversion automatically handles negative numbers as follows: a single leading minus sign is retained; a single trailing minus sign converts to a leading minus sign; a positive number enclosed in parentheses converts to a negative number with a leading minus sign. Note that leading sign characters must appear after the currency symbol. An *ostring* containing any other characters or character sequences always returns as 0. An empty string *ostring* value returns an empty string.

**Group (delimited substring) extraction:** a substring is extracted from *istring*, based on a specified delimiter character ($d$) found in *istring* that indicates the stopping point. This delimiter cannot be a number character or a dynamic array level delimiter character. The optional $s$ integer specifies the number of delimiters to skip from the beginning of the string before starting the extract. The default is to start at the beginning of the string. The $n$ integer specifies the number of delimiters to count in performing the extract. If $n$ is larger than the number of $d$ delimiters, the extract continues to the end of the string.
Length conversion: "L" or "L0": returns the number of characters in istring.

"Ln": returns the value of istring if n is the exact number of characters in istring. Otherwise returns the empty string. n must be a positive non-zero integer.

"Ln-m" or "Ln,m": returns the value of istring if the number of characters in istring is in the range n through m (inclusive). Otherwise returns the empty string. n can be specified as zero in this syntax.

The same code values can be used in an <<...>> inline prompt, to validate (not convert) an interactive input value. Inline prompts can be used in MVBasic statements or MultiValue command line commands. They are described in the Caché MultiValue Commands Reference.

The DATE and TIME functions return internal format values. The TIMEDATE function returns external format values.

Note: You can specify the default date and time formats using Caché NLS. Because of operational differences between MV and Caché NLS in the handling of month names, your NLS default date format must represent months as integers.

- If a code value is not valid, ICONV returns ostring unchanged.
- If ostring is the empty string (""), ICONV returns the empty string for all code values except “L” (length).
  ICONV ("","L") returns 0.
- If a date ostring is not valid, ICONV returns the empty string.
- If a time ostring is not valid, ICONV returns ostring unchanged.

You can use the STATUS function to determine the success of an ICONV conversion. The following status values are supported: 0=successful conversion; 1=invalid ostring; 2=invalid code value.

The ICONV function converts from external format to internal format. The OCONV function converts from internal format to external format. Note that the MCDX/MCXD, MCAX/MCXA, and MCWX/MCXW code pairs have the opposite meanings in OCONV, reversing the ICONV operation.

You can use the ICONVS function to convert the elements of a dynamic array from external format to internal format.

Examples

The following example show date conversions from external to internal format. All of these ICONV functions return the internal date 14143:

DateConversions:
PRINT ICONV("20 SEP 2006","D")
PRINT ICONV("09-20-2006","D")
PRINT ICONV("09/20/2006","D")

The following example shows time conversions from external to internal format:

TimeConversions:
PRINT ICONV("13:21","MT"); ! Returns 48060
PRINT ICONV("1:21PM","MT"); ! Returns 48060
PRINT ICONV("13:21:01","MT"); ! Returns 48061
PRINT ICONV("13:21:01.65","MT"); ! Returns 48061.65

The following example shows decimal-to-hex and hex-to-decimal conversions. It shows both the ICONV conversions and the inverse OCONV conversions:
HexConversions:
PRINT ICONV(10,"MCXD"); ! Returns A
PRINT ICONV(10,"MCDX"); ! Returns 16
PRINT OCONV(10,"MCXD"); ! Returns 16
PRINT OCONV(10,"MCDX"); ! Returns A

The following example shows character-to-hexcode and hexcode-to-character conversions. It shows both the ICONV conversions and the inverse OCONV conversions:

CharConversions:
PRINT ICONV("mnop","MCXA"); ! Returns 6D6E6F70
PRINT ICONV("6D6E6F70","MCAX"); ! Returns mnop
PRINT OCONV("mnop","MCAX"); ! Returns 6D6E6F70
PRINT OCONV("6D6E6F70","MCXA"); ! Returns mnop

The following example shows masked decimal conversions with rounding and zero padding:

MaskedDecimalConversions:
PRINT ICONV("123.57","MD0"); ! Returns 124  n=0 m=n no decimal shift, rounding
PRINT ICONV("123.57","MD1"); ! Returns 1236  1 decimal shift, rounding
PRINT ICONV("123.57","MD2"); ! Returns 12357  2 decimal shift
PRINT ICONV("123.57","MD3"); ! Returns 123570  3 decimal shift, zero padding
PRINT ICONV("123.57","MD25"); ! Returns 12357000 n ignored, m=5 decimal shift
PRINT ICONV("123.57","MD35"); ! Returns 12357000

The following example shows masked decimal conversions with valid sign characters:

MaskedDecimalConversions:
PRINT ICONV("123.57","MD2"); ! Returns 12357
PRINT ICONV("+123.57","MD2"); ! Returns 12357
PRINT ICONV(“-123.57","MD2"); ! Returns -12357
PRINT ICONV("(123.57)","MD2"); ! Returns -12357
PRINT ICONV("$123.57","MD2"); ! Returns 12357
PRINT ICONV("$123.57","MD2"); ! Returns -12357

Multiple sign characters and other non-numeric characters are invalid and return 0.

Emulation
In Caché MultiValue and most emulations, an invalid ostring date value (with code “D” or “DI”) returns the empty string. An invalid ostring numeric value (with code “ML”, “MR”, “MD”) returns 0. In UniData emulation an invalid value for these date and numeric codes returns the ostring value unchanged.

In Caché MVBasic and most emulations, a six-digit numeric string without separators is parsed as YYMMDD. Thus, the following are equivalent:

PRINT ICONV(861117,"D")
PRINT ICONV("11/17/86","D")

In UniData emulation, a six-digit numeric string without separators is parsed as MMDDYY. Thus, the following are equivalent:

PRINT ICONV(111786,"D")
PRINT ICONV("11/17/86","D")

See Also
- ICONVS function
- OCONV function
- STATUS function
- DATE function
- TIME function
- **TIMEDATE** function
- **Strings**
ICONVS

Converts a dynamic array from external format to internal format.

ICONVS (odynarray, code)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>odynarray</td>
<td>An expression that resolves to a <strong>dynamic array</strong>, each element of which specifies a value in external (output) format.</td>
</tr>
<tr>
<td>code</td>
<td>An expression that resolves to a conversion code <strong>string</strong>. This conversion code specifies the type of conversion to perform. Conversion is from external format to internal format. Conversion codes are not case-sensitive. For descriptions of these <strong>code</strong> values, refer to the <strong>ICONV</strong> function. For a complete list of conversion codes, refer to the <strong>Conversion Codes</strong> table in the <strong>MultiValue Basic Quick Reference</strong>.</td>
</tr>
</tbody>
</table>

Description

The **ICONVS** function is a general-purpose conversion function used to convert each of the elements of a dynamic array from external (output) format to internal (storage) format. It returns a dynamic array of values. The type of conversion is specified by a **code** string that is specific to the type of data to be converted.

The **ICONVS** function converts dynamic array element values from external format to internal format. The **OCONVS** function converts dynamic array element values from internal format to external format. Note that the MCDX/MCXD, MCAX/MCXA, and MCWX/MCXW **code** pairs have the opposite meanings in **OCONVS**, reversing the **ICONVS** operation.

If a **code** value is not valid, the **odynarray** is returned unchanged. If a date element value is not valid, the empty string is returned for that element. If a time element value is not valid, the input data value for that element is returned unchanged. If a numeric element value is not valid, zero is returned for that element.

You can use the **ICONV** function to convert a single value from external format to internal format. For further details on conversions, refer to the **ICONV** function.

Examples

The following example converts dates to a uniform output format. First **ICONVS** performs date conversions from external to internal format, returning a dynamic array of elements containing internal dates. The **OCONVS** performs date conversions from internal to external format, returning all dates in the same default display format:

```plaintext
DateConversions:
  x="20 SEP 2006";@VM:"09-21-2006";@VM:"09/22/2006"
  idates=ICONVS(x,"D");
  PRINT idates; Returns 14143ý14144ý14145
  odates=OCONVS(idates,"D")
  PRINT odates; Returns 20 SEP 2006ý21 SEP 2006ý22 SEP 2006
```

The following example shows masked decimal conversions with rounding and zero padding:

```plaintext
MaskDecimalConversions:
  x="123.40";@VM:"123.57";@VM:"123.4"
  PRINT ICONVS(x,"MD2")

Returns: 12340ý12357ý12340.
```

For further examples of format conversion, see **ICONV**.
See Also

- ICONV function
- OCONVS function
- STATUS function
- DATE function
- TIME function
- TIMEDATE function
- Dynamic Arrays
IFS

Returns a value for each dynamic array element based on the truth value of that element.

IFS(dynarray,tdyn,fdyn)

Arguments

<table>
<thead>
<tr>
<th>dynarray</th>
<th>The dynamic array tested for truth values of elements. An expression that resolves to a dynamic array of boolean value elements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>tdyn</td>
<td>An expression that resolves to a dynamic array of replacement values. A tdyn element value replaces the corresponding dynarray element if the dynarray element has a value of True.</td>
</tr>
<tr>
<td>fdyn</td>
<td>An expression that resolves to a dynamic array of replacement values. A fdyn element value replaces the corresponding dynarray element if the dynarray element has a value of False.</td>
</tr>
</tbody>
</table>

Description

The IFS function returns a dynamic array consisting of element values from the tdyn and fdyn dynamic arrays. IFS evaluates each element of dynarray as either true or false. If an element is evaluated as true, the corresponding element from tdyn is included in the returned dynamic array. If an element is evaluated as false, the corresponding element from fdyn is included in the returned dynamic array.

The IFS truth test is as follows:

- 0 (zero) is evaluated as False.
- 1 or any other non-zero numeric is evaluated as True.
- a non-numeric value is evaluated as False.
- an empty string or absent element value is evaluated as False.

IFS does not perform arithmetic evaluation of expressions. For example, the element values “7=7” and “7=8” would both evaluate as True, because they both are non-zero numerics. Similarly, “5–5” or “5+0” evaluate as True.

IFS only recognizes numeric values as logically true or false. It does not recognize “T” or “F” (or any other alphabetic string) as having a logical value. All alphabetic strings evaluate to False.

IFS must have a corresponding tdyn or fdyn element value (or, preferably, both) in order to evaluate an element.

If dynarray contains more than one element, IFS returns the number of elements in dynarray, if either tdyn or fdyn contain at least that many elements. Excess tdyn or fdyn elements are ignored. If either tdyn or fdyn does not contain enough elements, an empty string element is supplied. If both tdyn and fdyn do not contain enough elements, IFS returns a dynamic array containing the number of elements in the longer of tdyn or fdyn.

Single Elements in dynarray

If dynarray is a numeric or string value, it is treated as a dynamic array with one element. If dynarray is a single data value (True or False), the returned dynamic array consists of either all of the tdyn true values or all of the fdyn false values, depending on the true or false value of dynarray. This is shown in the following example:

```cacheml
booldyn=1
tdyn="1":@VM:"2":@VM:"3":@VM:"4":@VM:"5"
fdyn="missing1":@VM:"missing2":@VM:"missing3":@VM:"missing4":@VM:"missing5"
PRINT IFS(booldyn,tdyn,fdyn)
```
This program returns the dynamic array 1ý2ý3ý4ý5.

If dynarray contains a single field element value, with no value element or subvalue element values, the returned dynamic array element for that field consists of either all tdyn or all fdyn values for that field and all of its value and subvalue elements. This is shown in the following example:

```
booldyn=1:@FM:0:0FM
tdyn="1":@VM:"one":@VM:"uno":@VM:"two":@VM:"due":@VM:"three":@VM:"tre"
fdyn="A":@VM:"alpha":@VM:"alef":@VM:"B":@VM:"beta":@VM:"G":@VM:"gamma":@VM:"gimel"
PRINT IFS(booldyn,tdyn,fdyn)
```

This program returns the dynamic array 1ýoneýunoþBýbetaýbetþ3ýthreeýtre

If dynarray contains a single value element value with no subvalue element values, the returned dynamic array element for that value element consists of either all tdyn or all fdyn values for that value element and all of its subvalue elements.

**Examples**

The following example uses the IFS function to return a dynamic array based on truth values:

```
booldyn="0":@VM:"1":@VM:"1":@VM:"
tdyn="1":@VM:"2":@VM:"3":@VM:"4":@VM:"
fdyn="missing1":@VM:missing2":@VM:"missing3":@VM:"missing4":@VM:"
PRINT IFS(booldyn,tdyn,fdyn)
```

This program returns the dynamic array missing1ý2ý3ýmissing4ý5.

The following example shows that tdyn and fdyn may have more elements than dynarray:

```
booldyn="0":@VM:"1":@VM:"
tdyn="1":@VM:"2":@VM:"3":@VM:"
fdyn="missing1":@VM:missing2":@VM:"missing3":@VM:"
PRINT IFS(booldyn,tdyn,fdyn)
```

This program returns the dynamic array missing1ý2ý3.

The following examples show what happens when tdyn or fdyn have fewer elements than dynarray:

```
booldyn="0":@VM:"1":@VM:"1":@VM:"
tdyn="1":@VM:"2":@VM:"
fdyn="missing1":@VM:missing2":@VM:"
PRINT IFS(booldyn,tdyn,fdyn)
```

This program returns the dynamic array missing1ý2ý3ýmissing4ý. Note that the returned dynamic array does not specify a value for the fifth element.

```
booldyn="0":@VM:"1":@VM:"
tdyn="1":@VM:"
fdyn="missing1":@VM:missing2":@VM:"
PRINT IFS(booldyn,tdyn,fdyn)
```

This program returns the dynamic array missing1ý2ý3ýmissing4ýmissing5.

**See Also**

- Dynamic Arrays
INDEX

Returns starting position of a substring in a string.

INDEX(string,substring,occurs)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be searched for substring. An expression that resolves to a string or a numeric value.</td>
</tr>
<tr>
<td>substring</td>
<td>An expression that resolves to a substring to locate within string.</td>
</tr>
<tr>
<td>occurs</td>
<td>An expression that resolves to a positive integer specifying which occurrence of substring to locate.</td>
</tr>
</tbody>
</table>

Description

The INDEX function returns the starting character position, counting from 1, of substring within string. Matching of substring is case-sensitive. You use the occurs argument to specify which occurrence of substring to return the location of.

INDEX returns 0 for any of the following:

- If substring does not occur in string.
- If occurs specifies more occurrences of substring than appear in string.
- If occurs is 0, a negative number, the null string, or a non-numeric string.
- If string is the null string (""") and substring is not.

If substring is the null string (""), INDEX returns 1. If both string and substring are the null string (""), INDEX returns 1. If occurs is a mixed numeric string, the numeric part is parsed until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

See Also

- INDEXS function
- Strings
INDEXS

Returns the starting position of a substring for each element of a dynamic array.

`INDEXS(dynarray, substring, occurs)`

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>A dynamic array of elements to be searched for substring. An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td>substring</td>
<td>An expression that resolves to a substring to locate within string.</td>
</tr>
<tr>
<td>occurs</td>
<td>An expression that resolves to a positive integer specifying which occurrence of substring to locate.</td>
</tr>
</tbody>
</table>

**Description**

The INDEXS function returns a dynamic array of integers, each integer element containing the starting character position, counting from 1, of substring within the corresponding dynarray element. Matching of substring is case-sensitive. You use the occurs argument to specify which occurrence of substring to return the location of.

INDEXS returns 0 for a dynamic array element for any of the following:

- If substring does not occur in the element.
- If dynarray or substring is the null string ("").
- If occurs specifies more occurrences of substring than appear in the element.
- If occurs is 0, a negative number, a decimal number, the null string, or a non-numeric string.

If occurs is a mixed numeric string, the numeric part is parsed until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

**See Also**

- INDEX function
- Dynamic Arrays
- Strings
INDICES

Returns information about a file's secondary key indices.

INDICES(filevar[,indexname])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>A local variable name assigned to a MultiValue file by the OPEN command when the file was opened.</td>
</tr>
<tr>
<td>indexname</td>
<td>Optional — An expression that resolves to the name of a secondary index in the file referenced by filevar. You can specify this either as the actual index name or as the MVName (the name of the index as stored in the MultiValue dictionary).</td>
</tr>
</tbody>
</table>

Description

The INDICES function returns a dynamic array that contains secondary index information for a file.

- If *indexname* is omitted, INDICES returns a dynamic array containing the index names of all secondary indices in the file referenced by *filevar*. The secondary index names are separated by field marks (@FM).
- If *indexname* is specified, INDICES returns a dynamic array containing information about this secondary index. The secondary index information items are separated by field marks (@FM).

The returned dynamic array consists of six fields. These fields can contain multiple values, as follows:
### Field 1
Value 1: the index type code value. Possible values include A, D, I, and S (from the MVTYPE parameter).
Value 2: always 0.
Value 3: unused.
Value 4: always 1.
Value 5: the path name.
Value 6: unused.
Value 7: justification code value, R (right justified) or L (left justified).
Value 8: uniqueness code value, Y (yes) or N (no).
Values 9 through 16: unused.
Value 17: the collation name.

### Field 2
Property specifications. For type I, this is the MVITYPE. For types A, D, or S, this is the MVTOLOGICAL value (if it exists), otherwise the MVATTRIBUTE (if it exists), otherwise the empty string.

### Field 3
Unused.

### Field 4
Unused.

### Field 5
Unused.

### Field 6
MultiValue code value, M (multi-valued) or S (single-valued).

### Field 7
Unused.

### Field 8
The property name.

### Field 9
The MVName (the name of the index as stored in the MultiValue dictionary).

### See Also
- OPEN statement
- Dynamic Arrays
INMAT

Returns the number of array elements.

\[
\text{INMAT(array)}
\]

**Arguments**

<table>
<thead>
<tr>
<th><strong>array</strong></th>
<th>Optional — The name of a dimensioned array; must be a literal name, not enclosed with quotes. If omitted, the most recently parsed dimensioned array.</th>
</tr>
</thead>
</table>

**Description**

The **INMAT** function has two uses:

- **INMAT(array)** returns the defined dimensions of the named array.
- **INMAT()** returns the number of elements loaded into the most recently parsed array.

Before invoking **INMAT**, an array must have been dimensioned using the **DIM** (or **DIMENSION**) statement.

**INMAT(array)** takes the name of a dimensioned array and returns a two-element dynamic array containing the *rows* and *columns* dimensions of the array. If the **DIM** did not specify a *columns* dimension, **INMAT** returns 1 as the *columns* dimension.

Specifying an *array* value that is not a dimensioned array results in a #1039 compile error. The *array* must be an explicitly dimensioned static array. Specifying an implicitly dimensioned (dynamic) array results in a runtime <ARRAY DIMENSION> error.

**INMAT()** defaults to the most recently loaded array. It returns an integer specifying the number of elements that were loaded using a **MATREAD**, **MATREADU**, or **MATPARSE** statement. If no array has been loaded, or the most recently loaded array was loaded with the null string or with a single element, **INMAT()** returns 1.

**Examples**

The following example returns the row and column dimensions of a dimensioned array:

```COBOL
DIM MyArray(6,5)
CRT INMAT(MyArray)
   ! Returns 6x5
```

The following example returns the number of dimensioned array elements parsed by **MATPARSE**:

```COBOL
DIM MyArray(6,5)
x="Fred":@FM:"Barney":@FM:"Wilma"
MATPARSE MyArray FROM x
CRT INMAT()
   ! Returns 3
```

**See Also**

- **DIM** statement
- **MATPARSE** statement
- **MATREAD** statement
**INSERT**

Inserts data in a dynamic array.

\[ \text{INSERT}(\text{dynarray}, f[, v[, s]]; \text{expression}) \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to the name of a dynamic array.</td>
</tr>
<tr>
<td>f</td>
<td>An expression that resolves to an integer specifying the Field level of the dynamic array in which to insert the data. Fields are counted from 1.</td>
</tr>
<tr>
<td>v</td>
<td>Optional — An expression that resolves to an integer specifying the Value level of the dynamic array in which to insert the data. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td>s</td>
<td>Optional — An expression that resolves to an integer specifying the Subvalue level of the dynamic array in which to insert the data. Subvalues are counted from 1 within a Value.</td>
</tr>
<tr>
<td>;expression</td>
<td>The data to be inserted. An expression that resolves to a string.</td>
</tr>
</tbody>
</table>

**Description**

The **INSERT** function inserts a data value at the specified dynamic array location, then returns the full dynamic array including this insertion. Which element to insert is specified by the \( f \), \( v \), and \( s \) integers. For example, if \( f=2 \) and \( v=3 \), this means insert the new data value as the third value in the second field. The **INSERT** function does not overwrite; if there already was a third value, the insert increments its location to the fourth value. **INSERT** adds multiple delimiter characters, when needed, to place the data value at the specified location.

Note that a semicolon (;) is used before expression as an argument separator. This is because the \( v \) and \( s \) arguments are optional and can be omitted.

To insert a value at the beginning of a dynarray set \( f \) to 1 or 0. To insert a value at the end of a dynarray set \( f \) to -1. If lower level delimiters exist in dynarray, setting an upper level to 0, the null string, or a non-numeric value is equivalent to setting it to 1.

Both the **INSERT** function and the **INS** command insert a value into a dynamic array. The **INSERT** function returns a dynamic array containing the insert; it does not change the value of the supplied dynarray. The **INS** command changes the value of the supplied dynarray.

**Examples**

The following example uses the **INSERT** function to insert the second value in the first field of a dynamic array:

```
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT INSERT(cities,1,2;"Providence")
! Returns: "New YorkýProvidenceýLondonýChicagoýBostonýLos Angeles"
```

**Emulation**

UniData systems differ in how they handle \( f \), \( v \), and \( s \) arguments set to 0. The $OPTIONS ATTR.0IS1 ("zero is one") provides support for this UniData feature. UniData systems ignore \( v \) and \( s \) arguments that are set to a negative number.

**See Also**

- **INS** statement
- **COUNTS** function
• DELETE function
• EXTRACT function
• FIELDSTORE function
• Dynamic Arrays
Returns the integer component of an expression.

**INT(string)**  

**Arguments**

| string | An expression that resolves to a number or numeric string. |

**Description**

The **INT** function returns the integer portion of a numeric or numeric string. It returns both positive and negative integers. Fractional numbers are truncated (not rounded) to an integer. A zero, an empty string (""), or a non-numeric string all return the integer 0.

For numbers and numeric strings, prior to determining the integer, MVBasic performs all arithmetic operations and converts numbers to canonical form, with leading and trailing zeroes, a trailing decimal point, and all signs removed except a single minus sign.

**Examples**

The following examples all use the **INT** function to return the integer 321:

```
PRINT INT(321.37);   ! Returns 321  
PRINT INT(321.99);   ! Returns 321  
PRINT INT("--00321.6"); ! Returns 321  
PRINT INT("321blastoff"); ! Returns 321
```

**See Also**

- **FIX function**
- **FMT function**
- **PRECISION command**
ISOBJECT

Returns whether or not a something is a Caché object.

\[ \text{ISOBJECT}(\text{name}) \]

**Arguments**

| name | Any valid expression. |

**Description**

The ISOBJECT function returns a boolean value indicating whether the specified name corresponds to an existing Caché Object. Returns 1 if name is an object; otherwise returns 0.

**See Also**

- EXISTS function
**ITYPE**

Returns the I-type value from the file dictionary.

<table>
<thead>
<tr>
<th>ITYPE(itype)</th>
</tr>
</thead>
</table>

**Arguments**

| itype | An expression that resolves to the contents of the I-descriptor. |

**Description**

The ITYPE function returns the contents of the compiled I-descriptor. You can read the I-descriptor from a file dictionary into the itype variable, then use the ITYPE function to return its contents.

An I-descriptor can reference a record ID (@ID) or a field value in a data record @RECORD). For further details, refer to the list of System Variables.

An invalid value for itype generates a <SUBSCRIPT> error.

**See Also**

- READ statement
KEYIN

 Receives a single character of user input.

 KEYIN([timeout])

 Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>timeout</td>
<td>Optional — An expression that resolves to an integer specifying the number of seconds to wait for user input before timing out.</td>
</tr>
</tbody>
</table>

Note that the parentheses are mandatory.

Description

The KEYIN function is used in interactive programs to receive a single input character from the user. KEYIN pauses program execution while awaiting user input. It displays a prompt to receive a single input character. The appearance of this prompt is governed by the terminal emulator, not MVBasic. Program execution continues immediately upon input of a character. No Enter key is required.

In Caché MultiValue the input character is not echoed, regardless of the setting of ECHO. However, echoing is emulation-dependent.

If you specify a timeout value, KEYIN waits the specified number of seconds for user input. Upon time out it returns an empty string ("").

You can also use the IN function to receive a single character of user input, or the INPUT statement to receive one or more characters of user input. You can use the <<...>> inline prompt to prompt for a user input value to insert in a MVBasic statement or a MultiValue command line command. The <<...>> inline prompt is described in the Caché MultiValue Commands Reference.

KEYIN does not accept stacked input data. You can use the INPUT statement for user input of more than one character or for other user input options. You cannot use the DATA statement to supply a character to KEYIN.

Examples

The following example calls the KEYIN function to input a single character:

```cacheml
x=KEYIN()
PRINT "input character:",x
```

Emulation

In Caché, UniVerse, and several other emulations, the input character is never echoed, regardless of the setting of ECHO.

In D3, IN2, jBASE, MVBase, R83, POWER95, Reality, and Ultimate emulations, whether the input character is echoed depends on the setting of ECHO. In these emulations, when you specify ECHO ON the input character is echoed to the terminal; it is never echoed to the printer.

See Also

- IN statement
- INPUT statement
LEFT

Returns a specified number of characters from the left end of a string.

LEFT(string, length)

Arguments

<table>
<thead>
<tr>
<th>string</th>
<th>An expression that resolves to a string from which the leftmost characters are returned.</th>
</tr>
</thead>
<tbody>
<tr>
<td>length</td>
<td>An expression that resolves to a positive integer indicating how many characters to return. If 0, a zero-length string (&quot;&quot;) is returned. Fractional numbers are truncated to an integer. If greater than or equal to the number of characters in string, the entire string is returned. No padding is performed.</td>
</tr>
</tbody>
</table>

Description

The LEFT function returns the specified number of characters from the beginning (left end) of a string. If you specify a length greater than the string length, the entire string is returned. To determine the number of characters in string, use the LEN function.

The RIGHT function returns the specified number of characters from the end (right end) of a string.

Examples

The following example uses the LEFT function to return the first three characters of MyString:

```caché
MYSTRING = "InterSystems"
PRINT LEFT(MyString, 3); ! Returns "Int"
```

See Also

- LEN function
- RIGHT function
LEN

Returns the number of characters in a string.

LEN(string)

**Arguments**

| string | An expression that resolves to a string or numeric expression. |

**Description**

The **LEN** function returns the number of characters in a specified string. **LEN** counts characters, not bytes. You can use the **BYTELEN** function to count the number of bytes in a string.

For numerics, prior to determining the length MVBasic performs all arithmetic operations and converts numbers to canonical form, with leading and trailing zeroes, a trailing decimal point, and all signs removed except a single minus sign. Note that **LEN** does count the decimal point and the minus sign. Numeric strings are not converted to canonical form. An empty string (""") returns a length of 0.

**Examples**

The following example uses the **LEN** function to return the number of characters in a string:

```plaintext
PRINT LEN("InterSystems"); ! Returns 12
PRINT LEN(+0099.900); ! Returns 4
PRINT LEN("0099.900"); ! Returns 8
PRINT LEN(CHAR(960)); ! Returns 1
PRINT LEN("*"); ! Returns 0
```

**See Also**

- **BYTELEN** function
- **COUNT** function
- **LENS** function
LENS

Returns the length of each element of a dynamic array.

LENS(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array. |

Description

The **LENS** function returns the number of characters in each element of a dynamic array. **LENS** counts characters, not bytes. Results are returned as a dynamic array of integers.

For numerics, prior to determining the length MVBasic performs all arithmetic operations and converts numbers to canonical form, with leading and trailing zeroes, a trailing decimal point, and all signs removed except a single minus sign. Note that **LENS** does count the decimal point and the minus sign. Numeric strings are not converted to canonical form. An empty string (""") or a missing element returns a length of 0 for that element.

Examples

The following example uses the **LENS** function to return the number of characters in each element of a dynamic array. Numbers are converted to canonical form:

```
nums=123:@VM:12.300:@VM:+0123.00:@VM:"+123.00":@VM:""
PRINT LENS(nums);  ! Returns 3\ý4\ý3\ý7\ý0
```

The following example show how **LENS** handles missing dynamic array elements:

```
nums=123:@VM:456:@VM:89
PRINT LENS(nums);  ! Returns 3\ý3\ý0\ý3
```

See Also

- **COUNTS** function
- **LEN** function
- **Dynamic Arrays**
LES

Performs a less than or equal to comparison on elements of two dynamic arrays.

\[
\text{LES}(\text{dynarray}_1, \text{dynarray}_2)
\]

**Arguments**

<table>
<thead>
<tr>
<th>dynarray</th>
<th>An expression that resolves to a dynamic array.</th>
</tr>
</thead>
</table>

**Description**

The LES function compares each corresponding numeric element from two dynamic arrays and determines if the first value is less than or equal to the second value. It returns a dynamic array of boolean values in which each element comparison is represented. It returns a 1 if the \text{dynarray}_1 element value is less than or equal to the \text{dynarray}_2 element value. It returns a 0 if the \text{dynarray}_1 element value is greater than the \text{dynarray}_2 element value.

**LES** removes signs and leading and trailing zeros from element values before making the comparison. If an element is missing, or has a null string or a non-numeric value, **LES** assigns it a value of 0 for the purpose of this comparison.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of comparison. You can also use the \text{REUSE} function to define behavior when specifying two dynamic arrays with different numbers of elements.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

**Examples**

The following example uses the LES function to return a less than or equal to comparison for each of the elements in dynamic arrays \(a\) and \(b\):

\[
a=10:@VM:-22:@VM:-33:@VM:45 \\
b=10:@VM:-23:@VM:0:@VM:44 \\
\text{PRINT \text{LES}(a,b)} \\
\quad \text{! returns 100100}
\]

**See Also**

- \text{EQS} function
- \text{GES} function
- \text{GTS} function
- \text{LTS} function
- Dynamic Arrays
$LIST ($LI)

Returns elements in a list.

$LIST(list,position,end)
$LI(list,position,end)

Parameters

<table>
<thead>
<tr>
<th>list</th>
<th>An expression that resolves to a Caché list. Because lists contain encoding, list must be created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.</th>
</tr>
</thead>
<tbody>
<tr>
<td>position</td>
<td>Optional — The starting position in the specified list. An expression that resolves to an integer. Valid values are -1 and positive integers.</td>
</tr>
<tr>
<td>end</td>
<td>Optional — The ending position in the specified list. An expression that resolves to an integer. Valid values are -1, 0, and positive integers.</td>
</tr>
</tbody>
</table>

Description

$LIST returns elements from a list. The elements returned depend on the parameters used.

- **$LIST(list)** returns the first element string in the list.
- **$LIST(list,position)** returns the element indicated by the specified position. The position parameter must evaluate to an integer.
- **$LIST(list,position,end)** returns a “sublist” (an encoded list string) containing the elements of the list from the specified start position through the specified end position.

Parameters

**list**

An encoded list string containing one or more elements. Lists can be created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list by using the $LIST function. The following are valid list arguments:

```caché
myList = $LISTBUILD("Red","Blue","Green","Yellow")
PRINT $LIST(myList,2); ! prints Blue
subList = $LIST(myList,2,4)
PRINT $LIST(subList,2); ! prints Green
```

In the following example, subList is not a valid list argument, because it is a single element returned as an ordinary string, not an encoded list string:

```caché
myList = $LISTBUILD("Red","Blue","Green","Yellow")
subList = $LIST(myList,2)
PRINT $LIST(subList,1)
```

The second $LIST generates a <LIST> error.

**position**

The position of a list element to return. List elements are counted from 1. If position is omitted, the first element is returned. If the value of position is 0 or greater than the number of elements in the list, Caché issues a <NULL VALUE> error. If the value of position is negative one (−1), $LIST returns the final element in the list.
If the end parameter is specified, position specifies the first element in a range of elements. Even when only one element is returned (when position and end are the same number) this value is returned as an encoded list string. Thus, $LIST(x,2) is not identical to $LIST(x,2,2).

end

The position of the last element in a range of elements. You must specify position to specify end. When end is specified, the value returned is an encoded list string. Because of this encoding, such strings should only be processed by other $LIST functions.

If the value of end is:

- greater than position, an encoded string containing a list of elements is returned.
- equal to position, an encoded string containing the one element is returned.
- less than position, the null string ("") is returned.
- greater than the number of elements in list, it is equivalent to specifying the final element in the list.
- negative one (–1), it is equivalent to specifying the final element in the list.

When specifying end, you can specify a position value of zero (0). In this case, 0 is equivalent to 1.

Examples

The following two PRINT statements both return “RED”, the first element in the list. The first writes the first element by default, the second writes the first element because the position parameter is set to 1:

```
PRINT $LIST($LISTBUILD("RED","BLUE","GREEN"))
PRINT $LIST($LISTBUILD("RED","BLUE","GREEN"),1)
```

The following example returns “Blue”, the second element in the list:

```
x=$LISTBUILD("Red","Blue","Green")
PRINT $LIST(x,2)
```

The following example returns “Green White”, a two-element list string beginning with the first element and ending with the second element in the list.

```
x=$LISTBUILD("Green ","White ","Brown ","Black ")
PRINT $LIST(x,1,2)
```

The following example returns “Brown Black”, a two-element list string that begins with the third element and ends with the last element in the list:

```
x=$LISTBUILD("Green ","White ","Brown ","Black ")
PRINT $LIST(x,3,-1)
```

Notes

Invalid Parameter Values

If the expression in the list parameter does not evaluate to a valid list, a <LIST> error occurs.

```
x=CHAR(0):CHAR(0):CHAR(0):CHAR(1):CHAR(16):CHAR(27):CHAR(134):CHAR(240)
a=$LIST(x,2);    ! generates a LIST error
```

If the value of the position parameter or the end parameter is less than -1, invoking the $LIST function generates a <RANGE> error.

If the value of the position parameter refers to a nonexistent list member and no end parameter is used, invoking the $LIST function generates a <NULL VALUE> error.
list2=$LISTBUILD("Brown","Black")
PRINT $LIST(list2,3); ! generates a NULL VALUE error
x=$LIST(list2,0); ! generates a NULL VALUE error

If the value of the position parameter identifies an element with an undefined value, invoking the $LIST function also generates a <NULL VALUE> error.

PRINT $LIST(""); ! generates a NULL VALUE error
x=$LISTBUILD("A",")C")
PRINT $LIST(x,2); ! generates a NULL VALUE error

Two-Parameter and Three-Parameter $LIST

$LIST(list,1) is not equivalent to $LIST(list,1,1) because the former returns a string, while the latter returns a single-element list string. Furthermore, the first can receive a <NULL VALUE> error, whereas the second cannot; if there are no elements to return, it returns a null string.

Unicode

If one Unicode character appears in a list element, that entire list element is represented as Unicode (wide) characters. Other elements in the list are not affected.

The following example shows two lists. The y list consists of two elements which contain only ASCII characters. The z list consists of two elements: the first element contains a Unicode character (CHAR(960) = the pi symbol); the second element contains only ASCII characters.

y=$LISTBUILD("ABC":CHAR(68),"XYZ")
z=$LISTBUILD("ABC":CHAR(960),"XYZ")
PRINT "The ASCII list y elements: "
PRINT $LIST(y,1)
PRINT $LIST(y,2)
PRINT "The Unicode list z elements: "
PRINT $LIST(z,1)
PRINT $LIST(z,2)

Note that Caché encodes the first element of z entirely in wide Unicode characters. The second element of z contains no Unicode characters, and thus Caché encodes it using narrow ASCII characters.

See Also

- $LISTBUILD function
- $LISTDATA function
- $LISTFIND function
- $LISTFROMSTRING function
- $LISTGET function
- $LISTLENGTH function
- $LISTNEXT function
- $LISTSAME function
- $LISTTOSTRING function
- $LISTVALID function
**$LISTBUILD ($LB)**

Builds a list of elements from the specified expressions.

```plaintext
$LISTBUILD(element,...) $LB(element,...)
```

**Parameter**

| element | Element values to include in a Caché list. An expression that resolves to a number or string. Commonly, multiple element values are specified, separated by commas. To include a comma within an element, make the element a quoted string. |

**Description**

$LISTBUILD takes one or more element values and returns a Caché list structure containing a corresponding list of elements.

The following functions can be used to create a list:

- $LISTBUILD, which creates a list from multiple strings, one string per element.
- $LISTFROMSTRING, which creates a list from a single string containing multiple delimited elements.
- $LIST, which extracts a sublist from an existing list.

$LISTBUILD is used with the other $LIST functions: $LISTDATA, $LISTFIND, $LISTGET, $LISTLENGTH, $LISTSAME, and $LISTTOSTRING.

**Note:** $LISTBUILD and the other $LIST functions use an optimized binary representation to store data elements. For this reason, equivalency tests may not work as expected with some $LIST data. Data that might, in other contexts, be considered equivalent, may have a different internal representation. For example, $LISTBUILD(1) is not equal to $LISTBUILD("1").

For the same reason, a list string value returned by $LISTBUILD should not be used in character search and parse functions that use a delimiter character, such as $PIECE and the two-argument form of $LENGTH. Elements in a list created by $LISTBUILD are not marked by a character delimiter, and thus can contain any character.

**Examples**

The following example produces the three-element list "Red,Blue,Green":

```plaintext
x=$LISTBUILD("Red","Blue","Green")
PRINT $LIST(x,1,3)
```

**Notes**

**Omitting Parameters**

Omitting an element expression yields an element whose value is undefined. For example, the following $LISTBUILD statement produces a three-element list whose second element has an undefined value; referencing the second element with the $LIST function will produce a <NULL VALUE> error.

```plaintext
PRINT $LIST($LISTBUILD("Red",,"Green"),2)
```

However, the following produces a three-element list whose second element is a null string. No error condition exists.

```plaintext
PRINT $LIST($LISTBUILD("Red","","Green"),2)
```
Additionally, if a $LISTBUILD expression is undefined, the corresponding list element has an undefined value. The following two expressions both produce the same two-element list whose first element is "Red" and whose second element has an undefined value:

```
PRINT $LISTBUILD("Red"),
PRINT $LISTBUILD("Red",Z)
```

### Providing No Parameters

Invoking the $LISTBUILD function with no parameters returns a list with one element whose data value is undefined. This is not the same as a null string:

```
x=$LISTBUILD()
y=$LISTBUILD("")
PRINT x
PRINT y
```

### Nesting Lists

An element of a list may itself be a list. For example, the following statement produces a three-element list whose third element is the two-element list, "Walnut,Pecan":

```
x=$LISTBUILD("Apple","Pear",$LISTBUILD("Walnut","Pecan"))
PRINT $LIST(x,3)
```

### Concatenating Lists

The result of concatenating two lists with the Concatenation Operator (:) is another list. For example, the following two WRITE statements produce the same list, "A,B,C":

```
PRINT $LIST($LISTBUILD("A","B"):$LISTBUILD("C"),0,-1)
PRINT $LIST($LISTBUILD("A","B","C"),0,-1)
```

A null string ("") is an empty list. For example, the following two expressions each produce the same two-element list:

```
PRINT $LISTBUILD("A","B"):
PRINT $LISTBUILD("A","B")
```

However, the following two expressions each produce a three-element list:

```
PRINT $LISTBUILD("A","B"):$LISTBUILD("")
PRINT $LISTBUILD("A","B"):$LISTBUILD()
```

### Unicode

If one or more characters in a list element is a wide (Unicode) character, all characters in that element are represented as wide characters. To ensure compatibility across systems, $LISTBUILD always stores these bytes in the same order, regardless of the hardware platform. Wide characters are represented as byte strings. Therefore, the length reflects the number of bytes, not the number of Unicode characters.

In the following example, the first element has a length of ten: four characters, each two bytes long, plus the length and data type bytes. The data type byte is 02 (Unicode string). Each character is represented by two bytes in little-endian order. The second element has a length of five: three characters, plus the length and data type bytes. The data type byte is 01 (Binary string).

```
z=$LISTBUILD(CHAR(987):"ABC","ABC")
PRINT LEN(z)
```

### See Also

- $LIST function
- $SLISTDATA function
• $LISTFIND function
• $LISTFROMSTRING function
• $LISTGET function
• $LISTLENGTH function
• $LISTNEXT function
• $LISTSAME function
• $LISTTOSTRING function
• $LISTVALID function
$LISTDATA ($LD)

Indicates whether the specified element exists and has a data value.

$LISTDATA(list,position)
$LD(list,position)

**Parameters**

<table>
<thead>
<tr>
<th>list</th>
<th>An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.</th>
</tr>
</thead>
<tbody>
<tr>
<td>position</td>
<td>Optional — An expression that resolves to an integer specifying a position in list. Valid values are -1, 0, and positive integers.</td>
</tr>
</tbody>
</table>

**Description**

$LISTDATA checks for data in the requested element in a list and returns a boolean value. $LISTDATA returns a value of 1 if the element indicated by the position parameter is in the list and has a data value. $LISTDATA returns a value of 0 if the element is not in the list or does not have a data value.

**Parameters**

*list*

A list is an encoded string containing multiple elements. A list must have been created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.

*position*

If you omit the position parameter, $LISTDATA evaluates the first element. If the value of the position parameter is -1, it is equivalent to specifying the final element of the list. If the value of the position parameter refers to a nonexistent list member, then invoking the $LISTDATA function returns a 0.

**Examples**

The following examples show the results of the various values of the position parameter.

All of the following $LISTDATA statements return a value of 0 (Y is an undefined variable):

```
x=$LISTBUILD("Red",,Y,"","Green")
PRINT $LISTDATA(x,2);  ! second element is undefined
PRINT $LISTDATA(x,3);  ! third element is undefined variable
PRINT $LISTDATA("");   ! null string
PRINT $LISTDATA(x,0);  ! the 0th position
PRINT $LISTDATA(x,6);  ! 6th position in 5-element list
```

The following $LISTDATA statements return a value of 1 for the same five-element list:

```
x=$LISTBUILD("Red",,Y,"","Green")
PRINT $LISTDATA(x);   ! first position (by default)
PRINT $LISTDATA(x,1); ! first position specified
PRINT $LISTDATA(x,4); ! fourth position value=null string
PRINT $LISTDATA(x,5); ! fifth position
PRINT $LISTDATA(x,-1); ! last (5th) position
```

**Notes**

*Invalid Parameter Values*

If the expression in the list parameter does not evaluate to a valid list, a <LIST> error occurs.
If the value of the *position* parameter is less than -1, invoking the **$LISTDATA** function generates a <RANGE> error.

**See Also**

- **$LIST** function
- **$LISTBUILD** function
- **$LISTFIND** function
- **$LISTFROMSTRING** function
- **$LISTGET** function
- **$LISTLENGTH** function
- **$LISTNEXT** function
- **$LISTSAME** function
- **$LISTTOSTRING** function
- **$LISTVALID** function
$LISTFIND ($LF)

Searches a specified list for the requested value.

$LISTFIND(list,value,startafter)
$LF(list,value,startafter)

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.</td>
</tr>
<tr>
<td>value</td>
<td>Optional — An expression that resolves to a positive integer, specifying a position in list. The search starts with the element after this position.</td>
</tr>
<tr>
<td>startafter</td>
<td>An expression that resolves to the desired element value.</td>
</tr>
</tbody>
</table>

**Description**

$LISTFIND searches the specified list for the first instance of the requested value. The search begins with the element after the position indicated by the startafter parameter. If you omit the startafter parameter, $LISTFIND assumes a startafter value of 0 and starts the search with the first element (element 1). If the value is found, $LISTFIND returns the position of the matching element. If the value is not found, $LISTFIND returns a 0. The $LISTFIND function will also return a 0 if the value of the startafter parameter refers to a nonexistent list member.

**Examples**

The following example returns 2, the position of the first occurrence of the requested string:

```plaintext
x=$LISTBUILD("A","B","C","D")
PRINT $LISTFIND(x,"B")
```

The following example returns 0, indicating the requested string was not found:

```plaintext
x=$LISTBUILD("A","B","C","D")
PRINT $LISTFIND(x,"E")
```

The following examples show the effect of using the startafter parameter. The first example does not find the requested string and returns 0 because it occurs at the startafter position:

```plaintext
x=$LISTBUILD("A","B","C","D")
PRINT $LISTFIND(x,"B",2)
```

The second example finds the second occurrence of the requested string and returns 4, because the first occurs before the startafter position:

```plaintext
y=$LISTBUILD("A","B","C","A")
PRINT $LISTFIND(y,"A",2)
```

The $LISTFIND function only matches complete elements. Thus, the following example returns 0 because no element of the list is equal to the string “B”, though all of the elements contain “B”:

```plaintext
mylist = $LISTBUILD("ABC","BCD","BBB")
PRINT $LISTFIND(mylist,"B")
```

**Notes**

*Invalid Parameter Values*

If the expression in the list parameter does not evaluate to a valid list, a <LIST> error occurs.
If the value of the \textit{startafter} parameter is less than -1, invoking the $\texttt{LISTFIND}$ function generates a \texttt{<RANGE>} error.

\textbf{See Also}

\begin{itemize}
\item $\texttt{LIST}$ function
\item $\texttt{LISTBUILD}$ function
\item $\texttt{LISTDATA}$ function
\item $\texttt{LISTFROMSTRING}$ function
\item $\texttt{LISTGET}$ function
\item $\texttt{LISTLENGTH}$ function
\item $\texttt{LISTNEXT}$ function
\item $\texttt{LISTSAME}$ function
\item $\texttt{LISTTOSTRING}$ function
\item $\texttt{LISTVALID}$ function
\end{itemize}
$LISTFROMSTRING ($LFS)

Creates a list from a string.

$LISTFROMSTRING(string,delimiter)
$LFS(string,delimiter)

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string to be converted into a Caché list. This string contains one or more elements, separated by a delimiter. The delimiter does not become part of the resulting Caché list. The string cannot contain the quoted string delimiter.</td>
</tr>
<tr>
<td>delimiter</td>
<td>Optional — The delimiter used to separate substrings (elements) in string. An expression that resolves to a string containing one or more characters. If no delimiter is specified, the default is the comma (,) character. The delimiter cannot contain the character used to delimit the quoted string.</td>
</tr>
</tbody>
</table>

**Description**

$LISTFROMSTRING takes a quoted string containing delimited elements and returns a Caché list. A list represents data in an encoded format which does not use delimiter characters. Thus a list can contain all possible characters, and is ideally suited for bitstring data. Lists are handled using the various $LIST functions.

**Parameters**

**string**

A string literal (enclosed in quotation marks), a numeric, or a variable or expression that evaluates to a string. This string can contain one or more substrings (elements), separated by a delimiter. The string data elements must not contain the delimiter character (or string), because the delimiter character is not included in the output list.

**delimiter**

A character (or string of characters) used to delimit substrings within the input string. It can be a numeric or string literal (enclosed in quotation marks), the name of a variable, or an expression that evaluates to a string.

Commonly, a delimiter is a designated character which is never used within string data, but is set aside solely for use as a delimiter separating substrings. A delimiter can also be a multi-character string, the individual characters of which can be used within string data.

If you specify no delimiter, the default delimiter is the comma (,) character. You cannot specify a null string (""") as a delimiter; attempting to do so results in a <STRINGSTACK> error.

**Example**

The following example takes a string of names which are separated by a blank space, and creates a list:

```plaintext
namestring="Deborah Noah Martha Bowie"
namelist=$LISTFROMSTRING(namestring," ")
PRINT "1st element: ",LIST(namelist,1)
PRINT "2nd element: ",LIST(namelist,2)
PRINT "3rd element: ",LIST(namelist,3)
```

**See Also**

- $LIST function
• $LISTBUILD function
• $LISTDATA function
• $LISTFIND function
• $LISTGET function
• $LISTLENGTH function
• $LISTNEXT function
• $LISTSAME function
• $LISTTOSTRING function
• $LISTVALID function
$LISTGET ($LG)

Returns an element in a list, or a specified default value if the requested element is undefined.

$LISTGET(list,position,default)

$LG(list,position,default)

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.</td>
</tr>
<tr>
<td>position</td>
<td><em>Optional</em> — An expression that resolves to an integer, specifying a position in list. Permitted values are -1, 0, and positive integers.</td>
</tr>
<tr>
<td>default</td>
<td><em>Optional</em> — An expression that resolves to a value to return if the list element has an undefined value.</td>
</tr>
</tbody>
</table>

**Description**

$LISTGET returns the requested element in the specified list. If the value of the position parameter refers to a nonexistent member or identifies an element with an undefined value, the specified default value is returned.

The $LISTGET function is identical to the one- and two-argument forms of the $LIST function except that, under conditions that would cause $LIST to produce a <NULL VALUE> error, $LISTGET returns a default value. See the description of the $LIST function for more information on conditions that generate <NULL VALUE> errors.

**Parameters**

**position**

The position parameter must evaluate to an integer. If it is omitted, by default, the function examines the first element of the list. If the value of the position parameter is -1, it is equivalent to specifying the last element of the list.

**default**

If you omit the default parameter, the null string ("") is assumed for the default value.

**Examples**

The $LISTGET functions in the following example both return “A”, the first element in the list:

```c
list =$LISTBUILD("A","B","C")
PRINT $LISTGET(list)
PRINT $LISTGET(list,1)
```

The $LISTGET functions in the following example both return “C”, the third and last element in the list:

```c
list =$LISTBUILD("A","B","C")
PRINT $LISTGET(list,3)
PRINT $LISTGET(list,-1)
```

The $LISTGET functions in the following example both return a value upon encountering the undefined 2nd element in the list. The first returns a question mark (?), which the user defined as the default value. The second returns a null string because a default value is not specified:

```c
PRINT $LISTGET($LISTBUILD("A","C"),2,"?
PRINT $LISTGET($LISTBUILD("A","C"),2)
```
The $LISTGET functions in the following example both specify a position greater than the last element in the three-element list. The first returns a null string because the default value is not specified. The second returns the user-specified default value, “ERR”:

```c
list=$LISTBUILD("A","B","C")
PRINT $LISTGET(list,4)
PRINT $LISTGET(list,4,"ERR")
```

The $LISTGET functions in the following example both return a null string:

```c
list=$LISTBUILD("A","B","C")
PRINT $LISTGET(list,0)
PRINT $LISTGET("")
```

**Notes**

**Invalid Parameter Values**

If the expression in the list parameter does not evaluate to a valid list, a <LIST> error can occur.

If the value of the position parameter is less than -1, invoking the $LISTGET function generates a <RANGE> error.

**See Also**

- $LIST function
- $LISTBUILD function
- $LISTDATA function
- $LISTBOLD function
- $LISTFROMSTRING function
- $LISTLENGTH function
- $LISTNEXT function
- $LISTSAME function
- $LISTTOSTRING function
- $LISTVALID function
$LISTLENGTH ($LL)

Returns the number of elements in a specified list.

$LISTLENGTH(list)
$LL(list)

**Parameter**

| list       | An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST. |

**Description**

$LISTLENGTH returns the number of elements in list.

**Examples**

The following example returns 3, because there are 3 elements in the list:

PRINT $LISTLENGTH($LISTBUILD("Red","Blue","Green"))

The following example returns a 0, because a null string is a valid (zero-element) list.

PRINT $LISTLENGTH("")

**Notes**

**$LISTLENGTH and Nested Lists**

The following example returns 3, because $LISTLENGTH does not recognize the individual elements in nested lists:

x=$LISTBUILD("Apple","Pear","LISTBUILD("Walnut","Pecan")")
PRINT $LISTLENGTH(x)

**See Also**

- $LIST function
- $LISTBUILD function
- $LISTDATA function
- $LISTFIND function
- $LISTFROMSTRING function
- $LISTGET function
- $LISTNEXT function
- $LISTSAME function
- $LISTTOSTRING function
- $LISTVALID function
**$LISTNEXT**

Retrieves elements sequentially from a list.

$LISTNEXT(list,ptr,value)

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.</td>
</tr>
<tr>
<td>ptr</td>
<td>A pointer to the next element in the list. You must specify ptr as a local variable initialized to 0 to point to the beginning of list. ptr cannot be a global variable or a subscripted variable.</td>
</tr>
<tr>
<td>value</td>
<td>A local variable used to hold the data value of a list element. value does not have to be initialized before invoking $LISTNEXT. value cannot be a global variable or a subscripted variable.</td>
</tr>
</tbody>
</table>

**Description**

$LISTNEXT sequentially returns elements in a list. You initialize ptr to 0 before the first invocation of $LISTNEXT. This causes $LISTNEXT to begin returning elements from the beginning of the list. Each successive invocation of $LISTNEXT advances ptr and returns the next list element value to value. The $LISTNEXT function returns 1, indicating that a list element has been successfully retrieved.

When $LISTNEXT reaches the end of the list, it returns 0, resets ptr to 0, and leaves value unchanged from the previous invocation. Because ptr has been reset to 0, the next invocation of $LISTNEXT would start at the beginning of the list.

Caché MVBasic increments ptr using an internal address algorithm. Therefore, the only value you should use to set ptr is 0.

You can use $LISTVALID to determine if list is a valid list. An invalid list causes $LISTNEXT to generate a <LIST> error.

Not all lists validated by $LISTVALID can be used successfully with $LISTNEXT. When $LISTNEXT encounters a list element with a null value, it returns 1 indicating that a list element has been successfully retrieved, advances ptr to the next element, and resets value to be an undefined variable. This can happen with any of the following valid lists: value=$LB(), value=$LB(NULL), value=$LB(,), or when encountering an omitted list element, such as the second invocation of $LISTNEXT on value=$LB("a","b").

$LISTNEXT("",ptr,value) returns 0, and does not advance the pointer or set value. $LISTNEXT($LB(""),ptr,value) returns 1, advances the pointer, and set value to the null string ("").

**$LISTNEXT and Nested Lists**

The following example returns three elements, because $LISTNEXT does not recognize the individual elements in nested lists:

```
list=$LISTBUILD("Apple","Pear",$LISTBUILD("Walnut","Pecan"))
ptr=0
count=0
LOOP UNTIL 0=$LISTNEXT(list,ptr,value)
  count=count+1
  CRT value
REPEAT
CRT "End of list:",count,"elements found"
```

**Examples**

The following example sequentially returns all the elements in the list:
list=$LISTBUILD("Red","Blue","Green")
ptr=0
count=0
LOOP UNTIL 0=$LISTNEXT(list,ptr,value)
count=count+1
CRT value
REPEAT
CRT "End of list: ",count," elements found"

See Also

- $LIST function
- $LISTBUILD function
- $LISTDATA function
- $LISTFIND function
- $LISTFROMSTRING function
- $LISTGET function
- $LISTLENGTH function
- $LISTSAME function
- $LISTTOSTRING function
- $LISTVALID function
$LISTSAME ($LS)

Compares two lists and returns a boolean value.

Syntax

$LISTSAME(list1, list2)
$LS(list1, list2)

Parameters

- **list**: An expression that resolves to a Caché list. A Caché list is created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST.

Description

$LISTSAME compares the contents of two lists and returns 1 if the lists are identical. If the lists are not identical, $LISTSAME returns 0.

A Caché list can either be a list created using $LISTBUILD, or a null string ("""). If list is not a valid list, you receive a <LIST> error.

Examples

The following example returns 1, because the two lists are identical:

```c
x = $LISTBUILD("Red","Blue","Green")
y = $LISTBUILD("Red","Blue","Green")
PRINT $LISTSAME(x,y)
```

The following example returns 0, because the two lists are not identical:

```c
x = $LISTBUILD("Red","Blue","Yellow")
y = $LISTBUILD("Red","Blue","Green")
PRINT $LISTSAME(x,y)
```

Notes

**Identical Lists**

$LISTSAME considers two lists to be identical if the string representations of the two lists are identical. This is not the same equivalence test as the one used by other list operations, which test using the internal representation of a list. This distinction is easily seen when comparing a number and a numeric string, as in the following example:

```c
x = $LISTBUILD("365")
y = $LISTBUILD(365)
IF x=y { PRINT "number and numeric string lists differ" } 
PRINT $LISTSAME(x,y), "number and numeric string lists identical"
```

The IF comparison tests the internal representations of these lists (which are not identical). $LISTSAME performs a string conversion on both lists, compares them, and finds them identical.

The following example shows two lists with various representations of numeric elements. $LISTSAME considers these two lists to be identical:

```c
x = $LISTBUILD("360","361","362","363","364","365","366")
y = $LISTBUILD(00360.000,(19*19),+"362",363,364.0,+365,"3"_"66")
PRINT $LISTSAME(x,y), "lists are identical"
```

In the following example, both $LISTSAME comparisons returns 0, because these lists are not considered identical:
The following example returns 1, because the lists are considered identical:

\[
x = \text{LISTBUILD("Apple","Pear","Walnut","Pecan")}
y = \text{LISTBUILD("Apple","Pear",\text{LISTBUILD("Walnut","Pecan")})}
z = \text{LISTBUILD("Apple","Pear","Walnut","Pecan","")}
\]

\[
\text{PRINT } \text{LISTSAME}(x,y)," nested list"\\
\text{PRINT } \text{LISTSAME}(x,z)," null string is list item"
\]

**Null String and Null List**

A list containing the null string (an empty string) as its sole element is a valid list. The null string by itself is also considered a valid list. However these two (a null string and a null list) are not considered identical, as shown in the following example:

\[
\text{PRINT } \text{LISTSAME(\text{LISTBUILD("")},\text{LISTBUILD("")})}," null lists"\\
\text{PRINT } \text{LISTSAME(\"\"),\"\")}," null strings"\\
\text{PRINT } \text{LISTSAME(\text{LISTBUILD("")},\"\")}," null list and null string"
\]

Normally, a string is not a valid \$LISTSAME argument, and \$LISTSAME issues a <LIST> error. However, the following \$LISTSAME comparisons complete successfully and return 0. The null string and the string “abc” are compared and found not to be identical. These null string comparisons do not issue a <LIST> error:

\[
\text{PRINT } \text{LISTSAME(\"\",\"abc\")}
\text{PRINT } \text{LISTSAME(\"abc\",\")}
\]

The following \$LISTSAME comparisons do issue a <LIST> error, because a list (even a null list) cannot be compared with a string:

\[
x = \text{LISTBUILD("")}
\text{PRINT } \text{LISTSAME("abc",x)}
\text{PRINT } \text{LISTSAME(x,"abc")}
\]

**See Also**

- \$LIST function
- \$LISTBUILD function
- \$LISTDATA function
- \$LISTFIND function
- \$LISTFROMSTRING function
- \$LISTGET function
- \$LISTLENGTH function
- \$LISTNEXT function
- \$LISTTOSTRING function
- \$LISTVALID function
$$\textit{LISTTOSTRING} (\$LTS)$$

Creates a string from a list.

$$\texttt{LISTTOSTRING(list, delimiter)}$$
$$\texttt{LTS(list, delimiter)}$$

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>list</strong></td>
<td>An expression that resolves to a Caché list. A Caché list is created using $\texttt{LISTBUILD}$ or $\texttt{LISTFROMSTRING}$, or extracted from another list using $\texttt{LIST}$.</td>
</tr>
<tr>
<td><strong>delimiter</strong></td>
<td>Optional — A delimiter used to separate substrings. An expression that resolves to a string containing one or more characters. If no delimiter is specified, the default is the comma (,) character. The delimiter cannot contain the character used to delimit the quoted string.</td>
</tr>
</tbody>
</table>

**Description**

$\texttt{LISTTOSTRING}$ takes a Caché list and converts it to a string. In the resulting string, the elements of the list are separated by the delimiter.

A list represents data in an encoded format which does not use delimiter characters. Thus a list can contain all possible characters, and is ideally suited for bitstring data. $\texttt{LISTTOSTRING}$ converts this list to a string with delimited elements. It sets aside a specified character (or character string) to serve as a delimiter. These delimited elements can be handled using the $\texttt{PIECE}$ function.

**Note:** The delimiter specified here must not occur in the source data. Caché makes no distinction between a character serving as a delimiter and the same character as a data character.

**Parameters**

**list**

A Caché list, which contains one or more elements. A list is created using $\texttt{LISTBUILD}$ or extracted from another list using $\texttt{LIST}$. If the expression in the list parameter does not evaluate to a valid list, a <LIST> error occurs.

**delimiter**

A character (or string of characters) used to delimit substrings within the output string. It can be a numeric or string literal (enclosed in quotation marks), the name of a variable, or an expression that evaluates to a string.

Commonly, a delimiter is a designated character which is never used within string data, but is set aside solely for use as a delimiter separating substrings. A delimiter can also be a multi-character string, the individual characters of which can be used within string data.

If you specify no delimiter, the default delimiter is the comma (,) character. You can specify a null string ("") as a delimiter; in this case, substrings are concatenated with no delimiter. To specify a quote character as a delimiter, either use another delimiter for the string (for example, "\") or use the CHAR() function (34=", 39=’, 92=\).

**Example**

The following example creates a list of four elements, then converts it to a string with the elements delimited by the colon (:) character:
Namelist=$LISTBUILD("Deborah","Noah","Martha","Bowie")
PRINT $LISTTOSTRING(namelist,":")
returns "Deborah:Noah:Martha:Bowie"

See Also

- $LIST function
- $LISTBUILD function
- $LISTDATA function
- $LISTFIND function
- $LISTFROMSTRING function
- $LISTGET function
- $LISTLENGTH function
- $LISTNEXT function
- $LISTSAME function
- $LISTVALID function
$LISTVALID

Determines if an expression is a list.

$LISTVALID(exp)
$LVALID(exp)

**Parameters**

| exp   | An expression. |

**Description**

$LISTVALID determines whether exp is a Caché list, and returns a Boolean value: If exp is a list, $LISTVALID returns 1; if exp is not a list, $LISTVALID returns 0.

A list can be created using $LISTBUILD or $LISTFROMSTRING, or extracted from another list using $LIST. A list containing the empty string (""") as its sole element is a valid list. The empty string (""") by itself is also considered a valid list.

**Examples**

The following examples all return 1, indicating a valid list:

```plaintext
w = $LISTBUILD("Red","Blue","Green")
x = $LISTBUILD("Red")
y = $LISTBUILD(365)
z = $LISTBUILD(""")
CRT $LISTVALID(w)
CRT $LISTVALID(x)
CRT $LISTVALID(y)
CRT $LISTVALID(z)
```

The following examples all return 0. Numbers and strings (with the exception of the null string) are not valid lists:

```plaintext
x = "Red"
y = 44
CRT $LISTVALID(x)
CRT $LISTVALID(y)
```

The following examples all return 1. Concatenated, nested, and omitted value lists are all valid lists:

```plaintext
w=$LISTBUILD("Apple","Pear")
x=$LISTBUILD("Walnut","Pecan")
y=$LISTBUILD("Apple","Pear",$LISTBUILD("Walnut","Pecan"))
z=$LISTBUILD("Apple","Pear","Pecan")
CRT $LISTVALID(w:x) ! concatenated
CRT $LISTVALID(y) ! nested
CRT $LISTVALID(z) ! omitted element
```

The following examples all return 1. $LISTVALID considers all of the following “empty” lists as valid lists:

```plaintext
CRT $LISTVALID("")
CRT $LISTVALID($LB( ))
CRT $LISTVALID($LB(NULL))
CRT $LISTVALID($LB(""))
CRT $LISTVALID($LB($LB( ( ) )))
CRT $LISTVALID($LB($LB( )) )
```

**See Also**

- $LIST function
- $LISTBUILD function
- $LISTDATA function
- $LISTFIND function
- $LISTFROMSTRING function
- $LISTGET function
- $LISTLENGTH function
- $LISTNEXT function
- $LISTSAME function
- $LISTTOSTRING function
LN

Returns the natural logarithm of a number.

\[
\text{LN}(\text{number})
\]

**Arguments**

| number | An expression that resolves to a positive number. |

**Description**

The \text{LN} function returns the natural logarithm of \text{number}. The \text{number} value must be a non-zero positive number; all other values generate an \text{<ILLEGAL VALUE>} error.

The \text{LN} function complements the action of the \text{EXP} function, which is sometimes referred to as the antilogarithm.

**Examples**

The following example uses the \text{LN} function to calculate the natural logarithm of each of the integers 1 through 10:

```cacheml
FOR x=1 TO 10
PRINT "Natural log of ",x," = ",LN(x)
NEXT
```

**See Also**

- \text{EXP function}
- \text{Derived Math Functions}
LOWER

Lowers dynamic array delimiters to next level.

LOWER(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array. |

Description

The **LOWER** function returns a dynamic array with its delimiters converted to the next lower-level delimiters. For example, @VM value mark delimiters become @SM subvalue mark delimiters. When a delimiter cannot be lowered any further, it is returned unchanged. A `dynarray` value that does not contain dynamic array delimiters is returned unchanged.

The available levels, in descending order, are: @IM (CHAR(255)); @FM (CHAR(254)); @VM (CHAR(253)); @SM (CHAR(252)); @TM (CHAR(251)); and CHAR(250).

The **RAISE** function performs the opposite operation, raising the level of dynamic array delimiters to the next higher level.

Examples

The following example uses the **LOWER** function to convert dynamic array delimiters to the next lower level. It then uses the **RAISE** function to reverse this operation:

```
PRINT numvm;          ! Returns 123ý456ý10ý11
numlower = LOWER(numvm)
PRINT numlower;       ! Returns 123ü456ü10ü11
numraise = RAISE(numlower)
PRINT numraise;       ! Returns 123ý456ý10ý11
```

See Also

- **RAISE** function
- **Dynamic Arrays**
**LTS**

Performs a less than comparison on elements of two dynamic arrays.

\[
\text{LTS(dynarray1,dynarray2)}
\]

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |

**Description**

The **LTS** function compares each corresponding numeric element from two dynamic arrays and determines which value is lesser. It returns a dynamic array of boolean values in which each element comparison is represented. It returns a 1 if the `dynarray1` element value is less than the `dynarray2` element value. It returns a 0 if the `dynarray1` element value is equal to or greater than the `dynarray2` element value.

**LTS** removes signs and leading and trailing zeros from element values before making the comparison. If an element value is missing or has a null string or non-numeric value, **LTS** assigns it a value of 0 for the purpose of this comparison.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of comparison. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

**Examples**

The following example uses the **LTS** function to return a less than comparison for each of the elements in dynamic arrays `a` and `b`:

```plaintext
a=10:0VM:-22:0VM:-33:0VM:45
b=10:0VM:-23:0VM:0:0VM:44
PRINT LTS(a,b)
! returns 0ý0ý1ý0
```

**See Also**

- **EQS** function
- **GES** function
- **GTS** function
- **LES** function
- Dynamic Arrays
MAXIMUM

Returns the largest numeric value from the elements of a dynamic array.

MAXIMUM(dynarray)

Arguments

| dynarray     | An expression that resolves to a dynamic array of numeric values. |

Description

The MAXIMUM function compares the values of all of the elements in a dynamic array and returns the largest numeric value. The MAXIMUM function compares all dynamic array values, regardless of the dynamic array levels of the elements. If an element value is missing or has a null string or non-numeric value, MAXIMUM parses its value as 0 (zero).

Examples

The following example uses the MAXIMUM function to return the largest numeric value in a dynamic array:

```
a=10:@FM:9:@VM:8:@SM:7
PRINT MAXIMUM(a);  ! returns 10
```

See Also

- ADDS function
- MINIMUM function
- SUMMATION function
- Dynamic Arrays
MINIMUM

Returns the smallest numeric value from the elements of a dynamic array.

MINIMUM(dynarray)

Arguments

dynarray | An expression that resolves to a dynamic array of numeric values.

Description

The MINIMUM function compares the values of all of the elements in a dynamic array and returns the smallest numeric value. The MINIMUM function compares all dynamic array values, regardless of the dynamic array levels of the elements. If an element value missing or has a null string or non-numeric value, MINIMUM parses its value as 0 (zero).

Examples

The following example uses the MINIMUM function to return the smallest numeric value in a dynamic array:

```
a=10:@FM:9:@VM:8:@SM:7
PRINT MINIMUM(a); ! returns 7
```

See Also

- ADDS function
- MAXIMUM function
- SUMMATION function
- Dynamic Arrays
**MOD**

Modulo division of two values.

\[
\text{MOD}(\text{numstr1}, \text{numstr2})
\]

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>numstr1</td>
<td>The dividend. An expression that resolves to a number or numeric string.</td>
</tr>
<tr>
<td>numstr2</td>
<td>The divisor. An expression that resolves to a non-zero number or numeric string.</td>
</tr>
</tbody>
</table>

### Description

The **MOD** function divides the value of `numstr1` by `numstr2`, and returns the modulo (remainder following integer division) that results from this division. If a `numstr` value is the null string or a non-numeric value, **MOD** parses its value as 0 (zero).

Attempting to divide by zero generates a `<DIVIDE>` error, ending execution of the function and invoking an error trap handler, if available.

The **REM** function is functionally identical to the **MOD** function. To perform integer division, use the **DIV** function. To perform exact division with a fractional quotient, use the division operator (/).

You can use the **MODS** function to perform modulo division on the elements of a dynamic array.

### Examples

The following examples use the **MOD** function to return the modulo value for a division operation:

```
PRINT MOD(10,5);   ! returns 0
PRINT MOD(10,4);   ! returns 2
PRINT MOD(10,3);   ! returns 1
PRINT MOD(10,6);   ! returns 4
PRINT MOD(10,-6);  ! returns 4
PRINT MOD(10,11);  ! returns 10
```

### See Also

- **REM** function
- **DIV** function
- **MODS** function
- **DIVS** function
- **Operators**
MODS

Modulo division of corresponding elements in two dynamic arrays (zero divide not allowed).

```
MODS(dynarray1,dynarray2)
```

**Arguments**

| dynarray | An expression that resolves to a dynamic array of numeric values. |

**Description**

The MODS function divides the value of each element in `dynarray1` by the corresponding element in `dynarray2`. It then returns a dynamic array containing the modulo (remainder) for each element that results from these divisions. If an element is missing or has a null string or a non-numeric value, MODS parses its value as 0 (zero).

Attempting to divide by zero generates a `<DIVIDE>` error, ending execution of the function and invoking an error trap handler, if available. This is the same 0 divisor behavior as the DIVS function. In contrast, when the corresponding MODSZ or DIVSZ functions encounter a 0 divisor, they return 0 for that element.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the arithmetic operation. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the MOD function or the REM function to perform modulo division on single values.

You can use the NUMS function to determine if the elements in a dynamic array are numeric. You can use the ADDS (addition), SUBS (subtraction), MULS (multiplication), DIVS or DIVSZ (division), and PWRS (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

**Examples**

The following example uses the MODS function to return the modulo value for each division operation on the elements of two dynamic arrays:

```
a=11:@VM:22:@VM:0:@VM:-7
b=10:@VM:.5:@VM:10:@VM:42
PRINT MODS(a,b); ! returns 1ý0ý0ý-7
```

**See Also**

- ADDS function
- DIVS function
- DIVSZ function
- MOD function
- MODSZ function
- MULS function
- PWRS function
- REM function
- SUBS function
- Dynamic Arrays
MODSZ

Modulo division of corresponding elements in two dynamic arrays (zero divide allowed).

\[
\text{MODSZ} (\text{dynarray1}, \text{dynarray2})
\]

**Arguments**

| dynarray | An expression that resolves to a dynamic array of numeric values. |

**Description**

The **MODSZ** function divides the value of each element in \( \text{dynarray1} \) by the corresponding element in \( \text{dynarray2} \). It then returns a dynamic array containing the modulo (remainder) for each element that results from these divisions. If an element is missing or has a null string or a non-numeric value, **MODSZ** parses its value as 0 (zero).

When **MODSZ** encounters a 0 divisor, it returns 0 for that element. This is the same 0 divisor behavior as the **DIVSZ** function. The corresponding **MODS** function does not allow division by zero; attempting to divide by zero generates a <DIVIDE> error, ending execution of the function and invoking an error trap handler, if available.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the arithmetic operation. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the **MOD** function or the **REM** function to perform modulo division on single values.

You can use the **NUMS** function to determine if the elements in a dynamic array are numeric. You can use the **ADDS** (addition), **SUBS** (subtraction), **MULS** (multiplication), **DIVS** or **DIVSZ** (division), and **PWRS** (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

**Examples**

The following example uses the **MODSZ** function to return the modulo value for each division operation on the elements of two dynamic arrays:

\[
a=11:@VM:22:@VM:0:@VM:-7
b=10:@VM:.5:@VM:10:@VM:42
\]

\[
\text{PRINT MODSZ}(a,b); \quad ! \text{returns 1y0y0y-7}
\]

**See Also**

- **ADDS** function
- **DIVS** function
- **DIVSZ** function
- **MOD** function
- **MODS** function
- **MULS** function
- **PWRS** function
- **REM** function
- **SUBS** function
- Dynamic Arrays
MULS

Multiplies the values of corresponding elements in two dynamic arrays.

MULS(dynarray1, dynarray2)

Arguments

dynarray | An expression that resolves to a dynamic array of numeric values. If a dynamic array element contains a non-numeric value, MULS treats this value as 0 (zero).

Description

The MULS function multiplies the value of each element in dynarray1 by the corresponding element in dynarray2. It then returns a dynamic array containing the products of these multiplications. If a dynarray element value is missing, or has a null string or non-numeric value, MULS parses its value as 0 (zero).

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the arithmetic operation. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the NUMS function to determine if the elements in a dynamic array are numeric. You can use the ADDS (addition), SUBS (subtraction), DIVS or DIVSZ (division), MODS (modulo division), and PWRS (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

Examples

The following example uses the MULS function to multiply the elements of two dynamic arrays:

```caché
a=3:@VM:22:@VM:33:@VM:4
b=10:@VM:0.5:@VM:0:@VM:-4
PRINT MULS(a,b);  ! returns 30ý11ý0ý-16
```

The following example multiplies the elements of two dynamic arrays of different length:

```caché
a=3:@VM:22:@VM:33:@VM:4
b=10:@VM:0.5
PRINT MULS(a,b);  ! returns 30ý11ý0ý0
```

See Also

• SMUL function
• ADDS function
• DIVS function
• DIVSZ function
• MODS function
• PWRS function
• SUBS function
• Dynamic Arrays
NEG

Returns the inverse sign of a number.

**NEG(number)**

**Arguments**

| number | An expression that resolves to a number or a numeric string. |

**Description**

The **NEG** function returns the inverse sign of a number. For example, **NEG(-1)** returns 1, and **NEG(1)** returns -1. **NEG** removes multiple signs and leading and trailing zeros from **number**. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If **number** is the empty string or a non-numeric value, **NEG** returns 0 (zero).

The **NEG** function inverts the sign of a number: negative numbers become positive and positive numbers become negative.

The **ABS** function gives the absolute value of a number: all numbers become positive.

You can use the **NEGS** function to invert the sign for each element of a dynamic array.

**Examples**

The following example uses the **NEG** function to invert the sign of a number:

```
PRINT NEG(0050.300);  ! Returns -50.3
PRINT NEG(-50.3);     ! Returns 50.3
PRINT NEG(+++50.3);   ! Returns -50.3
PRINT NEG(0);         ! Returns 0
PRINT NEG(-0);        ! Returns 0
```

**See Also**

- **ABS** function
- **NEGS** function
NEGS

Returns the inverse sign of each number in a dynamic array.

NEGS(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array of numeric values. Its elements can contain values specified as a number or a numeric string. |

Description

The NEGS function inverts the sign of each numeric element of dynarray. These output values are returned as a dynamic array. A value of 1 is returned as -1, and a value of -1 is returned as 1. NEGS returns numbers (both numerics and numeric strings) in canonical form, removing multiple signs and leading and trailing zeros from each value. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7, and returns -7. If an element value is missing or has an empty string or non-numeric value, NEGS returns 0 (zero).

The NEGS function inverts the sign of each number in a dynamic array: negative numbers become positive and positive numbers become negative. The ABSS function gives the absolute value of each number in a dynamic array: all numbers become positive.

You can use the NEG function to invert the sign of a single number.

Examples

The following example uses the NEGS function to invert the sign of each number in a dynamic array:

```plaintext
nums=123:@VM:−12.300:@VM:+0123.00:@VM:“−123.00”:@VM:"
PRINT NEGS(nums)  ! Returns -123ý12.3ý-123ý123ý0
```

See Also

• ABSS function
• NEG function
• Dynamic Arrays
NES

Performs an inequality comparison on elements of two dynamic arrays.

**NES(dynarray1,dynarray2)**

**Arguments**

| dynarray | An expression that resolves to a dynamic array of numeric values. |

**Description**

The **NES** function (not equals) compares each corresponding numeric element from two dynamic arrays for inequality. It returns a dynamic array of boolean values, in which each element comparison is represented by a 1 (not equal) or a 0 (equal). **NES** removes signs and leading and trailing zeros from element values before making the comparison. If an element is missing, or has a null string or non-numeric value, **NES** assigns it a value of 0 for the purpose of this comparison.

For two elements to be compared, they must be on the same dynamic array level. For example, you cannot compare a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, unmatched elements return 1 (not equal). That is, the **NES** comparison of each element in the longer dynamic array that has no corresponding element in the shorter dynamic array always returns 1 (not equal), even when the value of the longer array element is 0 or the null string, or is a missing element within the dynamic array. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

The **NES** function is the functional opposite of the **EQS** function.

**Examples**

The following example uses the **NES** function to return a not equals comparison for each of the elements in dynamic arrays *a* and *b*:

```plaintext
a=11:@VM:-22:@VM:-33:@VM:44
b=11:@VM:-24:@VM:0:@VM:44
PRINT NES(a,b)
! returns 0ý1ý1ý0
```

**See Also**

- **EQS** function
- **GES** function
- **GTS** function
- **LES** function
- **LTS** function
- Dynamic Arrays
NOT

Returns the logical complement of an expression.

\[
\text{NOT}\left(\text{expression}\right)
\]

**Arguments**

| expression | An expression that resolves to a boolean value. |

**Description**

The `NOT` function returns the logical complement (inverse) of a boolean expression. Thus all expressions that evaluate to 0 become 1, and all expressions that evaluate to 1 (or any non-zero numeric value) become 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7 (boolean 1), and thus `NOT` returns 0. If `expression` is the null string or a non-numeric value, `NOT` parses it as boolean 0, and thus returns 1.

You can use the `ANDS` and `ORS` functions to perform logical comparisons on two values (either single expressions or arrays).

**Examples**

The following example uses the `NOT` function to return the inverse of a boolean expression:

```
PRINT NOT(1);     ! Returns 0
PRINT NOT(0);     ! Returns 1
PRINT NOT(7);     ! Returns 0
PRINT NOT(-7);    ! Returns 0
PRINT NOT("7dwarves"); ! Returns 0
PRINT NOT("fred"); ! Returns 1
PRINT NOT("");    ! Returns 1
```

**See Also**

- `ANDS` function
- `ORS` function
- `NOTS` function
- Operators
NOTS

Returns the logical complement of each element of a dynamic array.

\[ \text{NOTS}(\text{dynarray}) \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to a dynamic array of boolean values.</td>
</tr>
</tbody>
</table>

**Description**

The **NOTS** function returns the logical complement (inverse) of each element of a dynamic array. It returns a dynamic array of boolean values corresponding to the elements of `dynarray`.

All expressions that evaluate to 0 become 1, and all expressions that evaluate to a non-zero numeric value become 0. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7, and thus returns 0. If an element is missing or contains the null string or a non-numeric value, **NOTS** parses it as 0, and thus returns 1 for that element.

You can use the **ANDS** and **ORS** functions to perform logical comparisons on two dynamic arrays.

**Examples**

The following example uses the **NOTS** function to return the logical complement of the elements of a dynamic array:

```cacheml
a=7:@VM:"-7.1":@VM:"7dwarves":@VM:0:@VM:"":@VM:"fred"
PRINT NOTS(a)
! Returns 0ý0ý0ý1ý1ý1
```

**See Also**

- **ANDS** function
- **ORS** function
- **NOT** function
- **Dynamic Arrays**
- **Operators**
**NUM**

Returns whether a value is numeric.

**NUM(string)**

**Arguments**

| string | An expression that resolves to a string or numeric. |

**Description**

The **NUM** function determines whether a value is numeric or non-numeric. If `string` is a non-numeric value, **NUM** returns 0. If `string` is a numeric value, **NUM** returns 1. A numeric value can contain the numerals 0 through 9, plus and minus signs, and the decimal point. **NUM** also returns 1 for the null string.

You can use the **NUMS** function to make the same determination of each element of a dynamic array.

**See Also**

- **NUMS** function
- **SCMP** function
NUMS

Returns whether each element in a dynamic array is numeric.

NUMS(dynarray)

Arguments

dynarray | An expression that resolves to a dynamic array.

Description

The NUMS function determines whether each element in a dynamic array is numeric or non-numeric. It returns a dynamic array of boolean values corresponding to the elements in dynarray. If an element contains a non-numeric value, NUMS returns 0 for that element. If an element contains a numeric value, NUMS returns 1 for that element. NUMS also returns 1 for the null string, or for a missing element value.

A numeric value can be a numeric or a string numeric. A valid numeric value can contain the numbers 0 through 9, plus and minus signs, and the decimal point; it cannot contain any other characters.

You can use the NUM function to determine whether a single value is numeric or non-numeric.

Examples

The following example uses the NUMS function to determine the numeric status of the elements of a dynamic array:

```
a=3:@VM:007:@VM:"+33.00":@VM:"":@VM:0
PRINT NUMS(a);  ! returns 1ý1ý1ý1ý1
```

The following example show how NUMS handles non-numeric strings, arithmetic expressions, and missing elements:

```
b="7dwarves":@VM:"dwarves7":@VM:@VM:(4+3):@VM:"hello world"
PRINT NUMS(b);  ! returns 0ý0ý1ý10ý0
```

See Also

- NUM function
- SCMP function
- Dynamic Arrays
OCONV

Converts a value from internal format to external format.

OCONV(istring, code)

Arguments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>istring</td>
<td>An expression that resolves to a string or integer. It specifies a value represented in internal (storage) format.</td>
</tr>
<tr>
<td>code</td>
<td>An expression that resolves to a conversion code string. This conversion code specifies the type of conversion to perform. Conversion is from internal format to external format. Conversion codes are not case-sensitive. For a complete list of conversion codes, refer to the Conversion Codes table in the MultiValue Basic Quick Reference.</td>
</tr>
</tbody>
</table>

Description

The OCONV function is a general-purpose conversion function used to convert from internal (storage) format to external (output) format. The type of conversion is specified by a code string that is specific to the type of data to be converted.

The following types of conversions are supported:

- **Character conversions**: character-to-hexcode, hexcode-to-character.
- **Numeric conversions**: decimal-to-hex, hex-to-decimal, masked decimal conversion, range extraction, zero and non-zero substitution.
- **String Conversions**: case conversion, character type extraction, Soundex conversion, string length conversion, uniform string length adjustment, substring extraction by length, delimited substring extraction, pattern match extraction, extraction of strings of a specified length.
- **Time and Date Conversions**: time internal-to-display format, date internal-to-display format, date display-to-internal format, date element extraction, day-of-week, day-of-year, and quarter calculation.
- **Arithmetic and Logical Operations**: arithmetic, equality comparisons, collation sequence comparisons, date and time arithmetic.
- **String Concatenation**: concatenation, concatenation with inserted single-character delimiters.
- **Dynamic Array Element Extraction**: extracting an element from a dynamic array by position.

You can use the STATUS function to determine the success of an OCONV conversion.

The OCONV function converts from internal format to external format. The ICONV function converts from external format to internal format. Note that the MCDX/MCXD, MCAX/MCXA, and MCWX/MCXW code pairs have the opposite meanings in ICONV, reversing the OCONV operation.

You can use the OCONVS function to convert the elements of a dynamic array from internal format to external format.

Invalid Values

In most cases, if you specify an istring value that cannot be converted, OCONV returns the istring value unchanged.

- If you supply a non-numeric value to a numeric operation: date, time, and masked decimal conversions return the istring value unchanged. However, "DI" returns -46384. "MCX" and the other decimal/hex conversion return 0 (unless the first character(s) of the non-numeric string are viewed as the hexadecimal digits A through F.)
• If you supply a non-alphabetic value to an alphabetic operation: case conversions return the istring value unchanged. Soundex conversion returns 0000.

If you specify a code value that is valid but is not implemented, OCONV generates an [806] error. If you specify a nonexistent code value, OCONV generates an [850] error.

**Character Conversion**

The following are the conversion codes for character conversions:

| Character-to-code conversion: all characters in the istring input string are converted to their corresponding hexadecimal integer codes. Use "MCAX", "MX", or "MX0C" to output 8-bit code values. Use "MCWX" to output 16-bit (wide) code values. | "MCAX", "MX", "MX0C" "MCWX"
|---|---|
| Code-to-character conversion: one or more hexadecimal codes in the istring input string are converted to their corresponding characters. You can specify the hexadecimal letters A-F in uppercase or lowercase. Use "MCXA" or "MY" for two-byte code input values. Use "MCXW" for four-byte (wide) code input values. | "MCXA", "MY" "MCXW"

**Numeric Conversion**

The following are the conversion codes for numeric conversions:
### Decimal-to-hexadecimal conversion

“MCD” / “MCDX”

### Hexadecimal-to-decimal conversion

“MCX” / “MCXD”

### Masked decimal conversion

Shifts the decimal point of a numeric, sets the number of fractional digits, optionally limits the number of characters of the result to return, and optionally performs other number formatting, such as converting a minus sign or appending a currency symbol. The \( m \) integer value specifies the shift of the decimal point, with a positive value shifting the decimal point to the left, and with 0 indicating no shift; left side zero padding is added as needed. The \( n \) integer value specifies the number of fractional digits; rounding (by default) and zero padding are performed as needed. If \( m \) is omitted, it defaults to the same value as \( n \). The \( k \) integer specifies how many characters of the result to return. The \( x \) modifiers are non-numeric character codes for formatting results; you can specify multiple \( x \) codes. For \( x \) code values, see below. OCONV masked decimal conversion is the reverse of the ICONV masked decimal conversion.

### Range extraction

Returns \( istring \) if it falls within the numeric range \( n \) and \( m \) (inclusive). Otherwise, returns an empty string. \( istring \) can be any numeric value; \( n \) and \( m \) must be positive integers. You can specify multiple range pairs, separating them with a semicolon (:) or slash (/). For further details, see below.

### Zero and non-zero substitution

If \( istring \) is a non-zero value (either numeric or string), returns the \( nval \) literal. If \( istring \) is a zero value (0 or the empty string), returns the \( zval \) literal. \( nval \) and \( zval \) must both be specified (separated by semicolons) as either a quoted string or as an asterisk. You can substitute an asterisk (*) for either \( nval \) or \( zval \); when * is specified, the \( istring \) literal is returned for that condition, rather than a substitute value.

### Hexadecimal / Decimal Conversion

“MCD” and “MCDX” convert a positive decimal integer to a hexadecimal number. Hexadecimal numbers A through F are returned in upper case. A fractional number is truncated before conversion to hexadecimal. A mixed numeric string is parsed as an integer until the first non-numeric value is encountered, at which point it is truncated and the resulting integer converted to hexadecimal. A negative number is converted to a high-order hexadecimal value; for example -3 is converted to FFFFFFFFFFFFFFFD. A non-numeric string returns 0.

“MCX” and “MCXD” convert a hexadecimal number to a positive decimal integer. The hexadecimal letter A-F are not case-sensitive. A fractional number is truncated before conversion to a decimal integer. A mixed numeric string is parsed as a hexadecimal number until the first non-hexadecimal value is encountered, at which point it is truncated and the
The resulting hexadecimal string is converted to a decimal integer. A negative number returns 0. A non-numeric string returns 0.

**Masked Decimal Conversion / Currency Conversion**

“MD”, “ML”, and “MR” convert an integer by moving the decimal point, specifying the number of fractional digits, and (optionally) inserting a currency symbol or other numeric format characters. For example, to convert the stored integer 123456 to a displayed dollar currency value, you could use the conversion code “MD2$, “, which would result in the value $1,234.56.

“MD” removes leading zeros. “ML” (left justification) and “MR” (right justification) retain leading zeros.

The istring is commonly an integer. If istring is a fractional number, it is rounded to an integer before applying masked decimal conversion. istring can contain the numbers 0–9, a leading minus sign, a decimal point, and numeric group separators (commas). All other characters are considered non-numeric, and cause OCONV to return istring unchanged. Note that a leading plus sign (+) or a dollar sign ($) is considered a non-numeric character and prevents conversion.

The istring value is rounded to an integer, and then the n and m integer arguments are applied:

- n specifies the number of fractional digits in the result. A positive integer in the range 0 through 9 (inclusive) sets the number of fractional digits. The n argument is optional; the default is 0. If n is omitted, m is also omitted and defaults to 0.
- m specifies how many places (power of ten) to the left to move the decimal point. If m is omitted, it is assigned the same value as n.

Zero padding is added where needed.

This use of n and m is shown in the following examples:

```plaintext
PRINT OCONV(“0123.57”, “MD”)   ! returns 124: n defaults to 0, m defaults to n
PRINT OCONV(“0123.57”, “MD00”) ! returns 124: same as above
PRINT OCONV(“0123.57”, “MD2”)  ! returns 1.24: n=2 fractional digits, m defaults to n (2 places left)
PRINT OCONV(“0123.57”, “MD22”) ! returns 1.24: same as above
PRINT OCONV(“0123.57”, “MD21”) ! returns 12.36: n=2 fractional digits, m moves decimal 1 place left
PRINT OCONV(“0123.57”, “MD02”) ! returns 1: n=no fractional digits, m moves decimal 2 places left
```

If istring is the null string (“”), “MD” conversions always returns the null string. “ML” and “MR” conversions treats the null string as zero and apply the specified numeric conversions. This null string behavior is emulation-dependent:

- Caché, IN2, INFORMATION, PICK, PIOpen, Reality, Universe: treat the null string (“”) as zero for numeric conversions. Numeric conversions are applied.
- D3, jBASE, MVBase, R83, POWER95, Ultimate, UniData: treat the null string (“”) as null, and return the null string for numeric conversions.

**Formatting Codes: x**

The following optional x codes can be specified following the optional n and m codes:

- T: truncate the results of applying the n and m codes. The default is to round the results. Thus by applying "MD23T" "123456" becomes "123.45"; by applying "MD23" "123456" becomes "123.46".
- P: if istring already contains a decimal point, the decimal point is retained and the m value is not applied. Thus by applying "MD22P" "123456" becomes "123.46", but "12.3456" becomes "12.35". If “P” is not specified, "MD22" causes "12.3456" to become "0.12".
- - (minus sign) or M: moves the minus sign from leading to trailing. Thus by applying "MD22-n" "-123456" becomes "123.46-". Positive numbers are unaffected by this code character.
- N: removes the minus sign from a negative number. Has no effect on a positive number.
Caché MultiValue Basic Functions

- C (credit) or D (debit): When x=C positive numbers are unaffected, negative numbers lose their minus sign and take a CR suffix. When x=D positive numbers take a DB suffix, negative numbers lose their minus sign. Thus by applying "MD22D"* "123456" becomes "1234.56DB" and "-123456" becomes "1234.56". Specifying lowercase "c" or "d" results in a corresponding lowercase cr or db suffix.

- < (left angle bracket) or E: delimits a negative value with angle brackets. Thus by applying "MD22< " -123456" becomes "<1234.56>". Positive numbers are unaffected by this code character.

- $ (dollar sign): appends a dollar sign to the conversion result. Thus by applying "MD22$ "123456" becomes "$1234.56" and "-123456" becomes "$-1234.56". If supported by the locale, the F (franc), I (international), and Y (yen) currency symbols are applied; if not supported by the locale, these are synonyms for $.

- , (comma): inserts numeric group separators. Thus by applying "MD22, "123456" becomes "1,234.56" and "-123456" becomes "-1,234.56".

If istring already contains one or more commas, these conversion codes handle existing commas as follows: a comma in istring is treated as a digit when applying n and m codes. After applying n and m, the conversion removes all commas to the left of the decimal point. Then, if x is a comma, the conversion adds commas as numeric group separators where needed.

- Z: zero converted to empty string. If istring has a zero value, the Z conversion code returns the empty string rather than zero. Thus by applying "MD22Z" the istring values "0", "0.00", or ",-0.00" all become the empty string. However, note that Z is applied before n and m processing; thus applying "MD22Z" to "0.1" results in "0.00". Appending a “Z” character code causes “ML” and “MR” conversions to return an empty string when istring is the empty string.

The E, M, N, P, T, and Z letter codes are not case-sensitive.

Multiple x code suffixes can be combined in any order. For example, "MD22$", "appen$ a dollar sign to the decimal fraction, moves any existing minus sign to the trailing position, and inserts numeric group separators where needed. Thus OCONV (-123456, "MD22$", ") returns "$1,234.56". The x codes are applied in left-to-right order. Therefore, if multiple x code suffixes conflict (for example, C, <, and --), the last (rightmost) x code is the one applied.

**Numbers of Characters to Return: k**

You can optionally specify how many characters of the masked decimal conversion result to return. For “MD” and “MR” these are the rightmost characters of the conversion result. For “ML” these are the leftmost characters of the conversion result.

The number of characters to return (k) can be specified in several ways:

- As a third positive integer value following n and m. For example, “MD224" specifies three integers: n the number of fractional digits; m the number of places to move the decimal point to the left; and k the number of characters of the result to display. Unlike n and m, k cannot be 0, but can be an integer larger than 9. Thus by applying "MD22 "123456" becomes "1234.56" and by applying "MD224 "123456" becomes "4.56". Note that the decimal point is counted as a character.

In this syntax, n, m, and k must be explicitly specified. x codes should not be specified.

For “MD” and “MR”, the k characters are counted from right to left. For “ML” the k characters are counted from left to right. If k exceeds the number of characters in the result, the result is padded with blank spaces.

- As a multi-character x code, the first character of which is a #, %, or * character, followed by the k integer value. This code can be specified with or without delimiting parentheses. Thus "MD224", "MD22#4", and "MD22 (#4)" return the same results.

This syntax does not require explicit n and/or m values. Thus "MD4", "(4)", and MD004" return the same results.

This syntax allows you to apply x codes before or after selecting the character subset. Code characters are applied in left-to-right order. Therefore, any x codes specified to the left of the k code are included in the k count. x codes to the
right of the \( k \) code are applied after the \( k \) count. Thus by applying \( "MD22-#3-123456" \) returns the three characters \( "56-" \); the trailing minus sign is applied before the \( k \) count. Applying \( "MD22#3-" \) to \( "123456" \) returns the four characters \( "56-" \); the trailing minus sign is applied after the \( k \) count.

You can add a string suffix to the returned numeric string. Use the following syntax, with or without the enclosing parentheses: \( MD\text{num}(\#\text{kstring}) \), where \( \text{string} \) is one or more non-numeric characters. For example, to add the string suffix "salary" separated from the numeric by a single space: \( MD\text{22}$(\#\text{8 salary})" \) or \( MD\text{22}$\#\text{8 salary}" \).

You can add a fill character suffix to the returned numeric string. Use the following syntax, with or without the enclosing parentheses: \( MD\text{num}(\#\text{char}^\text{r}) \), where \( \text{char} \) is a single non-numeric character and \( r \) is an integer repetition count. For example, to add the fill character suffix \( "^^^^\" \) to the numeric: \( "MD\text{22}$(\#\text{8^5})\" \) or \( "MD\text{22}$\#\text{8^5}" \).

You can add multiple string suffixes and fill character suffixes. For example, to add the suffix \( "^^^URGENT^^^^\" \), you would specify \( "MD\text{22}$(\#\text{8^4URGENT^4})\" \).

### Range Extraction

The \( "Rn,m" \) code extracts positive numeric values within the specified range (inclusive). The \( n \) and \( m \) values specify the bounds of the range. They must be positive integers; 0 is a permitted value. A range may be in ascending or descending order (ascending is preferable when specifying multiple ranges). The \( n \) and \( m \) values may be the same value. If a number is within the range (inclusive of the \( n \) and \( m \) values) it is returned. If a number is not within the range, the empty string is returned. Signed numbers are returned with their sign; however, the only negative number that can be returned is \( -0 \).

Fractional numbers are evaluated as being larger than their integer (they are neither rounded nor truncated); thus 1.9 is not within the range 2,4 or in the range 0,1 but is within the range 1,2. An \( \text{istring} \) containing non-numeric characters is parsed as 0.

You can specify multiple ranges by separating each range pair with either a semicolon or a slash. Thus \( "R2,4;8,10" \) is a valid range which will return the integers 2, 3, 4, 8, 9, or 10. When specifying multiple ranges, each successive range must start at a number equal to or greater than the low value of the previous range. Thus \( "R2,4;6,10", "R2,4;3,6", \) or \( "R2,4;2,6" \) are valid range codes. \( "R2,4;1,6" \) is not a valid range code; only the first range is parsed as a range; the lower number of the second range is parsed, extending the first range downward. Thus \( "R2,4;2,6" \) returns 2, 3, 4, 5, or 6; \( "R2,4;1,6" \) returns 1, 2, 3, or 4.

### Masked String Conversion

The following are the codes for string and numeric conversions:

| Case conversion: converts the case of alphabetic characters in \( \text{istring} \); has no effect on non-alphabetic characters. "MCL" converts uppercase letters to lowercase. "MCU" converts lowercase letters to uppercase. | "MCL"  
<p>| &quot;MCU&quot; |
| --- | --- |
| Title case conversion: converts the initial letter of each word to uppercase, other letters converted to lowercase. The first letter following an apostrophe is also converted to uppercase, unless that letter is followed by a blank or other non-letter character (thus &quot;O’Brian’s Account&quot;, &quot;Three O’Clock&quot;). &quot;MCT&quot; has no effect on non-letter characters. | &quot;MCT&quot; |
| Mask Character Alphabetic: converts ( \text{istring} ) by removing all non-alphabetic characters, returning only the alphabetic characters. The inverse is &quot;MC/A&quot; which removes all alphabetic characters, returning only the non-alphabetic characters. | &quot;MCA&quot; |</p>
<table>
<thead>
<tr>
<th>Mask Character Both Alphabetic and Numeric: converts <em>istring</em> by removing all punctuation characters, returning only the alphabetic and numeric characters. The inverse is “MC/B” which removes all alphabetic and numeric characters, returning only the punctuation characters.</th>
<th>“MCB”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mask Character Numeric: converts <em>istring</em> by removing all non-numeric characters, returning only the number characters 0 through 9. (Note that plus and minus signs and the decimal point are removed.) The inverse is “MC/N”, which removes all number characters (0 through 9), returning only non-numeric characters.</td>
<td>“MCN”</td>
</tr>
<tr>
<td>Non-printable character conversion: converts <em>istring</em> by replacing each non-printable character with a period (.). It returns the resulting string of printable characters and periods.</td>
<td>“MCP”</td>
</tr>
<tr>
<td>Soundex conversion: represents the <em>istring</em> alphabetic string with a four-character Soundex representation. For further details, refer to the SOUNDEX function.</td>
<td>“S”</td>
</tr>
</tbody>
</table>
| Length conversion: “L” or “L0”: returns the number of characters in *istring*. “Ln”: returns the value of *istring* if *n* is exactly the number of characters in *istring*. Otherwise, returns the empty string. *n* must be a positive non-zero integer. “Ln-m” or “Ln,m”: returns the value of *istring* if the number of characters in *istring* is in the range *n* through *m* (inclusive). Otherwise, returns the empty string. *n* can be specified as zero in this syntax. | “L” or “L0”
“Ln”
“Ln-m” or “Ln,m” |
| Uniform string length adjustment: returns *istring* with trailing padding characters and/or text mark (@TM) insertions. *n* is an integer specifying the desired uniform string length and *x* is a single non-numeric padding character (for example, “7#” converts *istring* to one or more strings each string being 7 characters long). If *n* is larger than the length of *istring*, *OCONV* pads *istring* with *x* characters to a total length of *n* characters. If *n* is smaller than the length of *istring*, *OCONV* inserts @TM delimiters every *n* characters, optionally padding with *x* so that all delimited substrings are the same length. If *n* is the same as the length of *istring*, *istring* is returned unchanged. | “nx” |
Text substring extraction: a substring is extracted from istring based on a start position integer and a length integer. The start position integer is optional: if start is specified, length is counted left-to-right from that position; if start is omitted, length is counted right-to-left from the end of the string. If specified, start must be positive integer 1 or greater. length must be positive integer 0 or greater. If start exceeds the length of istring, the empty string is returned. If start is not specified and length equals or exceeds the length of istring the whole string is returned. If start is specified and length equals or exceeds the length of the istring counting from the start point, the substring from start to the end of the string is returned.

Group (delimited substring) extraction: a substring is extracted from istring, based on a specified delimiter character (d) found in istring that indicates the stopping point. The optional s integer specifies the number of delimiters to skip from the beginning of the string before starting the extract. The default is to start at the beginning of the string. The n integer specifies the number of delimiters to count in performing the extract. If n is larger than the number of d delimiters, the extract continues to the end of the string.

Pattern match extraction: returns an istring if it matches the pattern code; otherwise returns the empty string. A pattern code consists of a series of integer/letter pairs. The integer specifies the number of sequential characters to match with a specified character type; a 0 means to match any number (including 0) of characters. The letter specifies the character type: A=alphabetic, N=numeric, X=alphanumeric. These codes are not case-sensitive. You can also specify literal characters in the pattern code string. Some literals, including numbers and parentheses, must be specified enclosed in single quotes. (The MATCH operator provide similar pattern matching support.)

You can specify multiple patterns, separated by a semicolon (;) or a slash (/). Each pattern is enclosed in parentheses. OCONV returns the istring if it matches any of the specified patterns. For example, the following returns dates with either a one-digit or a two-digit month:

OCONV(‘06/11/2010’, ”P(2N/2N/4N);(1N/2N/4N)“)

**Group (Delimited Substring) Extraction**

You can extract a substring from istring based on a specified non-numeric delimiter character (d) found in istring. This delimiter is the stopping point for the extract operation. This delimiter cannot be a number or a dynamic array level.
delimiter character (@VM, @FM, etc.). The G conversion code extracts a substring until it encounters the specified delimiter character. The delimiter is not included in the extracted string. If the specified delimiter is not found in istring, the entire string is returned, unless you have specified a non-zero value for the optional s (skip) argument.

The optional s (skip) integer specifies the number of d delimiters to skip from the beginning of the string before starting the extract. The default is 0 (zero) which means to start extraction at the beginning of the string. If the specified delimiter is not found in istring and the optional s (skip) argument is specified as a non-zero integer value, the empty string is returned. If s is larger than the number of delimiters in istring the empty string is returned.

The n integer specifies the number of delimiters to count when extracting the substring. Substring extraction begins at the starting point established by s and continues until the specified number of delimiters is reached. If n is 1, the extract stops when the first delimiter is encountered. If n is 2, the extract stops when the second delimiter is encountered. Intermediate delimiters are included in the substring, but the final delimiter is not. If n is larger than the number of delimiters, the extract continues to the end of the string. If n is 0, the empty string is returned.

**Time and Date Conversion**

The following are the conversion codes for time and date conversion. If you specify optional code characters for date or time formatting, these characters must be specified in the order described below.

Internal dates are specified as the number of days elapsed since December 31, 1967. Dates prior to this are specified using a negative number of days. Internal times are specified as the number of seconds elapsed since midnight. Permitted values are 0 (00:00:00) through 86399 (23:59:59); higher numeric values result in an <ILLEGAL VALUE> error. OCONV accepts, but truncates, fractional seconds.
<table>
<thead>
<tr>
<th>Time conversion from internal format to display format.</th>
<th>&quot;MT&quot; returns the local time in 24–hour format \texttt{hh:mm}. You can append one or more of the following optional codes (in the following order): H=12 hour clock with AM or PM suffix. P=12 hour clock with AM or PM prefix. S=include seconds. Z=suppress leading zero from hour integer. A single character to be used as the time separator character, replacing the default colons. AM and PM letters are always displayed uppercase.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date conversion from internal format to display format.</td>
<td>&quot;D&quot; returns the local date in the format \texttt{dd MMM yyyy}, where MMM is the three-letter abbreviation for the month name. You can append one or more optional codes in the following sequence: The integers 0, 2, or 4 to specify the number of year digits (the default is 4). A character (such as /, –, or a space) to specify the date separator character; this cause the date to be displayed in an all-numeric format: \texttt{mm/dd/yyyy}. The \texttt{Z}=zero suppress code for leading zeros. The \texttt{E}=European format code for all-numeric format returns dates in European format \texttt{dd/mm/yyyy}, regardless of your locale (the default is to use the all-numeric date format for the locale). The letter \texttt{L}, to specify that abbreviated month names are displayed in mixed case (the default is all uppercase).</td>
</tr>
<tr>
<td>Date conversion from internal format to ODBC display format.</td>
<td>&quot;DS&quot; returns the date in the format \texttt{yyyy-mm-dd}. &quot;DMI&quot; returns the date in the format \texttt{yyyy mm dd}. You can optionally specify the integers 2 or 4 to specify the number of year digits (the default is 4).</td>
</tr>
<tr>
<td>Date conversion from external format to internal format.</td>
<td>&quot;DI&quot; converts a date in display format to internal format. The input date can be in any American all-numeric display format (with optional 2–digit or 4–digit years) or ODBC date format with 4–digit years. If you omit the year portion of the date, &quot;DI&quot; conversion assumes the current year. Refer to the ICONV function for further details on external to internal conversions.</td>
</tr>
<tr>
<td>Day extraction: The day of the month is extracted from a date specified in internal format.</td>
<td>&quot;DD&quot; returns the day of the month as a two-digit integer (08). &quot;DDM&quot; returns the day of the month and the month as two integers, separated by a space (August 6 = 06 08). Appending a \texttt{Z} to the code (&quot;DDZ&quot; or &quot;DDMZ&quot;) suppresses the leading zero for the day integer.</td>
</tr>
</tbody>
</table>
Month extraction: The month is extracted from a date specified in internal format.

"DM" returns the month as a two-digit integer (08).
"DMA" returns the full name of the month in uppercase letters (AUGUST).
"DMB" returns the 3–letter abbreviation for the month in uppercase letters (AUG).
Appending an L to the code ("DMAL" or "DMBL") returns the month name in mixed case letters.
However, letter case of month names and abbreviations is emulation-dependent (see below).
"DMR" returns the month as a Roman numeral.
Appending a Z to a code that returns the month as an integer suppresses the leading zero for the month integer.

Day of week extraction: The day of the week is extracted from a date specified in internal format.

"DW" returns the day of the week as an integer, counting Monday as day 1.
"DWA" returns the full name of the day in uppercase letters (SUNDAY).
"DWB" returns the 3–letter abbreviation for the day in uppercase letters (SUN).
Appending an L to the code ("DWAL" or "DWBL") returns the day name in mixed case letters.
However, letter case of day of week names and abbreviations is emulation-dependent (see below).

Year extraction: The year is extracted from a date specified in internal format.

"DY" (or "DN") returns the year portion of the date (2004).
"DY2" returns the year portion as a 2-digit date (04).
"DYA" and "DYAL" return the Chinese zodiac animal corresponding to the year.

Days of year extraction: The number of elapsed day in the year is extracted from a date specified in internal format.

"DJ" returns the elapsed days in the year as a 3-digit integer.
"DJZ" suppresses the leading zero(s) for the elapsed days integer.

Quarter / Season extraction: The quarter of the year is extracted from a date specified in internal format.

"DQ" returns the quarter of the year as an integer (Jan.-Mar. = 1).
"DQA" returns the name of the season in upper case, with Q1 = WINTER.
"DQAL" returns the name of the season in mixed case (Winter).

Date Extraction

Date extraction codes can be combined, with the date components displayed in the order specified, separated by a space, and the L or Z appended codes affecting the first specified component. For example, "DMD", "DMAD", "DMBD", "DMADL", and "DMBDL" return the month followed by the day integer. "DMY" returns the month and the year as two integers. "DMAY", "DMAYL", "DMBY", and "DMBYL" return the name of the month and the year. "DJM" returns the month and the elapsed days in the year as two integers. "DMW" returns the month and the day of the week as two integers. "DWD" returns the day of the week and the day of the month. "DWJ" returns the day of the week and the elapsed days in the year as two integers.

Caché MVBasic displays month names, day of week names, and their abbreviations as either all uppercase ("DMA", "DWA") or lowercase with the first letter capitalized ("DMAL", "DWAL"). In D3, MVBase, R83, POWER95, Ultimate, and UniData emulations, these names and abbreviations are always displayed as lowercase with the first letter capitalized.

Date Conversion

You can display a date in any of the following formats:

- Abbreviated month format, as shown in the following examples:
• Numeric format. The default day/month order is determined by the current Caché locale. The following examples use American format as the locale default:

OCONV('16000','D')   returns 21 OCT 2011
OCONV('16000','D2')  returns 21 OCT 11
OCONV('16000','DL')  returns 21 Oct 2011
OCONV('16000','D2L') returns 21 Oct 11

• ODBC format, as shown in the following examples:

OCONV('16000','DS')   returns 2011-10-21
OCONV('16000','DS2')  returns 11-10-21
OCONV('16000','DMI')  returns 2011 10 21
OCONV('16000','DMI2') returns 11 10 21

Note: You can specify the default date format using Caché NLS. Because of operational differences between MV and Caché NLS in the handling of month names, your NLS default date format must represent months as integers.

You can use the DATE function to supply the current date in internal format. The DATE and TIME functions return internal format values. The TIMEDATE function returns external format values.

An internal date is an integer count of days, with 0 representing December 31, 1967. If you specify a fractional number for an internal date, it is truncated to an integer. If you specify a non-numeric value for an internal date, it is returned unchanged.

Dates earlier than December 31, 1967 can be represented using negative numbers. The largest permitted internal date is 2933628, which represents December 31, 9999. The smallest permitted internal date is -46385, which represents December 31, 1840.

The expansion of two-digit years to four digits is governed by the MultiValue CENTURY.PIVOT verb, described in Operational Differences Between MultiValue and Caché.

Arithmetic and Logical Operations

The 'A' conversion code can be used for a variety of operations, including arithmetic, equality comparison of numbers or strings, collation order comparison, current date and time arithmetic or equality comparison, and string concatenation. The 'A' conversion code is followed by its operands; 'A' is separated from its operands by either a blank space or a semicolon.

All 'A' operations ignore the istring value, and operate on the values following the 'A' code. For example, an addition operation is performed as follows:

PRINT OCONV(123,"A '5'+'6'");   ! returns 11

Note that the istring value must be present but is not used; it could just as easily be an alphabetic string or an empty string placeholder. Also note that numeric literals must be enclosed by delimiters; you may use double quotes ("), single quotes ('), or backslashes (\) to enclose the code string. Within the code string you may use double quotes (") or single quotes (') as literal delimiters.

'A' conversion code operations only process one multivalue at a time. When using 'A' with a multivalue, you must set up the following @ variables: @RECORD = item to get data from; @ID = item Id to use for attribute 0; @NV = specific multivalue to use; @NS = specific subvalue to use.

The following are supported arithmetic and logical operators:
**Addition:** "A 'n'+'m'"

**Subtraction:** "A 'n'-'m'"

**Multiplication:** "A 'n'*'m'"

**Division:** "A 'n'/'m'". Division is integer division only; neither fractions nor a remainder are returned. Dividing a number by 0 returns 0.

**Remainder:** "A R('n','m')". Returns the remainder of dividing n by m as an integer or fractional number. Attempting to divide by zero results in a <DIVIDE> error.

**Equal to:** "A 'n'='m'". Returns either 0 (not equal) or 1 (equal). Can compare numeric or non-numeric strings for equality. Numbers are compared in canonical form; plus signs and leading and trailing zeros are ignored.

**Not Equal to:** "A 'n'#'m'". Returns either 0 (equal) or 1 (not equal). Can compare numeric or non-numeric strings for equality. Numbers are compared in canonical form; plus signs and leading and trailing zeros are ignored.

**Less Than:** "A 'n'<'m'". Returns either 0 or 1. Compares collation sequence of non-numeric strings.

**Greater Than:** "A 'n'>'m'". Returns either 0 or 1. Compares collation sequence of non-numeric strings.

**Less Than or Equal to:** "A 'n'<='m'". Returns either 0 or 1. Compares collation sequence of non-numeric strings.

**Greater Than or Equal to:** "A 'n'>='m'". Returns either 0 or 1. Compares collation sequence of non-numeric strings.

By default, Caché MVBasic order of operations is to perform division, then multiplication, then subtraction, then addition, then equality/inequality tests. You can change this order of operations by using parentheses to nest operations. Note that ObjectScript uses a different order of operations; it uses strict left-to-right evaluation of operators.

You can use the AND and OR logical operators to group multiple equality/inequality operations.

```
PRINT OCONV(123,"A '5'='6' OR '3'<'7'" );   ! returns 1
```

You can use IF, THEN, and ELSE functions with an equality/inequality operation to return a user-specified result. You must specify a THEN function (boolean 1). The ELSE function is optional; if ELSE is omitted, boolean 0 returns the empty string.

```
PRINT OCONV(123,"A IF('5'='6') THEN('equal') ELSE('not equal')");   ! returns 'not equal'

PRINT OCONV(123,"A IF('5'='6') THEN('equal')");   ! returns empty string
```

You can use the D and T variables to specify the current date or time in arithmetic or logical operations. Dates and times are represented in internal format as integers:

```
PRINT OCONV(123,"A D+'7'");   ! returns the current date plus 7 days
```

This example returns a value such as 15622.

Caché MVBasic provides additional operators, as described in the Operators page of this manual.
String Concatenation and Delimiter Insertion

You can use either the 'A' code or the 'C' code for string concatenation. These codes can concatenate multiple substrings into a single string. In both cases, the concatenation operands follow the letter code.

'A' Code Concatenation

'A' is used for simple concatenation, using the colon character. For example, the following returns 'quickbrownfox':

```
PRINT OCONV(123,'A;'quick':'brown':'fox'"
```

Although the istring is required, it is always ignored by the 'A' conversion code. The istring can be any value, including an empty string.

'C' Code Concatenation with Insertion

'C' is used for concatenation that inserts a single-character delimiter. For example, the following returns 'quick^brown^fox':

```
PRINT OCONV(123,'C;'quick'^'brown'^'fox'"
```

'C' is also used for concatenation that inserts the istring value as specified by the asterisk wildcard.

The character following the 'C' code must be a semicolon; you cannot separate 'C' from its operands with a blank space.

Although the istring is required, the 'C' code ignores the istring value unless you specify an asterisk wildcard (as described below). The istring can be any value, except an empty string.

The 'C' code can specify the same single-character delimiter, or different single-character delimiters between items. For example, the following returns 'quick^brown*fox':

```
PRINT OCONV(123,'C;'quick'^'brown'*'fox'"
```

You can specify almost any single character, including the blank space, as a delimiter when concatenating substrings into a string. You can specify a string delimiter (single quote, double quote, or backslash) if that delimiter is not already in use. For example, the following returns 'quick"brown"fox':

```
PRINT OCONV(123,'C;'quick"'brown"'fox""
```

The semicolon is a special case. The semicolon is used to specify concatenation with no inserted delimiter. For example, the following returns 'quick^brownfox':

```
PRINT OCONV(123,'C;'quick''brown''fox"
```

The colon, which elsewhere in MultiValue is a concatenation operator, is here simply a literal character. For example, the following returns 'quick:brownfox':

```
PRINT OCONV(123,'C;'quick':brown':'fox"
```

The 'C' code can insert the istring value in to the returned string by using an asterisk as a substring wildcard. An asterisk can be used as either an inserted delimiter or a wildcard.

The following example uses the asterisk as an inserted delimiter. It returns 'quick*fox*dog':

```
PRINT OCONV('red','C;'quick'*'fox'*'dog"
```

The following example uses blank spaces as the inserted delimiters, and uses the asterisk as a wildcard for the istring value. It returns 'quick red fox red dog':

```
PRINT OCONV('red','C;'quick' + 'fox' + 'dog"
```

You can use an asterisk wildcard to specify the substring delimiter in istring. This wildcard delimiter can be a single character or a multiple character string. It can be a dynamic array delimiter variable, such as @FM. It can even be a semicolon.
The following example uses asterisks to specify the substring delimiter as a wildcard, with its value supplied by istring. It returns ‘quick^^brown^^fox’:

PRINT OCONV('^^',"C;'quick';*;'brown';*;'fox'")

The following example uses asterisks to specify the substring delimiter as a wildcard, with a semicolon as the istring value. It returns ‘quick;brown;fox’:

PRINT OCONV(';',"C;'quick';*;'brown';*;'fox'")

The following example uses asterisks to specify the substring delimiter as a wildcard, with @FM (the field mark delimiter) as the istring value:

PRINT OCONV(@FM,"C;'quick';*;'brown';*;'fox'")

**Dynamic Array Element Extraction**

You can use the 'ZVn' code to extract a single value mark element from a dynamic array. Here n is a positive integer specifying the position of the element in the dynamic array, counting from 1. Specifying a n value of 0 returns the entire dynamic array. Specifying a n value larger than the number of elements in the dynamic array returns the null string.

The following program returns the string “Barney”:

```
x="Fred":@VM:"Barney":@VM:"Wilma"
CRT OCONV(x,"ZV2")
```

**Implicit Formatting**

Many OCONV conversion codes are identical to FMT formatting codes. You can, therefore, perform many of the OCONV conversions using implicit formatting. Implicit formatting simply specifies the code value as the second argument in a CRT, DISPLAY, or PRINT statement. It is functionally identical to explicit formatting using the FMT function. For example, the following are equivalent date conversions:

```
PRINT OCONV(14100,"D");   ! "08 AUG 2006"
PRINT 14100 "D";          ! "08 AUG 2006"
PRINT FMT(14100,"D");     ! "08 AUG 2006"
```

When there is a difference between OCONV conversion and FMT formatting, implicit formatting behaves like FMT:

- Because the letters "L" and "R" are used as FMT formatting codes, the OCONV length ("L", "Ln", "Ln-m" or "Ln,m") and range ("Rn,m") conversion codes cannot be used for implicit formatting.
- The "MLn" and "MRn" conversion codes are not the same as the corresponding format codes. In OCONV these conversion codes move the decimal point the specified number of digits. In FMT (and implicit formatting) these codes append the specified number of fractional digits. Thus:

```
PRINT OCONV(12345,"ML2");   ! "123.45"
PRINT 12345 "ML2";          ! "12345.00"
PRINT FMT(12345,"ML2");     ! "12345.00"
```

The "MDn" code is the same for both OCONV and FMT. Thus:

```
PRINT OCONV(12345,"MD2");   ! "123.45"
PRINT 12345 "MD2";          ! "123.45"
PRINT FMT(12345,"MD2");     ! "123.45"
```

**Examples**

The following example shows date conversions:
DateConversions:
! Month Abbreviation Formats:
PRINT OCONV(0,"D"); ! "31 DEC 1967"
PRINT OCONV(14100,"D"); ! "08 AUG 2006"
PRINT OCONV(14100,"D2"); ! "08 AUG 06"
PRINT OCONV(DATE(),"D"); ! current date, for example "20 APR 2011"
PRINT OCONV(14120,"D-"); ! "08-28-2006"
PRINT OCONV(14120,"D/"); ! "08/28/2006"
PRINT OCONV(14120,"D")! "28/08/2006"
PRINT OCONV(14120,"D2")! "28-08/06"
PRINT OCONV(14120,"D2-E")! "28-08-06"

The following example shows time conversions:

TimeConversions:
PRINT OCONV(0,"MT") ! "00:00"
PRINT OCONV(TIME(),"MT") ! current time, for example "21:02"
PRINT OCONV(TIME(),"MTH") ! current time, for example "09:02PM"
PRINT OCONV(TIME(),"MTS") ! current time, for example "21:02:41"
PRINT OCONV(TIME(),"MTS.") ! current time, for example "21.02.41"
PRINT OCONV(TIME(),"MTHS*") ! current time, for example "09*02*41PM"

The following example shows case conversions:

CaseConversions:
mystr="The qUICK BrOwn foX"
PRINT OCONV(mystr,"MCU") ! Returns: THE QUICK BROWN FOX
PRINT OCONV(mystr,"MCL") ! Returns: the quick brown fox
PRINT OCONV(mystr,"MCT") ! Returns: The Quick Brown Fox

The following example shows decimal-to-hex and hex-to-decimal conversions. It shows both the OCONV conversions and the inverse ICONV conversions:

HexConversions:
PRINT OCONV(10,"MCXD"); ! Returns 16
PRINT OCONV("10","MCXD"); ! Returns A
PRINT ICONV(10,"MCXD"); ! Returns A
PRINT ICONV("10","MCXD"); ! Returns 16

The following example shows character-to-code and code-to-character conversions. It shows both the OCONV conversions and the inverse ICONV conversions:

CharConversions:
PRINT OCONV("mnop","MCAX"); ! Returns 6D6E6F70
PRINT OCONV("6D6E6F70","MCXA"); ! Returns mnop
PRINT ICONV("mnop","MCXA"); ! Returns 6D6E6F70
PRINT ICONV("6D6E6F70","MCAX"); ! Returns mnop

The following example shows masked decimal conversions with moving of the decimal point, rounding or truncation to the specified number of fractional digits, and zero padding when needed. The first integer (n) is number of fractional digits, the second integer (m) is the leftward shift of the decimal point, the third integer (k or #k) is a returned character count mask.

MaskedDecimalConversions:
PRINT OCONV("123456","MD2"); ! Returns 1234.56 n=2 m=n by default
PRINT OCONV("123456","MD12"); ! Returns 1234.6 n=1 m=2 round by default
PRINT OCONV("123456","MD12T"); ! Returns 1234.5 n=1 m=2 T=truncate
PRINT OCONV("123456","MD12T$"!! Returns $1234.5 n=1 m=2 $=append dollar sign
PRINT OCONV("123456","MD12T,""); ! Returns $1,234.5 n=1 m=2 ,=add numeric group separator(s)
PRINT OCONV("123456","MD12T#3"); ! Returns .5 n=1 m=2 #=k=3 char mask
PRINT OCONV("123456","MD37"); ! Returns 0.012 n=3 m=7 zero padding
PRINT OCONV("123456","MD374"); ! Returns .012 n=3 m=7 k=4 char mask

The following example shows length conversions:
LengthConversions:
PRINT OCONV("abcd","L"); ! Returns 4
PRINT OCONV("abcd","L0"); ! Returns 4
PRINT OCONV("abcd","L4"); ! Returns "abcd"
PRINT OCONV("abcd","L3"); ! Returns empty string
PRINT OCONV("abcd","L5"); ! Returns empty string
PRINT OCONV("abcd","L4-4"); ! Returns "abcd"
PRINT OCONV("abcd","L0-5"); ! Returns "abcd"
PRINT OCONV("abcd","L4-6"); ! Returns "abcd"
PRINT OCONV("abcd","L4-4"); ! Returns "abcd"
PRINT OCONV("abcd","L5-9"); ! Returns empty string

The following example shows pattern match extraction. It returns the input string if it matches the specified pattern. These examples perform pattern matches on 7 and 10 digit telephone numbers specified in the following commonly used formats: "123–4567", "617-123-4567", and "(617) 123-4567":

PatternMatch:
PRINT OCONV(telnum,"P(3n-3n-4n)")
! matches and returns 10-digit numbers
! in hyphen format
PRINT OCONV(telnum,"P(3n-4n);(3n-3n-4n)"
! matches and returns either 7-digit or 10-digit numbers
! in hyphen format.
PRINT OCONV(telnum,"P(3n-3n-4n);('3n') 3n-4n)"
! matches and returns 10-digit numbers
! in either hyphen or parentheses formats.
PRINT OCONV(telnum,"P('617'-3n-4n);('(617)' 3n-4n)"
! matches and returns 10-digit numbers
! in either hyphen or parentheses formats
! that begin with the 617 area code.

See Also
• ICONV function
• OCONVS function
• FMT function
• STATUS function
• DATE function
• TIME function
• TIMEDATE function
• DOWNCASE function
• UPCASE function
• Strings
• MATCH Pattern Match operator
OCONVS

Converts dynamic array element values from internal format to external format.

OCONVS(idynarray, code)

Arguments

| idynarray | An expression that resolves to a dynamic array, each element of which specifies a value in internal (storage) format. |
| code      | An expression that resolves to a conversion code string. This conversion code specifies the type of conversion to perform. Conversion is from internal format to external format. Conversion codes are not case-sensitive. For descriptions of these code values, refer to the OCONV function. For a complete list of conversion codes, refer to the Conversion Codes table in the MultiValue Basic Quick Reference. |

Description

The OCONVS function is a general-purpose conversion function used to convert the elements of a dynamic array from internal (storage) format to external (output) format. The type of conversion is specified by a code string that is specific to the type of data to be converted.

The OCONVS function converts dynamic array element values from internal format to external format. The ICONVS function converts dynamic array element values from external format to internal format. Note that the MCDX/MCXD, MCAX/MCXA, and MCWX/MCXW code pairs have the opposite meanings in ICONVS, reversing the OCONVS operation.

You can use the OCONV function to perform conversions for a single value. For available code values, further details on conversions, and additional program examples, refer to the OCONV function.

Examples

The following example shows date conversions:

```
DateConversions:
x=14143:@VM:14144:@VM:14145
PRINT OCONVS(x,"D")
! Returns 20 SEP 2006ý21 SEP 2006ý22 SEP 2006
```

The following example shows character-to-hexcode and hexcode-to-character conversions. It shows both the OCONVS conversions and the inverse ICONVS conversions:

```
CharConversions:
odyn="m":@VM:"n":@VM:"o":@VM:"p"
idyn=OCONVS(odyn,"MCAX")
PRINT idyn; ! Returns 6Dý6Eý6Fý70
PRINT OCONVS(idyn,"MCXA"); ! Returns mýnýoýp
PRINT ICONVS(odyn,"MCXA"); ! Returns 6Dý6Eý6Fý70
PRINT ICONVS(idyn,"MCAX"); ! Returns mýnýoýp
```

See Also

- OCONV function
- ICONVS function
- STATUS function
- DATE function
• TIME function
• TIMEDATE function
• DOWNCASE function
• UPCASE function
• Dynamic Arrays
• MATCH Pattern Match operator
$ORDER ($O)

Returns the next local variable or the subscript of a local or global variable.

$ORDER(variable,direction,target)
$O(variable,direction,target)

**Parameters**

<table>
<thead>
<tr>
<th>parameter</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable</td>
<td>Either a local variable or a subscripted local, global, or process-private global variable. If an array, the subscript is required. You cannot specify just the array name. variable may be specified as a variable or an object property with the syntax obj-&gt;property.</td>
</tr>
<tr>
<td>direction</td>
<td>Optional — The subscript order in which to traverse the target array. An expression that resolves to either: 1 = ascending subscript order (the default) or -1 = descending subscript order. For unsubscripted local variables, 1 (the default) is the only permitted value.</td>
</tr>
<tr>
<td>target</td>
<td>Optional — Returns the current data value of the next or previous node of variable. Whether it is the next or previous depends on the setting of direction. You must specify a direction value to specify a target. For unsubscripted local variables, direction must be set to 1. If variable is undefined, the target value remains unchanged. target may be specified as a variable or an object property with the syntax obj-&gt;property. The target parameter cannot be used with structured system variables (SSVNs) such as ^$ROUTINE.</td>
</tr>
</tbody>
</table>

**Description**

The value $ORDER returns depends on the parameters used.

- **$ORDER**(variable) returns the number of the next defined subscript if variable is a subscripted variable. The returned subscript is at the same level as that specified for the variable. For example, $ORDER(^client(4,1,2)) returns the next subscript (3), assuming that ^client(4,1,3) exists.

- **$ORDER**(variable) returns the name of the next defined local variable in alphabetic collating sequence, if variable is an unsubscripted local variable. For example, $ORDER would return the following defined local variables in the following sequence: a, a0a, a1, a1a, aa, b, bb, c.

- **$ORDER**(variable,direction) returns either the next or the previous subscript for the variable. You can specify direction as 1 (next, the default) or -1 (previous).

  For unsubscripted local variables, $ORDER returns variables in direction 1 (next) order only; you cannot specify a direction of -1 (previous).

- **$ORDER**(variable,direction,target) returns the subscript for the variable, and sets target to its current data value. This can be either the next or the previous subscript for a subscripted variable, depending on the direction setting. For an unsubscripted local variable, direction must be set to 1 to return the current data value to target. The target parameter cannot be used with structured system variables (SSVNs) such as ^$ROUTINE.

**Examples**

The following example lists the name and value of the next defined global variable subscript after variable ^fruit(1):
The following example returns 1, the first subscript in ^X. It sets the naked indicator to the first level.

```
^x(1,2,3)="1"
^x(2)="2"
PRINT $ORDER(^x(-1))
```

The following example returns 2, the next subscript on the single subscripted level. (The node you specify in the argument need not exist.) The naked indicator is still set to the first level.

```
^x(1,2,3)="1"
^x(2)="2"
PRINT $ORDER(^x(1))
```

The following example returns 2, the first subscript on the two-subscript level. The naked indicator is now set at the second level.

```
^x(1,2,3)="1"
^x(2)="2"
PRINT $ORDER(^x(1,-1))
```

The following example uses $ORDER to list all of the primary subscripts in the ^data global:

```
^data(1)="a"
^data(3)="c"
^data(7)="g"
! Get first subscript
key=$ORDER(^data("")
! Get next subscript
key=$ORDER(^data(key))
```

In the following example, a multidimensional property is used as the variable value. This example returns the names of defined namespaces to the target parameter:

```
obj = "%ResultSet"->%New("%SYS.Namespace:List")
obj->Execute()
obj->Next()
rtm = $ORDER(obj->Data(x),1,val)
crt rtm ! returns level "Nsp"
crt val ! returns namespace name
obj->Next()
rtm = $ORDER(obj->Data(x),1,val)
crt val ! returns next namespace name
obj->Next()
rtm = $ORDER(obj->Data(x),1,val)
crt val ! returns next namespace name
```

Similar programs return the same information using the $GET and $DATA functions.

**Notes**

**Uses for $ORDER**

$ORDER is typically used with loop processing to traverse the nodes in a sparse array. A sparse array is an array that may contain undefined nodes on any given level. Unlike the $DATA function, $ORDER simply skips over undefined nodes to return the subscript of the next existing node. For example:

```
struct=""
FOR {   
  struct=$ORDER("client(struct))
QUIT:struct=""
PRINT ^client(struct)
}
```
The above routine writes the values for all the top-level nodes in the ^client global array.

$ORDER skips over undefined nodes, but not nodes that contain no data. Such nodes include both pointer nodes and terminal nodes. If you use $ORDER in a loop to feed a command (such as PRINT) that expects data, you must include a $DATA check for dataless nodes.

**Start and End for a Search**

To start a search from the beginning of the current level, specify a null string (""") for the subscript. This technique is required if the level may contain negative as well as positive subscripts. The following example returns the first subscript on the array level:

```caché
s=$ORDER(^client(""))
PRINT s
```

When $ORDER reaches the end of the subscripts for the given level, it returns a null string ("""). If you use $ORDER in a loop, your code should always include a test for this value.

**$ORDER Uses Naked Global Reference**

Like the $NAME and $QUERY functions, $ORDER can be used with a naked global reference, which is specified without the array name and designates the most recently executed global reference. For example:

```caché
var1=^client(4,5)
var2=$ORDER(^(""))
PRINT "var1=",var1,"var2=",var2
```

The first SET command establishes the current global reference, including the subscript level for the reference. The $ORDER function uses a naked global reference to return the first subscript for this level. For example, it might return the value 1, indicating ^client(4,1).

For more details, see Naked Global Reference in Using Caché Globals.

**$ORDER and $NEXT**

$ORDER is similar to $NEXT. Both functions return the subscripts of the next sibling in collating order to the specified node. However, $ORDER and $NEXT have different start and failure codes, as follows:

<table>
<thead>
<tr>
<th></th>
<th>$NEXT</th>
<th>$ORDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting point</td>
<td>-1</td>
<td>Null string</td>
</tr>
<tr>
<td>Failure code</td>
<td>-1</td>
<td>Null String</td>
</tr>
</tbody>
</table>

Because $ORDER starts and fails on the null string, it correctly returns nodes having both negative and positive subscripts.

**See Also**

- $DATA function
- $GET function
- Global Structure chapter in Using Caché Globals
ORS

Returns the logical OR of corresponding elements of two dynamic arrays.

ORS(dynarray1,dynarray2)

Arguments

| dynarray | An expression that resolves to a dynamic array of boolean values. |

Description

The ORS function performs a logical OR test on the corresponding element values of dynarray1 and dynarray2. If either element value is a non-zero numeric value, ORS returns 1 for that element. Otherwise, ORS returns 0. If an element value is missing, a null string, or a string containing any non-numeric value, ORS parses its value as 0.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the logical comparison. You can also use the REUSE function to define behavior when specifying two dynamic arrays with different numbers of elements.

Caché MVBasic also supports the logical operators ! and OR.

Examples

The following example uses the ORS function to compare two dynamic arrays. It returns 1 when either element value is non-zero:

```
a=1:@VM:0:@VM:33:@VM:0
b=10:@VM:9:@VM:1:@VM:0
PRINT ORS(a,b)
! returns 1ý1ý1ý0
```

The following example performs an OR test on two dynamic arrays of different lengths:

```
a=1:@VM:0:@VM:1:@VM:0
b=1:@VM:1:@VM:1:@VM:1:@VM:1:@VM:0
PRINT ANDS(a,b)
! returns 1ý1ý1ý1ý1ý0
```

See Also

- ANDS function
- NOTS function
- Dynamic Arrays
- Operators
PWR

Returns a number raised to a power.

\[ \text{PWR}(\text{num}, \text{exponent}) \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>num</td>
<td>The base number. An expression that resolves to a numeric, specified either as a number or as a numeric string. If ( \text{num} ) is 0, ( \text{exponent} ) must be non-negative. If ( \text{num} ) is negative, ( \text{exponent} ) must be an integer.</td>
</tr>
<tr>
<td>exponent</td>
<td>The exponent. An expression that resolves to a numeric, specified either as a number or as a numeric string.</td>
</tr>
</tbody>
</table>

**Description**

The `PWR` function raises \( \text{num} \) to the power specified by \( \text{exponent} \). Both numeric values can be expressed as either numbers or as strings. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and null strings are parsed as 0.

Any non-zero \( \text{num} \) raised to an \( \text{exponent} \) of 0 returns 1. If \( \text{num} \) and \( \text{exponent} \) are both 0, `PWR` returns 0. If \( \text{num} \) is 0 and \( \text{exponent} \) is a negative number, `PWR` generates an `<ILLEGAL VALUE>` error. If \( \text{num} \) is a negative number and \( \text{exponent} \) is a fractional number, `PWR` generates an `<ILLEGAL VALUE>` error.

Very large positive \( \text{exponent} \) values (such as `PWR(9,153)`) or very small \( \text{num} \) values with a negative \( \text{exponent} \) (such as `PWR(.00005,-30)`) may result in an overflow, generating a `<MAXNUMBER>` error. Very large negative \( \text{exponent} \) values (such as `PWR(9,-135)`) or very small \( \text{num} \) values with a positive \( \text{exponent} \) (such as `PWR(.00005,30)`) may result in an underflow, returning 0.

The same operation can be performed using the exponentiation operator: **. To perform exponentiation on the elements of a dynamic array, use the `PWRS` function.

**See Also**

- `PWRS` function
- `SQRT` function
- `FMUL` function
- `SMUL` function
- Operators
## PWRS

Returns the elements of a dynamic array raised to a power.

**PWRS(dynarray,exponents)**

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to a dynamic array of numeric values. Each element in <code>dynarray</code> is raised to the exponent in the corresponding element of the <code>exponents</code> dynamic array. If an element value is 0, the corresponding <code>exponents</code> element must be non-negative. If an element is negative, the corresponding <code>exponents</code> element must be an integer.</td>
</tr>
<tr>
<td>exponents</td>
<td>The exponents to apply to the <code>dynarray</code> elements. An expression that resolves to a dynamic array of numeric values.</td>
</tr>
</tbody>
</table>

### Description

The `PWRS` function raises each element of `dynarray` to the power specified by the corresponding element of the `exponents` dynamic array. Both numeric values can be expressed as either numbers or as strings. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

If the two dynamic arrays have different numbers of elements, by default the shorter dynamic array) is padded so that the returned dynamic array has the number of elements of the longer dynamic array. If the shorter dynamic array is the value to be raised, it is padded with the required number of elements with the value of 0. If the shorter dynamic array is the exponents, it is padded with the required number of elements with the value of 1. You can also use the `REUSE` function to define behavior when specifying two dynamic arrays with different numbers of elements.

**Note:** In the `exponents` dynamic array, missing elements and elements with a null string or non-numeric string value are parsed as 1. This parsing differs from the `PWR` function and other MultiValue numeric functions and operators, which parse non-numerics as 0.

Any non-zero numeric element value raised to an exponent of 0 returns 1. If the corresponding `dynarray` and `exponents` elements are both 0, `PWRS` returns 0 for that element. If the `dynarray` element is 0 and the corresponding `exponents` element is a negative number, `PWRS` generates an `<ILLEGAL VALUE>` error. If the `dynarray` element is a negative number and the corresponding `exponents` element is a fractional number, `PWRS` generates an `<ILLEGAL VALUE>` error.

A very large positive `exponents` element value (such as 135), or a very small `dynarray` element value (such as .00005) with a corresponding negative `exponents` element (such as -30) may result in an overflow, generating a `<MAXNUMBER>` error. A very large negative `exponents` element value (such as -135), or a very small `dynarray` element value (such as .00005) with a corresponding positive `exponents` element (such as 30) may result in an underflow, returning 0.

To return the exponent of a single value raised to a power, use the `PWR` function or the `**` operator.

### Example

The following example returns the value of each element in `mynums` raised to the corresponding element in `myexps`:

```plaintext
mynums=1:0VM:2:0VM:3:0VM:4:0VM:5
myexps=2:0VM:3:0VM:2:0VM:3:0VM:2
crt PWRS(mynums,myexps)
! returns: 1y8y9y6y4y25
```
See Also

- PWR function
- MULS function
- SQRT function
- Operators
QUOTE

Encloses a value in double quotation marks.

QUOTE(string)

Arguments

| string | An expression that resolves to a string or a number. string may be a dynamic array. |

Description

The QUOTE function returns string enclosed in double quotation marks. The quotation marks are part of the resulting string. Therefore, using QUOTE increases the length of string by 2 characters. If string is the null string (""), QUOTE returns a string consisting of two quotation mark characters, a string with a length of 2. This should not be confused with the null string (""), which has a length of 0.

The QUOTE function converts a numeric to canonical form before enclosing it in quotation marks. QUOTE does not convert a numeric string to canonical form.

The DQUOTE function is functionally identical to QUOTE. The SQUOTE function is similar, except that it encloses string with single quotation marks, rather than double quotation marks.

Examples

The following example uses the QUOTE function to convert a numeric to a string enclosed in double quotation marks:

```vbscript
quoted = QUOTE(+007.000)
PRINT quoted;     ! Returns "7"
PRINT LEN(quoted); ! Returns 3
```

The following example uses the QUOTE function to enclose a string in double quotation marks:

```vbscript
str1 = "Hello"
str2 = 'Hello'
str3 = \\Hello\\
PRINT str1:str2:str3;  ! Returns HelloHelloHello
PRINT LEN(str1),LEN(str2),LEN(str3);  ! Returns 5  5  5
q1 = QUOTE(str1)
q2 = QUOTE(str2)
q3 = QUOTE(str3)
PRINT q1:q2:q3;       ! Returns "Hello""Hello""Hello"
PRINT LEN(q1),LEN(q2),LEN(q3);    ! Returns 7  7  7
```

Note that the quote marks are not simply string delimiters, but are part of the returned string.

See Also

- DQUOTE function
- SQUOTE function
- LEN function
- PRINT statement
RAISE

Raises dynamic array delimiters to next level.

**RAISE**(dynarray)

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |

**Description**

The **RAISE** function returns a dynamic array with its delimiters converted to the next higher-level delimiters. For example, @SM subvalue mark delimiters become @VM value mark delimiters. When a delimiter cannot be raised any further, it is returned unchanged. **RAISE** returns a non-dynamic array value unchanged.

The available levels, in ascending order, are: CHAR(250); @TM (CHAR(251)); @SM (CHAR(252)); @VM (CHAR(253)); @FM (CHAR(254)); and @IM (CHAR(255)).

The **LOWER** function performs the opposite operation, lowering the level of dynamic array delimiters to the next lower level.

**Examples**

The following example uses the **RAISE** function to convert dynamic array delimiters to the next higher level. It then uses the **LOWER** function to reverse this operation:

```
numsm=123:@SM:456:@SM:789:@SM:"10":@SM:"11"
PRINT numsm;  ! Returns 123ü456ü10ü11
numraise = RAISE(numsm)
PRINT numraise;  ! Returns 123ý456ý10ý11
numlower = LOWER(numraise)
PRINT numlower;  ! Returns 123ü456ü10ü11
```

**See Also**

- **LOWER** function
- Dynamic Arrays
**RECORDLOCKED**

Returns the lock status for a record or file.

```markdown
RECORDLOCKED(filevar, recID)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>filevar</td>
<td>A file variable name used to refer to a MultiValue file. This <code>filevar</code> is supplied by the <code>OPEN</code> statement. <code>filevar</code> must be specified as a literal.</td>
</tr>
<tr>
<td>recID</td>
<td>The record ID of the record to be checked for lock status. An expression that resolves to an integer.</td>
</tr>
</tbody>
</table>

**Description**

The **RECORDLOCKED** function returns an integer code specifying the lock status of the specified record or file. The following are the return codes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>This user has a file lock (shared or exclusive).</td>
</tr>
<tr>
<td>2</td>
<td>This user has an update record lock.</td>
</tr>
<tr>
<td>1</td>
<td>This user has a shared record lock.</td>
</tr>
<tr>
<td>0</td>
<td>This record is not locked.</td>
</tr>
<tr>
<td>-1</td>
<td>Another user has a shared record lock.</td>
</tr>
<tr>
<td>-2</td>
<td>Another user has an update record lock.</td>
</tr>
<tr>
<td>-3</td>
<td>Another user has a file lock (shared or exclusive).</td>
</tr>
</tbody>
</table>

If the specified file has both a file lock and a record lock, **RECORDLOCKED** returns the record lock code.

Invoking the **RECORDLOCKED** function sets the **STATUS** function to the job number of the job that holds the lock. If the lock is a shared lock, **STATUS** returns the job number of the first job found. If the current user shares the lock with another user, **STATUS** returns the other user's job.

**File and Record Locking and Unlocking**

To lock a file, use the **FILELOCK** statement. To unlock a file, use the **FILEUNLOCK** statement.

To lock a record, use the **RECORDLOCKU** (update lock) or **RECORDLOCKL** (shared lock) statement. To unlock a record, use the **RELEASE** statement.

**See Also**

- **OPEN** statement
- **STATUS** statement
- **STATUS** function
**REM**

Remainder after integer division of two values.

```
REM(numstr1,numstr2)
```

**Arguments**

<table>
<thead>
<tr>
<th>numstr1</th>
<th>The dividend. An expression that resolves to a number or numeric string.</th>
</tr>
</thead>
<tbody>
<tr>
<td>numstr2</td>
<td>The divisor. An expression that resolves to a non-zero number or numeric string.</td>
</tr>
</tbody>
</table>

**Description**

The REM function divides the value of `numstr1` by `numstr2`, and returns the remainder following integer division (modulo) that results from this division. If a `numstr` value is the null string or a non-numeric value, REM parses its value as 0 (zero). You cannot divide a number by 0. Attempting to do so results in a <DIVIDE> error.

The MOD function is functionally identical to the REM function. You can use the MODS function to perform modulo division on the elements of a dynamic array.

**Note:** Caché MVBasic contains both a REM (remarks) statement and a REM (remainder) function. These are completely unrelated and should not be confused.

**Examples**

The following examples use the REM function to return the remainder value for an integer division operation:

```
PRINT REM(10,5);  ! returns 0
PRINT REM(10,4);  ! returns 2
PRINT REM(10,3);  ! returns 1
PRINT REM(10,6);  ! returns 4
PRINT REM(10,-6); ! returns 4
PRINT REM(10,11); ! returns 10
```

**See Also**

- DIVS function
- MOD function
- MODS function
**REMOVE**

Extracts sequential elements of a dynamic array.

```
REMOVE(dynarray, delimcode)
```

**Arguments**

<table>
<thead>
<tr>
<th>dynarray</th>
<th>An expression that resolves to a dynamic array from which successive data values are to be extracted.</th>
</tr>
</thead>
<tbody>
<tr>
<td>delimcode</td>
<td>A local variable used to receive an integer code for the dynamic array delimiter type. <code>delimcode</code> cannot be a global variable or a subscripted variable.</td>
</tr>
</tbody>
</table>

**Description**

The **REMOVE** function efficiently extracts successive data values from a dynamic array. The extracted element value is returned. The delimiter type is placed in the `delimcode` variable. The **REMOVE** function operates on all dynamic array delimiter levels; in contrast, the **REMOVE** statement operates on a specified delimiter level.

**REMOVE** maintains an internal pointer so that repeated calls return successive element values. If **REMOVE** is called after the last element value has been extracted, it returns the empty string.

You can use the **GETREM** function to return the character position in `dynarray` of the **REMOVE** pointer.

**Note:** The **REMOVE** function, **REMOVE** statement, and **REVREMOVE** statement all share the same character position pointer. It is incremented by Remove operations and decremented by Revremove operations.

The `delimcode` integer code values are as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>End of file</td>
</tr>
<tr>
<td>1</td>
<td>@IM Item Mark CHAR(255)</td>
</tr>
<tr>
<td>2</td>
<td>@FM Field Mark CHAR(254)</td>
</tr>
<tr>
<td>3</td>
<td>@VM Value Mark CHAR(253)</td>
</tr>
<tr>
<td>4</td>
<td>@SM Subvalue Mark CHAR(252)</td>
</tr>
<tr>
<td>5</td>
<td>@TM Text Mark CHAR(251)</td>
</tr>
</tbody>
</table>

**Examples**

The following example successively extracts the first five elements from a dynamic array:

```codemultivalue
names="Fred":@VM:"Barney":@FM:"Wilma":@VM:"Betty"
FOR x=1 TO 5
    PRINT REMOVE(names, lvl)
    PRINT lvl
    ! Returns:
    !   Fred
    !   3
    !   Barney
    !   2
    !   Wilma
    !   3
    !   Betty
    !   0
    !   ""
    !   0
NEXT
```
See Also

- REVREMOVE statement
- EXTRACT function
- GETREM function
- REMOVE function
REPLACE

Replaces the data in an element of a dynamic array.

\[
\text{REPLACE}(\text{dynarray}, f[, v[, s]]; \text{replacement})
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td>f</td>
<td>An expression that resolves to an integer specifying the Field level of the dynamic array from which to access the data. Fields are counted from 1.</td>
</tr>
<tr>
<td>v</td>
<td>Optional — An expression that resolves to an integer specifying the Value level of the dynamic array from which to access the data. Values are counted from 1 within a Field.</td>
</tr>
<tr>
<td>s</td>
<td>Optional — An expression that resolves to an integer specifying the Subvalue level of the dynamic array from which to access the data. Subvalues are counted from 1 within a Value.</td>
</tr>
<tr>
<td>replacement</td>
<td>An expression that resolves to a data value used to replace the element data value specified by f, v, and s. Note the semicolon (;) that precedes replacement; if f, v, and s are all specified, you can precede replacement with a comma, otherwise you must use a semicolon.</td>
</tr>
</tbody>
</table>

**Description**

The REPLACE function replaces the data value in one element of a dynamic array with a new value. Which element to replace is specified by the f, v, and s integers. For example, if \( f=2 \) and \( v=3 \), this means replace the third value from the second field. If \( f=2 \) and \( v \) is not specified, this means to replace the entire second field.

If \( f, v, \) or \( s \) is higher than the current number of elements at that location, REPLACE appends the replacement value with the appropriate number of level delimiter characters.

Note that a semicolon (;) is used before replacement as an argument separator. This is because the \( v \) and \( s \) arguments are optional and can be omitted.

If replacement is the null string, REPLACE removes the current data value (replaces it with a null string), but does not remove the level delimiter character.

If lower level delimiters exist in dynarray, setting an upper level to 0, the null string, or a non-numeric value is equivalent to setting it to 1.

If lower level delimiters do not exist in dynarray, setting this nonexistent lower level to 1, 0, the null string, or a non-numeric value has no effect on the data value in the level above it.

You can also use the <> operator to replace an element value in a dynamic array. For further details, see the Dynamic Arrays page of this manual.

**Examples**

The following example replaces the second value from the first field of a dynamic array:

```plaintext
cities="New York":@VM:"London":@VM: "Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT REPLACE(cities,1,2;"Minneapolis")
```

The following example replaces the second value with an empty string:
cities="New York":@VM:"London":@VM: "Chicago":@VM:"Boston":@VM: "Los Angeles"
PRINT REPLACE(cities,1,2,0,"")

**Emulation**

UniData systems differ in how they handle $f$, $v$, and $s$ arguments set to 0. The $OPTIONS$ ATTR.0IS1 ("zero is one") provides support for this UniData feature. UniData systems ignore $v$ and $s$ arguments that are set to a negative number.

**See Also**

- REMOVE statement
- EXTRACT function
- Dynamic Arrays
**REUSE**

Reuses a value when comparing two dynamic arrays of different lengths.

```plaintext
REUSE(dynarray)
```

**Arguments**

| dynarray | An expression that resolves to a dynamic array. This argument can be a dynamic array of one element—a string or numeric expression. |

**Description**

The **REUSE** function is used in combination with MVBasic functions that compare the elements of two dynamic arrays. Its most common use is to provide a corresponding element value when comparing dynamic arrays of different lengths. **REUSE** provides the needed element values for the shorter of the two dynamic arrays by reusing the last element value as the value for all subsequent element comparisons.

**REUSE** can be used with the following MVBasic functions: **ADDS** (addition), **SUBS** (subtraction), **MULS** (multiplication), **DIVS** (division), **MODS** (modulo division), **PWRS** (exponentiation), **EQS** (equal to), **NES** (not equal to), **GTS** (greater than), **GES** (greater than or equal to), **LTS** (less than), **LES** (less than or equal to), **CATS** (concatenate), **SPLICE** (concatenate with delimiter), **ANDS** (logical AND), and **ORS** (logical OR).

Specifying **REUSE** has no effect when the two dynamic arrays are of the same size, or if **REUSE** is specified for the larger of the two dynamic arrays.

If **dynarray** is set to a literal, it is treated as a dynamic array with one element. In other words, the literal is compared to every element in the other dynamic array.

If **REUSE** is not used when comparing dynamic arrays of different lengths, a value is provided for the elements without a match. In most cases these elements are compared with either the null string (for string comparisons) or with 0 (for numeric comparisons). Note however that the **DIVS** function supplies a value of 1 for missing divisor elements to prevent division by zero errors.

**Emulation**

**INFORMATION, jBASE, PIOpen, Prime, and UniData** set **$OPTIONS VEC.MATH**. When the **$OPTIONS VEC.MATH** is set, **REUSE** can use operator symbols to perform the five basic arithmetic operations on dynamic arrays. The `+` operator is equivalent to the **ADDS** function. The `–` operator is equivalent to the **SUBS** function. The `*` operator is equivalent to the **MULS** function. The `/` operator is equivalent to the **DIVS** function. The `**` operator is equivalent to the **PWRS** function. These operators perform vector arithmetic when supplied dynamic array arguments, and perform simple arithmetic operations when supplied numeric arguments.

**Examples**

The following example gives the shipping weight of various items. The items (widget) vary in weight, but the packaging (box) is always the same weight:

```plaintext
widget=4:@VM:3:@VM:4.5:@VM:2.5:@VM:5:@VM:4:@VM:3
box=1.3
shipwt=ADDS(widget,REUSE(box))
PRINT shipwt
```

```
5.3v4.3v5.8v3.8v6.3v5.3v4.3
```

The following example concatenates the string value elements of two dynamic arrays. In this case, the `qrtrs` dynamic array is static; it always has four values, while the `qpaid` dynamic array grows as quarterly payments are posted. By making its last element value “unpaid”, the resulting paidstatus dynamic array always has a payment status for each quarter:

```plaintext
qrtrs=420
qpaid=1
qrts=CATS(qrtrs,REUSE(qpaid))
PRINT qrts
```

```
420v1v1v1
```
The following example uses REUSE to calculate bonuses based on salary. The policy of this organization is to give its three highest-paid employees (the partners) a bonus of 1.5% of salary, and all other employees a bonus of 2% of salary:

```
BonusPct=1.5:@VM:1.5:@VM:1.5:@VM:2
BonusAmt=MULS(SalInThou,REUSE(BonusPct))
```

See Also

- Dynamic Arrays
RIGHT

Returns a specified number of characters from the right end of a string.

RIGHT(string,length)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string from which the rightmost characters are returned.</td>
</tr>
<tr>
<td>length</td>
<td>An expression that resolves to a positive integer indicating how many characters to return. If 0, a zero-length string (&quot;&quot;) is returned. Fractional numbers are truncated to an integer. If greater than or equal to the number of characters in string, the entire string is returned. No padding is performed.</td>
</tr>
</tbody>
</table>

Description

The RIGHT function returns the specified number of characters counting backwards from the end (right end) of a string. If you specify a length greater than the string length, the entire string is returned. To determine the number of characters in string, use the LEN function.

The LEFT function returns the specified number of characters from the beginning (left end) of a string.

Examples

The following example uses the RIGHT function to return a specified number of characters from the right side of a string:

AnyString = "Hello World"
PRINT RIGHT(AnyString,1);  ! Returns "d"
PRINT RIGHT(AnyString,5);  ! Returns "World"
PRINT RIGHT(AnyString,20); ! Returns "Hello World"

See Also

- LEFT function
- LEN function
RND

Returns a random number.

RND(number)

Arguments

| number | An expression that resolves to an integer, specified as a number or a numeric string. |

Description

The RND function returns a random value between zero and the specified number, inclusive of zero but exclusive of number. Thus the available range of returned numbers is 0 through number-1.

If number is a fractional number it is truncated to its integer portion. If number is a negative number, a negative number is returned.

A number string value is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If number resolves to 1, 0, or -1, RND always returns 0. If number is a non-numeric string or the empty string (""), it is parsed as 0, and thus RND always returns 0.

Examples

The following example generates twenty random numbers in the range 0 through 99 (inclusive):

FOR x=1 TO 20
   PRINT RND(100)
NEXT

See Also

• RANDOMIZE statement
ROUND

Rounds a number.

ROUND(num[,precision])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>num</td>
<td>An expression that resolves to a number or numeric string.</td>
</tr>
<tr>
<td>precision</td>
<td>Optional — An expression that resolves to an integer specifying the number of decimal digits to round to. If omitted, rounds to an integer.</td>
</tr>
</tbody>
</table>

Description

The **ROUND** function returns a number rounded to the specified number of decimal digits. The number 5 is always rounded up. If **precision** is not specified, or is specified as 0, a negative number, or an non-numeric string, **ROUND** rounds **num** to an integer. If **precision** is specified, only those digits that were present in **num** can be returned. The **precision** argument specifies the maximum number of fractional digits to be returned; **ROUND** does not perform zero-padding of fractional digits.

For numerics, prior to rounding MVBasic performs all arithmetic operations and converts numbers to canonical form, removing leading and trailing zeroes, a trailing decimal point, and all signs except a single minus sign. For this reason, input trailing zeros are not returned, but decimal digits rounded to trailing zeros are returned.

Examples

The following examples use the **ROUND** function to return a number rounded to an integer:

```
PRINT ROUND(123.4);         ! Returns 123
PRINT ROUND(123.5);         ! Returns 124
PRINT ROUND(123.4,0);       ! Returns 123
PRINT ROUND(123.999,0);     ! Returns 124
PRINT ROUND(123,-1);        ! Returns 123
```

The following examples use the **ROUND** function to return a number rounded to the specified number of decimal digits. Note that trailing zeros are only returned when they are the result of the rounding operation:

```
PRINT ROUND(1.234,2);       ! Returns 1.23
PRINT ROUND(1.235,2);       ! Returns 1.24
PRINT ROUND(1.000,2);       ! Returns 1
PRINT ROUND(1.100,2);       ! Returns 1.1
PRINT ROUND(1.999,2);       ! Returns 2.00
PRINT ROUND(1.999,3);       ! Returns 1.999
```

See Also

- **FMT** function
- **FMTS** function
- **LEN** function
SADD

Adds two numeric strings.

\[ \text{SADD}(\text{numstr}1, \text{numstr}2) \]

**Arguments**

| numstr   | An expression that resolves to a number or numeric string. |

**Description**

The SADD function adds two numeric values, expressed as either numbers or as strings, and returns the result. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and the null string are parsed as 0.

**Arithmetic Operations**

- To perform arithmetic operations on numeric strings, use the SADD, SSUB, SMUL, and SDIV functions.
- To perform arithmetic operations on floating point numbers, use the FADD, FSUB, FMUL, and FDIV functions, or use the standard arithmetic operators.
- To perform integer division, use the DIV function. To perform modulo division, use the MOD function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the ADDS, SUBS, MULS, DIVS, and MODS functions.
- To add together the element values within a single dynamic array, use either the SUM function (for single-level dynamic arrays) or the SUMMATION function (for multi-level dynamic arrays).
- To perform numeric comparison operations, use the SCMP function, or use the standard comparison operators.

**Examples**

The following examples use the SADD function to add two numeric strings. All of these examples return 10:

```plaintext
PRINT SADD(7,3)
PRINT SADD("7","3")
PRINT SADD("+7.00","003")
PRINT SADD("7dwarves","3wishes")
```

All of the following examples return 7:

```plaintext
PRINT SADD(7,0)
PRINT SADD("7","")
PRINT SADD("7","three")
```

**See Also**

- FADD function
- ADDS function
- SUM function
- SUMMATION function
- Operators
SCMP

Performs a string comparison of two numbers.

SCMP (num1, num2)

Arguments

<table>
<thead>
<tr>
<th>num1</th>
<th>An expression that resolves to a number or a numeric string.</th>
</tr>
</thead>
<tbody>
<tr>
<td>num2</td>
<td>An expression that resolves to a number or a numeric string.</td>
</tr>
</tbody>
</table>

Description

The SCMP function compares two numeric values, expressed as either numbers or as strings. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and the null string are parsed as 0.

The comparison return values are as follows:

- -1: \text{num1} < \text{num2}
- 0: \text{num1} = \text{num2}
- 1: \text{num1} > \text{num2}

See Also

- SADD function
- SDIV function
- Operators
SDIV

Divides two numeric strings.

SDIV(numstr1,numstr2)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>numstr1</td>
<td>The dividend. An expression that resolves to a number or numeric string.</td>
</tr>
<tr>
<td>numstr2</td>
<td>The divisor. An expression that resolves to a non-zero numeric or numeric string.</td>
</tr>
</tbody>
</table>

Description

The SDIV function divides numstr1 by numstr2 and returns the quotient. The two numeric values can be expressed as either numbers or as strings. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and null strings are parsed as 0.

Attempting to divide by zero generates a <DIVIDE> error, ending execution of the function and invoking an error trap handler, if available.

For compatibility, a third numeric argument is accepted, but ignored.

Arithmetic Operations

- To perform arithmetic operations on numeric strings, use the SADD, SSUB, SMUL, and SDIV functions.
- To perform arithmetic operations on floating point numbers, use the FADD, FSUB, FMUL, and FDIV functions, or use the standard arithmetic operators.
- To perform integer division, use the DIV function. To perform modulo division, use the MOD function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the ADDS, SUBS, MULS, DIVS, and MODS functions.
- To perform numeric comparison operations, use the SCMP function, or use the standard comparison operators.

Examples

The following examples use the SDIV function to divide a numeric string by another numeric string. All of these examples return 2.333333333:

```
PRINT SDIV(7,3)
PRINT SDIV("7","3")
PRINT SDIV("+7.00","003")
PRINT SDIV("7dwarves","3wishes")
```

All of the following examples return 0:

```
PRINT SDIV(0,7)
PRINT SDIV("","0")
PRINT SDIV("seven","3")
```

All of the following examples generate a <DIVIDE> error:

```
PRINT SDIV(7,0)
PRINT SDIV("7","")
PRINT SDIV("7","three")
```
See Also

- FDIV function
- DIVS function
- DIV function
- MOD function
- MODS
- Operators
SELECTINFO

Returns information about a select list.

SELECTINFO(listnum,key)

Arguments

| listnum | An expression that resolves to an integer between 1 and 10 (inclusive) that identifies a select list. This value is defined in the SELECT statement. listnum 0 is not valid for Caché MVBasic. |
| key     | An expression that resolves to an integer code indicating what select list information to return. The available values are 1 (active), and 3 (count). |

Description

The SELECTINFO function returns different values depending on the value of key:

- If key is 1, SELECTINFO returns a boolean value, indicating whether the specified select list is active. 1=select list is active; 0=select list is inactive. A SELECT command activates a select list. When a READNEXT attempts to read past the last item of the select list, the list is inactivated.
- If key is 3, SELECTINFO returns an integer value, specifying the total number of items in the select list. It returns 0 if the select list is not active, or if an active select list does not contain any items.

Examples

The following example uses the SELECTINFO function to return information about select list 4:

```
slist=4
PRINT SELECTINFO(slist,1)
PRINT SELECTINFO(slist,3)
``` 

See Also

- SELECT command
SENTENCE

Returns the command line that invoked the current process.

SENTENCE ([n])

Arguments

| n | Optional — An expression that resolves to an integer used to specify what portion of the command line to return. |

Description

The SENTENCE function returns the most recently issued command line. It returns all portions of the command line exactly as specified, including any user-specified comments.

SENTENCE is commonly invoked with no arguments to return the entire command line. The parentheses are mandatory. SENTENCE with no arguments is functionally identical to the @SENTENCE system variable.

You can specify an optional integer argument to limit the value returned to only one portion of the command line. An n value of 0 returns the initial command. For example, PRINT SENTENCE(0) returns “PRINT”. An n value of 1 returns the first command argument. For example, PRINT SENTENCE(1) returns “SENTENCE(1)”. Higher values of n return subsequent arguments and commands on the command line. A value of n larger than the number of commands and arguments on the command line returns the empty string. This optional argument is provided for compatibility with jBASE.

Examples

The following examples use the argumentless form of SENTENCE to return the full command line:

USER: ;PRINT SENTENCE()
! Returns:
! ;PRINT SENTENCE()
USER: ;PRINT ABS(4-7),SENTENCE(); ! comment
! Returns:
! 3 ;PRINT ABS(4-7),SENTENCE(); ! comment
USER: ;PRINT SENTENCE();"hello world"; ! comment
! Returns:
! ;PRINT SENTENCE();"hello world"; ! comment hello world

The following examples use the SENTENCE n argument to return a single portion of the command line:

USER: ;PRINT ABS(4-7);"cheers",SENTENCE(0); ! comment
! Returns:
! 3cheers ;PRINT
USER: ;PRINT ABS(4-7);"cheers",SENTENCE(1); ! comment
! Returns:
! 3cheers ABS(4-7):
USER: ;PRINT ABS(4-7);"cheers",SENTENCE(2); ! comment
! Returns:
! 3cheers cheers
USER: ;PRINT ABS(4-7);"cheers",SENTENCE(3); ! comment
! Returns:
! 3cheers ,SENTENCE(3); USER: ;PRINT ABS(4-7);"cheers",SENTENCE(4); ! comment
! Returns:
! 3cheers !
USER: ;PRINT ABS(4-7);"cheers",SENTENCE(5); ! comment
! Returns:
! 3cheers comment
USER: ;PRINT ABS(4-7);"cheers",SENTENCE(6); ! comment
! Returns:
! 3cheers
USER:
See Also

- @SENTENCE system variable
SEQ

Returns the character code corresponding to a specified character.

SEQ(char)

Arguments

<table>
<thead>
<tr>
<th>char</th>
<th>An expression that resolves to a character or string. If char is a string, SEQ returns the value of the first character.</th>
</tr>
</thead>
</table>

Description

The SEQ function takes a character and returns the corresponding character code, a base-10 integer value. Its inverse, the CHAR function takes a numeric code and returns the corresponding character.

If char is the null string, SEQ returns -1. If char is a string the first character of which is either a space or a tab, SEQ returns 32.

The Caché MVBasic SEQ function returns the numeric value for a single character. The corresponding ObjectScript $ASCII function can take a string of characters and return the numeric value for a specific character by specifying its position in the string.

Note: SEQ and UNISEQ are functionally identical.

Examples

The following example uses the SEQ function to return the numeric code associated with the specified character:

```
PRINT SEQ('A');   ! Returns 65.
PRINT SEQ('a');   ! Returns 97.
PRINT SEQ('%');   ! Returns 37.
PRINT SEQ('>')    ! Returns 62.
```

The following example uses the SEQ function to return lowercase letter characters and associated numeric codes of the Russian alphabet. On a Unicode version of Caché it returns the Russian letters; on an 8-bit version of Caché it returns a -1 (indicating a null string) for each letter:

```
letter=1072
FOR x=1 TO 32
   glyph=CHAR(letter)
   PRINT SEQ(glyph), glyph
   letter=letter+1
NEXT
```

See Also

- CHAR function
- UNISEQ function
- ObjectScript: $ASCII function
SEQS

Returns the character code for the first character of each element in a dynamic array.

```objectscript
SEQS(dynarray)
```

### Arguments

| dynarray | An expression that resolves to a dynamic array. |

### Description

The `SEQS` function takes a dynamic array and returns the corresponding numeric codes for the first character in each element. It returns these character codes as a dynamic array. If an element consists of a string of more than one character, `SEQS` returns the numeric value of the first character of that element. If an element is missing or contains the null string, `SEQS` returns -1 for that element. If an element is a string the first character of which is either a space or a tab, `SEQS` returns 32.

If the first character of a dynamic array element is one of the following dynamic array level delimiters: CHAR(252), CHAR(253), or CHAR(254), `SEQS` treats this character as a level delimiter, and returns -1 for the null element(s) established by parsing this character as a level delimiter.

**Note:** `UNISEQS` and `SEQS` are functionally identical. On Unicode systems both can be used to return character codes for 16-bit Unicode characters. On 8-bit systems, these functions return that character code of the first 8 bits of a 16-bit Unicode character.

The `CHARS` function is the inverse of `SEQS`. It takes a dynamic array of numeric codes and returns the corresponding characters.

The `SEQ` function (or `UNISEQ` function) takes the first character of a string and returns the corresponding numeric code.

The `SEQS` function returns the numeric value for the first character of each element as a dynamic array element. The corresponding ObjectScript `$ASCII` function can take a string of characters and return the numeric value for a specific character by specifying its position in the string.

### Examples

The following example uses the `SEQS` function to return the numeric codes associated with each character in a dynamic array:

```objectscript
alpha="A":@VM:"B":@VM:"C":@VM:"D"
PRINT SEQS(alpha)
! returns 65ý66ý67ý68
```

The following example returns the numeric codes associated with four lowercase Russian letters in a dynamic array. On a Unicode system, it returns the Russian character codes. On an 8-bit system, characters beyond 255 are treated as null strings, so `SEQS` returns -1 for each element.

```objectscript
russian=CHAR(1072):@VM:CHAR(1073):@VM:CHAR(1074):@VM:CHAR(1075)
PRINT SEQS(russian)
```

### See Also

- `UNISEQS` function
- `CHARS` function
- `SEQ` function
- `Dynamic Arrays`
Caché MultiValue Basic Functions

- ObjectScript: $ASCII function
SIN

Returns the sine of an angle.

SIN(number)

Arguments

| number | An expression that resolves to a number that expresses an angle in degrees. |

Description

The **SIN** function takes an angle in degrees and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the hypotenuse, a value in the range -1 to 1 (inclusive).

To return results in radians, set **OPTIONS RADIANS**.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example uses the **SIN** function to return the sine of an angle:

```objectscript
DIM MyAngle
MyAngle = 1.3;       ! Define angle in degrees.
PRINT SIN(MyAngle);  ! Return sine in radians.
```

The following example uses the **SIN** function to return the cosecant of an angle:

```objectscript
DIM MyAngle, MyCosecant
MyAngle = 1.3;                  ! Define angle in degrees.
MyCosecant = 1 / SIN(MyAngle);  ! Calculate cosecant.
PRINT MyCosecant
```

See Also

- **ATAN** function
- **COS** function
- **SINH** function
- **TAN** function
- Derived Math Functions
- ObjectScript: **$ZSIN** function
SINH

Returns the hyperbolic sine of an angle.

SINH(number)

Arguments

| number | An expression that resolves to a number that expresses an angle in degrees. |

Description

The SINH function takes an angle in degrees and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the hypotenuse.

By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set $OPTIONS RADIANS.

The result, in radians, is in the range -1 to 1.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example uses the SINH function to return the hyperbolic sine of an angle:

```
DIM MyAngle
MyAngle = 1.3;         ! Define angle in degrees.
PRINT SINH(MyAngle);   ! Return hyperbolic sine in radians.
```

See Also

- ATAN function
- COS function
- SIN function
- TAN function
- Derived Math Functions
**SMUL**

Multiplies two numeric strings.

```plaintext
SMUL(numstr1,numstr2)
```

**Arguments**

| numstr | An expression that resolves to a number or numeric string. |

**Description**

The **SMUL** function multiplies the value of two numeric strings and returns a numeric value. If a `numstr` value is the null string or a non-numeric value, **SMUL** parses its value as 0 (zero).

**Arithmetic Operations**

- To perform arithmetic operations on numeric strings, use the **SADD**, **SSUB**, **SMUL**, and **SDIV** functions.
- To perform arithmetic operations on floating point numbers, use the **FADD**, **FSUB**, **FMUL**, and **FDIV** functions, or use the standard arithmetic operators.
- To perform integer division, use the **DIV** function. To perform modulo division, use the **MOD** function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the **ADDS**, **SUBS**, **MULS**, **DIVS**, and **MODS** functions.
- To perform numeric comparison operations, use the **SCMP** function, or use the standard comparison operators.

**Examples**

The following examples use the **SMUL** function to multiply two numeric strings. All of these examples return 21:

```plaintext
PRINT SMUL(3,7)
PRINT SMUL("3","7")
PRINT SMUL("003","+7.00")
PRINT SMUL("3wishes","7dwarves")
```

All of the following examples return 0:

```plaintext
PRINT SMUL(3,0)
PRINT SMUL("3","")
PRINT SMUL("3","seven")
```

**See Also**

- **FMUL** function
- **MULS** function
- **Operators**
SORT

Sorts the elements of a dynamic array.

SORT (dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array. |

Description

The SORT function takes a dynamic array and returns a dynamic array with its elements sorted in ascending ASCII order. The null string and missing elements are sorted first. Numbers are sorted in ASCII order (for example: 12, 12.3, 123, 13) not numeric order. Numbers are converted to canonical form (removing leading signs and zeros) before sorting; numeric strings are not converted to canonical form.

SORT is provided for compatibility with D3 systems.

Examples

The following example uses the SORT function to sort a dynamic array:

cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
PRINT SORT(cities)

returns BostonýChicagoýLondonýLos AngelesýNew York

See Also

- Dynamic Arrays
The **SOUNDEX** function is used to group and sort near-equivalents of alphabetic strings, such as variant spellings of a name. The Soundex algorithm takes an alphabetic string of any length, such as a name or an English word or phrase, and returns a four-character equivalence code. This code consists of the first recognized letter of the string (which may not be the first character), followed by three integers between 0 and 6 (inclusive) for the remaining 3 code characters. The three numbers assigned by the Soundex algorithm represent up to three distinct consonant sounds (syllables) that follow the initial letter. Repeating letters (such as “mm” or “mn”) have no effect on assigning a Soundex number.

For example, “Fred” is represented as F630, because F is the first character, 6 is assigned to the letter sound “R”, 3 is assigned to the letter sounds “D” or “T”, and 0 indicates that there are no more consonant sounds in the string. Note that vowels and unvoiced letters (A, E, I, O, U, H, W, Y) are not assigned a number. Ann, Anne, Anna, Ana, and Annie are all represented by A500. Anita, Anida, Annette, and Ann T. are all represented by A530. Anton, Anthony, Anoinette are all represented by A535.

Caché MVBasic uses the Soundex algorithm used by the United States Census Bureau; this is not the same algorithm used by other MultiValue implementations. Therefore, all files using Soundex should be regenerated when moving them to Caché MultiValue. The MVBasic Soundex numeric codes for English consonants are as follows: 1=B,F,P,V; 2=C,G,J,K,Q,S,X,Z; 3=D,T; 4=L; 5=M,N, 6=R.

The Soundex algorithm is not case-sensitive; all Soundex codes return the first recognized letter as an uppercase letter, regardless of its case in the input string. All non-alphabetic characters are ignored, including numbers, punctuation characters, and blank spaces. Soundex does not recognize accented letters or non-Latin letters. For example, “Ü-boat” returns B300, exactly the same as “Boat”. If **SOUNDEX** cannot recognize at least one letter in *string*, it returns 0000 (four zeros). If *string* is the null string, **SOUNDEX** returns the null string.

### Examples
The following examples use the **SOUNDEX** function to return equivalence codes. Note how the Soundex code is established by the initial letter and the next three significant consonants:

```
PRINT SOUNDEX("M"); ! Returns M000
PRINT SOUNDEX("MMM"); ! Returns M000
PRINT SOUNDEX("Mc"); ! Returns M200
PRINT SOUNDEX("Mac"); ! Returns M200
PRINT SOUNDEX("McD"); ! Returns M230
PRINT SOUNDEX("McT"); ! Returns M230
PRINT SOUNDEX("McDuff"); ! Returns M231
PRINT SOUNDEX("McDufflebag"); ! Returns M231
```

### See Also
- **OCONV** function
- **OCONVS** function
**SPACE**

Returns a string consisting of the specified number of spaces.

```
SPACE(number)
```

**Arguments**

<table>
<thead>
<tr>
<th>number</th>
<th>The number of spaces you want in the string. An expression that resolves to an integer.</th>
</tr>
</thead>
</table>

**Description**

The `SPACE` function returns a string of the specified number of spaces.

If `number` is 0, a negative number, a null string, or a non-numeric string, no spaces are returned. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If `number` is a decimal number, MVBasic truncates it to the integer portion.

You can use the `SPACES` function to return a dynamic array, each element of which contains the number of spaces specified for that element.

You can also insert spaces using tabbing. MVBasic sets default tab stops at 10-column intervals; this default is modifiable using the `TABSTOP` statement.

**Examples**

The following example uses the `SPACE` function to return a string with four spaces inserted in it:

```
PRINT "Hello":SPACE(4):"World"
```

**See Also**

- LEN function
- SPACES function
- PRINT statement
SPACES

Returns a dynamic array consisting of the specified number of spaces for each element.

SPACES(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array of positive integers, specifying the number of spaces you want in each corresponding element of the output dynamic array. |

Description

The SPACES function returns a dynamic array, each element of which contains the number of spaces specified for that element.

If an element value is missing, or is 0, a negative number, the null string, or a non-numeric string, no spaces are returned. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If an element value is a decimal number, SPACES truncates it to an integer.

You can use the SPACE function to return a single string of spaces. You can also insert spaces using tabbing. MVBasic sets default tab stops at 10-column intervals.

Examples

The following example uses the SPACES function to return a dynamic array, each element of which contains one additional space. It concatenates the string of spaces in each of these elements to a single-letter string from the letters dynamic array:

```vbnet
letters="A":@VM:"B":@VM:"C":@VM:"D":@VM:"E"
spaces=1:@VM:2:@VM:3:@VM:4:@VM:5
PRINT CATS(letters,SPACES(spaces))
```

See Also

- CATS function
- LENS function
- SPACE function
- PRINT statement
- Dynamic Arrays
SPLICE

Combines two dynamic arrays into a new dynamic array.

SPLICE(dynarray1, separator, dynarray2)

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |
| separator | An expression that resolves to a character or string of characters. SPLICE inserts separator when concatenating two elements from different dynamic arrays. If you specify a null string, no separator is inserted between concatenated elements. |

**Description**

The SPLICE function concatenates two dynamic arrays on an element-by-element basis. It returns a dynamic array containing all of the element values of dynarray1 and dynarray2, with a separator between the components of each element.

For two elements to be concatenated, they must be on the same dynamic array level. For example, you cannot concatenate a value mark (@VM) dynamic array element to a subvalue mark (@SM) dynamic array element.

Caché MVBasic converts numbers to canonical form (resolving signs, removing leading and trailing zeros, removing a leading plus sign, removing a trailing decimal point) before concatenating. Caché MVBasic does not convert numeric strings to canonical form before concatenating.

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with null string ("") value elements for the purpose of the concatenation operation. SPLICE inserts the separator in every element of the returned dynamic array, even when a source element is missing or is the null string. You can use the REUSE function to concatenate a default value (instead of the null string) when the dynamic arrays differ in length.

You can use the REUSE function with SPLICE to concatenate the same value to all of the elements of a dynamic array. You can use the CATS function to concatenate the elements of two dynamic arrays with no separator between the element components.

**Examples**

The following example uses SPLICE to return a concatenated dynamic array including all of the elements in dynamic arrays a and b:

```plaintext
a=10:@VM:20:@VM:30:@VM:40
d=15:@VM:25:@VM:35:@VM:45
PRINT SPLICE(a,'/',b)
! returns 10/15v20/25v30/35v40/45
```

The following example uses SPLICE to concatenate a dynamic array with itself, specifying a null string separator:

```plaintext
a=10:@VM:20:@VM:30:@VM:40
PRINT SPLICE(a,'',a)
! returns 1010v2020v3030v4040
```

The following example uses SPLICE to concatenate two dynamic arrays with different delimited levels:

```plaintext
a=10:@VM:20:@VM:30:@VM:40
c=11:@SM:12:@SM:13:@SM:14
PRINT SPLICE(a,''/,c)
! returns 10/11s/12s/13s/14v20v30v40
```
See Also

- CATS function
- REUSE function
- Dynamic Arrays
SPOOLER

Returns information on queued print jobs.

SPOOLER(n[,ident])

Arguments

<table>
<thead>
<tr>
<th>n</th>
<th>An expression that resolves to an integer code specifying what category of information to return. Available values are 1 through 5, inclusive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ident</td>
<td>Optional — Limits information returned to jobs created by the specified ident. An expression that resolves to either a positive integer port number or an account name string. Applicable to n=2 and n=4 only. The default is to return information on all jobs, regardless of the creator.</td>
</tr>
</tbody>
</table>

Description

The SPOOLER function returns information about form queues, jobs, and assignments. It returns a dynamic array in which print jobs are separated by Field Marks, and information items for each print job are separated by Value Marks. Which jobs (Fields) are returned depends on the value of ident. The type of information (Values) returned for each job depends on the n flag value. The following n values are supported:

1. Form queue information, consisting of the following elements: 1=form queue name, 2=queue type (the SP-CREATE device-type), 3=device name, 5=status, 6=number of jobs, 7=page skip.

2. Print job information, consisting of the following elements: 1=form queue name, 2=print job number, 3=username (OS login name), 4=port number of creator of job, 5=creation date (internal format), 6=creation time (internal format), 7=job status, 8=options (in legacy format), 9=print job size (in pages), 10=number of copies, 11=Username (same as 3), 12=Caché username in a security-enabled locked-down system, otherwise "UnknownUser", 13=account name, 14=page size (in lines), 15=options (in long format), 16=current position of the despool process (in lines,copies format).

3. Current assignments, consisting of the following elements: 1=channel number (0 to 255), 2=form queue name, 3=options (in legacy format), 4=number of copies, 5=options (in long format).

4. Current jobs, consisting of the following elements: 1=report channel number, 2=print job number, 3=print job size (in pages), 4=creation date (internal format), 5=creation time (internal format), 6=job status, 7=username (OS login name), 8=username (OS login name), 9=account name.

5. New Caché values, consisting of the following element: 1=name of Caché global for spooler. Default is ^%MV.SPOOL.

SPOOLER(1) can return information on a form queue, or on a form queue group. If it is a form queue group (element 2=GROUP) then element 3 consists of a subvalue mark delimited list of the form queues in the group.

You can use the OCONV function to convert dates and times from internal to display format.

Examples

The following example illustrate the use of the SPOOLER 2 function:

```
PRINT ON 1 "The quick brown fox"
PRINT SPOOLER(2)
```
returns:

STANDARDyÝFredyÝ5948yÝ14213yÝ54958yÝCLOSEDyÝUSERyÝ4y

which contains the following elements:

1 form queue name=STANDARD
2 print job number=1
3 username (OS login name)=Fred
4 port number of creator of job=5948
5 creation date (internal format)=14213 (29 NOV 2006)
6 creation time (internal format)=54958 (03:15:58PM)
7 job status=CLOSED
8 options (in legacy format) [none]
9 print job size (in pages)=1
10 number of copies=1
14 username (same as 3)=Fred
15 username (same as 3)=Fred
17=MV account name=USER
18=page size (in lines)=4
19=options (in long format).[none]

The following example illustrate the use of the SPOOLER 5 function:

PRINT SPOOLER(5)

returns:

^%MV.SPOOL

See Also

• PRINT statement
• PRINTER statement
• “Spooling” in Operational Differences between MultiValue and Caché
**SQRT**

Returns the square root of a number.

```
SQRT(number)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>An expression that resolves to a positive number or numeric string.</td>
</tr>
</tbody>
</table>

**Description**

The **SQRT** function returns the square root of `number`. This numeric value can be expressed as either a number or as a string. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and null strings are parsed as 0. The square root of 0 is 0.

You cannot return the square root of a negative number. Attempted to do so results in an `<ILLEGAL VALUE>` error.

**Examples**

The following example uses the **SQRT** function to calculate the square roots of the integers 0 through 16:

```
FOR x = 0 TO 16
PRINT "Square root of ", x, " = ", Sqrt(x)
NEXT
```

The following example uses the **SQRT** function to calculate the square root of pi:

```
pi = 4 * ATAN(1)
PRINT "Square root of pi = ", SQRT(pi)
```

**See Also**

- **PWR** function
SQUOTE

Encloses a value in single quotation marks.

SQUOTE(string)

Arguments

| string | An expression that resolves to a string or a number. string may be a dynamic array. |

Description

The SQUOTE function returns string enclosed in single quotation marks. The quotation marks are part of the resulting string. Therefore, using SQUOTE increases the length of string by 2 characters. If string is the null string, SQUOTE returns a string consisting of two single quotation mark characters, a string with a length of 2. This should not be confused with the null string, which has a length of 0.

The SQUOTE function converts a numeric to canonical form before enclosing it in quotation marks. SQUOTE does not convert a numeric string to canonical form.

The SQUOTE function encloses string with single quotation marks. The similar QUOTE and DQUOTE functions enclose string with double quotation marks.

Note: Some MultiValue Basic implementations (D3, for example) use SQUOTE and DQUOTE to extract quoted substrings from within a string. The Caché MVBasic quote functions do not support this functionality. Use the FIELD function or the [ ] operator to extract quoted substrings.

Examples

The following example uses the SQUOTE function to convert a numeric to a string enclosed in single quotation marks:

```vbnet
quoted = SQUOTE(+007.000)
PRINT quoted; ! Returns '7'
PRINT LEN(quoted); ! Returns 3
```

The following example uses the SQUOTE function to enclose a string in single quotation marks:

```vbnet
str1 = "Hello"
str2 = 'Hello'
str3 = 'Hello\n
PRINT str1:str2:str3; ! Returns HelloHelloHello
PRINT LEN(str1),LEN(str2),LEN(str3); ! Returns 5 5 5
q1 = SQUOTE(str1)
q2 = SQUOTE(str2)
q3 = SQUOTE(str3)
PRINT q1?q2?q3; ! Returns 'Hello''Hello''Hello'
PRINT LEN(q1),LEN(q2),LEN(q3); ! Returns 7 7 7
```

See Also

- QUOTE function
- DQUOTE function
- LEN function
- PRINT statement
SSUB

Subtracts two numeric strings.

SSUB(numstr1,numstr2)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>numstr1</td>
<td>The minuend. An expression that resolves to a number or numeric string.</td>
</tr>
<tr>
<td>numstr2</td>
<td>The subtrahend. An expression that resolves to a number or numeric string.</td>
</tr>
</tbody>
</table>

Description

The SSUB function subtracts numstr2 from numstr1, expressed as either numbers or as strings, and returns the result. Leading plus signs and leading and trailing zeros are ignored. A string is parsed as a number until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. Non-numeric strings and null strings are parsed as 0.

Arithmetic Operations

- To perform arithmetic operations on numeric strings, use the SADD, SSUB, SMUL, and SDIV functions.
- To perform arithmetic operations on floating point numbers, use the FADD, FSUB, FMUL, and FDIV functions, or use the standard arithmetic operators.
- To perform integer division, use the DIV function. To perform modulo division, use the MOD function.
- To perform arithmetic operations on corresponding elements of dynamic arrays, use the ADDS, SUBS, MULS, DIVS, and MODS functions.
- To perform numeric comparison operations, use the SCMP function, or use the standard comparison operators.

Examples

The following examples use the SSUB function to subtract two numeric strings. All of these examples return 4:

```
PRINT SSUB(7, 3)
PRINT SSUB("7", "3")
PRINT SSUB("+7.00", "003")
PRINT SSUB("7dwarves", "3wishes")
```

All of the following examples return 7:

```
PRINT SSUB(7, 0)
PRINT SSUB("7", ")
PRINT SSUB("7", "three")
```

See Also

- FSUB function
- SUBS function
- Operators
STATUS

Returns the status of the most recent operation.

**STATUS()**

*Arguments*

None. The parentheses are mandatory.

*Description*

The `STATUS` function returns an integer code that indicates the status of the most recently completed MVBasic operation for the current process. Many, but not all, MVBasic operations change the `STATUS` function value. MVBasic sets `STATUS` upon successful completion of an operation (completion without issuing an error).

`STATUS` returns 0 when an operation performed the intended task, and a non-zero integer (positive or negative) to indicate a situation that prevented the intended completion of the task. For example, a command could have completed without error but performed no operation because a specified operand was of the wrong type, or the specified operand was already in the state that the command was supposed to establish.

MVBasic initializes the `STATUS` function value to 0. The `STATUS` function value persists until changed by the successful completion of an operation. Exiting and reentering the MV Shell resets the `STATUS` function value to 0. You can set the `STATUS` function value to a user-defined positive or negative integer value using the `ASSIGN` statement.

The `STATUS` function value is set by the following commands. Please see the individual command for the applicable status code values: `BSCAN`, `CLEARFILE`, `CLOSE`, `CLOSESEQ`, `CREATE`, `DELETE`, `DELETESEQ`, `EXECUTE`, `FILELOCK`, `FILEUNLOCK`, `INPUT`, `OPEN`, `OPENPATH`, `OPENSEQ`, `READ`, `READBLK`, `READL`, `READSEQ`, `READU`, `READVL`, `READVU`, `SEEK`, `WEOFSEQ`, `WRITE`, `WRITEBLK`, `WRITESEQ`, `WRITESEQF`, `WRITEU`, `WRITEV`, and `WRITEVU`.

The `STATUS` function value is set by the following functions. Please see the individual function for the applicable status code values: `ACCESS()`, `FILEINFO()`, `FMT()`, `ICONV()`, `ICONVS()`, `OCONV()`, `OCONVS()`, `RECORDLOCKED()`.

*See Also*

- `ASSIGN` statement
**STR**

Repeats a string value.

```
STR(string, repeats)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>An expression that resolves to a string or number.</td>
</tr>
<tr>
<td>repeats</td>
<td>An expression that resolves to a positive integer specifying the number of repeats.</td>
</tr>
</tbody>
</table>

**Description**

The **STR** function replicates and concatenates a string multiple times. The number of repetitions is specified by the *repeats* argument. The *repeats* argument specifies the number of repeats as a positive integer. If *repeats* is a decimal number, it is truncated to an integer. The *repeats* string is parsed as an integer until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If *repeats* is 0, a negative number, or a non-numeric string, **STR** returns a null string.

You can use the **STRS** function to perform the same operation on all of the elements of a dynamic array.

**Examples**

The following example uses the **STR** function to repeat a string:

```
PRINT STR("test",5)
```

It returns: `testtesttesttesttest`

**See Also**

- **LEN** function
- **STRS** function
**STRS**

Repeats the string value of each element of a dynamic array.

```plaintext
STRS(dynarray, repeats)
```

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dynarray</td>
<td>An expression that resolves to a dynamic array.</td>
</tr>
<tr>
<td>repeats</td>
<td>An expression that resolves to a positive integer specifying the number of repetitions of the current value of each element.</td>
</tr>
</tbody>
</table>

### Description

The **STRS** function replicates each element of a dynamic array the number of times specified by `repeats`. In the returned dynamic array the value of each element of `dynarray` is replicated and concatenated the same number of times. The number of replications is specified by the `repeats` argument.

The `repeats` argument specifies the number of repeats as a positive integer. If `repeats` is a decimal number, it is truncated to an integer. The `repeats` string is parsed as an integer until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7. If `repeats` is 0, a negative number, or a non-numeric string, **STRS** returns a null string for all elements.

You can use the **STR** function to perform the same operation on a single value.

### Examples

The following example uses the **STRS** function to triplicate the value of each element of a dynamic array. Note that the third element is a null string:

```plaintext
test="A":@VM:"B":@VM:"":@VM:"D":@VM:"E"
PRINT STRS (*test*, 3)
```

It returns: AAAýBBBýýDDDýEEE

### See Also

- **LENS** function
- **STR** function
- Dynamic Arrays
SUBR

Returns a value from an external subroutine.

SUBR(routine[,arg1[,arg2...]])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>routine</td>
<td>The name of an existing subroutine, specified as a quoted string. If an external (user-defined) subroutine, just specify the subroutine name. If a system-supplied subroutine (a system function), prefix the function name with a minus sign. A list of supported system functions is provided below. This syntax for calling system functions is provided for compatibility with UniData systems.</td>
</tr>
<tr>
<td>arg</td>
<td>Optional — An argument, or comma-separated list of arguments to pass to the subroutine.</td>
</tr>
</tbody>
</table>

Description

The SUBR function calls an existing subroutine. It optionally passes the subroutine one or more argument values. SUBR returns the value supplied by the subroutine.

Commonly, SUBR is used to call user-defined subroutines. You can create a subroutine using the SUBROUTINE statement.

If the routine name begins with an asterisk (*), SUBR first looks it up as a local routine. If not found, SUBR looks it up as a global routine. If still not found, SUBR generates an error. Note that *routine processing is different in UniData emulation, as described below.

SUBR can also be used to call certain system-defined functions, using the following syntax:

SUBR('-funcname',arg1[,arg2])

Note the hyphen appended to funcname. The –funcname must be quoted. This syntax can be used in I-types; Caché MVBasic converts it to the corresponding standard MVBasic function during I-type compilation. The following MVBasic system functions are supported: ADDS, ANDS, CATS, CHARs, COUNTS, DIVS, EQS, FIELDS, GES, GTS, ICONVS, IFS, INDEXS, LENS, LES, LTS, MULS, NES, NOTS, NUMS, OCONVS, ORS, SEQS, SPACES, SPLICE, STRS, SUBS, and SUBSTRINGS. This syntactical form is compatible with UniData.

For example, the following two calls of the MVBasic LENS function are equivalent:

```plaintext
mydyn="Apple":@FM:"Orange":@FM:"Banana"
PRINT LENS(mydyn)
PRINT SUBR('-LENS',mydyn)
```

The following two CMQL queries are equivalent:

```plaintext
LIST VOC EVAL "SUBR('-OCONV',12345,'D')"
LIST VOC EVAL "OCONV(12345,'D')"
```

SUBR, CALL, and GOSUB

The SUBR function is used to call an external subroutine that returns a value. The CALL statement is used to call an external subroutine that does not return a value. The GOSUB statement is used to call an internal subroutine.

Examples

The following example uses the SUBR function call a subroutine that computes the cube of a number:

```plaintext
INPUT mynum
x=SUBR('Cube',mynum)
PRINT "the cube of ":mynum:" is ":x
```
**Emulation**

In UniData and UDPICK emulations, a *routine* name with an initial character of * is handled as a global routine name. **SUBR** removes the leading * and then looks up the resulting routine name as a global routine. If the runtime environment is not a UniData emulation, a normal lookup is done on a *routine* name with a leading * character.

The use of `$OPTIONS UNIDATA` in the MVBasic source file *does not* activate this behavior. The handling of names with leading * is determined by the user setting in the command language at runtime. Therefore, to activate this behavior, the **CEMU** command must set UniData emulation before running a program that calls a *routine* name with a leading *.

**See Also**

- **CALL** statement
- **GOSUB** statement
- **SUBROUTINE** statement
SUBS

Subtracts the values of corresponding elements in two dynamic arrays.

\[ \text{SUBS}(\text{dynarray1}, \text{dynarray2}) \]

**Arguments**

| dynarray1 | The minuend. An expression that resolves to a dynamic array of numeric values. If a dynamic array element contains a non-numeric value, **SUBS** treats this value as 0 (zero). |
| dynarray2 | The subtrahend. An expression that resolves to a dynamic array of numeric values. If a dynamic array element contains a non-numeric value, **SUBS** treats this value as 0 (zero). |

**Description**

The **SUBS** function subtracts the value of each element in \( \text{dynarray2} \) from the corresponding element in \( \text{dynarray1} \). It then returns a dynamic array containing the results of these subtractions. If an element value is missing, or is the null string or a non-numeric value, **SUBS** parses its value as 0 (zero).

If the two dynamic arrays have different numbers of elements, the returned dynamic array has the number of elements of the longer dynamic array. By default, the shorter dynamic array is padded with 0 value elements for the purpose of the arithmetic operation. You can also use the **REUSE** function to define behavior when specifying two dynamic arrays with different numbers of elements.

You can use the **ADDS** (addition), **MULS** (multiplication), **DIVS** or **DIVSZ** (division), **MODS** (modulo division), and **PWRS** (exponentiation) functions to perform other arithmetic operations on the corresponding elements of two dynamic arrays.

**Examples**

The following example uses the **SUBS** function to subtract the elements of two dynamic arrays:

```
a=11:@VM:22:@VM:33:@VM:44
b=10:@VM:9:@VM:8:@VM:7
PRINT SUBS(a,b)
! returns 1ý13ý25ý37
```

The following example subtracts elements of dynamic arrays of differing lengths:

```
a=11:@VM:22:@VM:33:@VM:44
b=2:@VM:2:@VM:2:@VM:2:@VM:2:@VM:2
PRINT SUBS(a,b)
! returns 9ý20ý31ý42ý-2ý-2
```

**See Also**

- **ADDS** function
- **DIVS** function
- **DIVSZ** function
- **MODS** function
- **MULS** function
- **PWRS** function
- Dynamic Arrays
**SUBSTRINGS**

Returns a substring for each element of a dynamic array.

```
SUBSTRINGS(dynarray,start,length)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dynarray</code></td>
<td>An expression that resolves to a dynamic array of elements from which a dynamic array of substrings is to be extracted.</td>
</tr>
<tr>
<td><code>start</code></td>
<td>An expression that resolves to a positive integer specifying the start position (counting from 1) within each element to begin extracting a substring.</td>
</tr>
<tr>
<td><code>length</code></td>
<td>An expression that resolves to a positive integer specifying the number of characters to extract from each element, beginning with the <code>start</code> position.</td>
</tr>
</tbody>
</table>

**Description**

The `SUBSTRINGS` function returns a dynamic array of substrings, each substring element containing the specified `length` number of characters from the corresponding `dynarray` element. `SUBSTRINGS` returns a substring for every element, regardless of the element's level delimiter.

If `start` is 1, substrings are extracted starting with the first character of each element. If `start` is 0, a negative number, the null string, or a non-numeric string, `SUBSTRINGS` behaves as if `start`=1. If `start` is greater than the character length of an element, the returned dynamic array contains only the level delimiter for that element.

If `length` is greater than the `dynarray` element's length, the full element value is returned. If `length` is 0, a negative number, the null string, or a non-numeric string, the `length` is parsed as 0; the returned dynamic array contains only the level delimiters from the original `dynarray`.

If `start` or `length` is a mixed numeric string, the numeric part is parsed until a non-numeric character is encountered. Thus “7dwarves” is parsed as 7.

You can use the `[]` string operator to perform a similar substring extract from a string. For further details, refer to the Operators page of this manual.

**Examples**

The following example uses the `SUBSTRINGS` function to return a dynamic array containing the first three characters of each element of a dynamic array:

```plaintext
cities="New York":@VM:"London":@VM:"Chicago":@VM:"Boston":@VM:"Los Angeles"
alphalist=SUBSTRINGS(cities,1,3)
PRINT alphalist
! Returns: "NewyLonýChiýBosýLos"
```

**See Also**

- Dynamic Arrays
- Strings
**SUM**

Adds the values of the elements of a dynamic array.

\[ \text{SUM}(\text{dynarray}) \]

**Arguments**

| dynarray | An expression that resolves to a dynamic array of numeric values. |

**Description**

The **SUM** function adds the values the elements in a dynamic array and returns the sum as a dynamic array. If an element is missing or has a null string or a non-numeric value, **SUM** parses its value as 0 (zero).

- If all of the elements in `dynarray` are on the same dynamic array level, **SUM** returns a dynamic array consisting of a single value, the sum of the elements. This is shown in the following example, in which each **SUM** returns 34:

  ```
  a=10:@FM:9:@FM:8:@FM:7
  b=10:@VM:9:@VM:8:@VM:7
  c=10:@SM:9:@SM:8:@SM:7
  PRINT SUM(a); ! returns 34
  PRINT SUM(b); ! returns 34
  PRINT SUM(c); ! returns 34
  ```

- If elements in `dynarray` are on different dynamic array levels, **SUM** returns a dynamic array in which elements at the lowest array level are summed. Values at higher levels are returned as array elements. This is shown in the following example:

  ```
  a=9:@VM:10:@VM:11:@FM:8:@FM:7
  PRINT SUM(a); ! returns 30^8^7
  b=9:@VM:10:@VM:11:@SM:8:@SM:7
  PRINT SUM(b); ! returns 9^10^26
  ```

The **SUM** function adds dynamic array values that are on the same dynamic array level. To add all values in a dynamic array, regardless of level, use the **SUMMATION** function. To add the elements of two dynamic arrays, use the **ADDS** function.

**See Also**

- **ADDS** function
- **SUMMATION** function
- Dynamic Arrays
SUMMATION

Adds the values of the elements of a multi-level dynamic array.

SUMMATION(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array of numeric values. |

Description

The SUMMATION function adds the values of all of the elements in a dynamic array and returns the sum. If an element is missing, or has a null string or a non-numeric value, SUMMATION parses its value as 0 (zero).

The SUMMATION function adds all dynamic array values, regardless of dynamic array levels of the elements. To add only those elements that are on the same dynamic array level, use the SUM function. To add the elements of two dynamic arrays, use the ADDS function.

Examples

The following example uses the SUMMATION function to add the elements of a dynamic array:

```
a=10:@FM:9:@VM:8:@SM:7
PRINT SUMMATION(a); ! returns 34
```

See Also

- ADDS function
- MAXIMUM function
- MINIMUM function
- SUM function
- Dynamic Arrays
# SYSTEM

Returns various system parameter values.

## SYSTEM (code)

### Arguments

<table>
<thead>
<tr>
<th>code</th>
<th>An expression that resolves to an integer code specifying which information to return.</th>
</tr>
</thead>
</table>

## Description

The `SYSTEM` function returns a variety of system parameters. The following table lists the `code` parameters. Those `code` numbers that are not listed are either not implemented or perform no operation and always return 0 or the empty string.

<table>
<thead>
<tr>
<th>code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Always returns 0 for all emulations except D3, see below.</td>
</tr>
<tr>
<td>1</td>
<td>A boolean value that returns 1 if the printer is on. Otherwise, returns 0.</td>
</tr>
<tr>
<td>2</td>
<td>Returns the current page width, in characters, as defined by the terminal settings. If output is directed to the printer, it returns the width of the printer (for channel 0).</td>
</tr>
<tr>
<td>3</td>
<td>Returns the current page length (depth), in lines, as defined by the terminal settings. If output is directed to the printer, it returns the page length of the printer (for channel 0).</td>
</tr>
<tr>
<td>4</td>
<td>Returns the number of lines remaining on the current page, with the last line being line 1. If output is directed to the printer, it returns the printer/spooler values, dependent on the <code>HEADING</code> and <code>FOOTING</code> settings. The <code>PRINTER RESET</code> command resets this value.</td>
</tr>
<tr>
<td>5</td>
<td>Returns the current page number, as calculated for the <code>HEADING</code> or <code>FOOTING</code> statement. Note that the <code>SYSTEM(5)</code> value reflects when the function is invoked, not when its return value is printed; the page number value may be the previous page when this return value is printed as the first line of the next page. This parameter may be set using the <code>ASSIGN</code> command from the Caché MultiValue Shell.</td>
</tr>
<tr>
<td>6</td>
<td>Returns the current line number.</td>
</tr>
<tr>
<td>7</td>
<td>Returns the terminal type code. This parameter may be set using the <code>ASSIGN</code> command from the Caché MultiValue Shell. Refer to the Caché MultiValue <code>CHOOSE.TERM</code> command for further details on terminal types.</td>
</tr>
<tr>
<td>9</td>
<td>CPU msec used.</td>
</tr>
<tr>
<td>10</td>
<td>A boolean value that indicates whether the data stack is active. Returns 1 if input data is pending from a DATA statement. Otherwise, returns 0.</td>
</tr>
<tr>
<td>11</td>
<td>An integer value that indicates the number of items in the default select list. If no select list is active, returns 0. (For UniVerse, PICK, INFORMATION, PIOpen, and IN2 emulation, see below.) See the <code>@SELECTED</code> system variable.</td>
</tr>
<tr>
<td>12</td>
<td>Returns the current system time in elapsed milliseconds since midnight (local time). This is the same local time returned by the <code>TIME</code> function, which returns the time in elapsed seconds and fractional seconds, rather than in milliseconds. Refer to <code>TIME</code> for details on how local time is determined.</td>
</tr>
<tr>
<td>13</td>
<td>Release timeslice.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>-------------</td>
</tr>
<tr>
<td>14</td>
<td>A boolean value that returns 1 when there are unread characters in the input buffer. Returns 0 when there are no characters in the input buffer.</td>
</tr>
<tr>
<td>15</td>
<td>Returns the option codes from the end of a command line. For example, if you invoke a cataloged program as <strong>MYPROG (X,P</strong> the value returned by SYSTEM(15) is &quot;XP&quot;. If you specify the command <strong>DATE.FORMAT (D)</strong>, SYSTEM(15) returns &quot;D&quot;.</td>
</tr>
<tr>
<td>16</td>
<td>A boolean value that indicates whether the current process is running from a proc. Returns 1 if running from a proc. Otherwise, returns 0.</td>
</tr>
<tr>
<td>17</td>
<td>STOP code for child process.</td>
</tr>
<tr>
<td>18</td>
<td>Returns the port number for the terminal. Refer to the LISTME command in <em>Caché MultiValue Commands Reference</em>.</td>
</tr>
<tr>
<td>19</td>
<td>Returns the current user's login name. (For D3 emulation, see below.)</td>
</tr>
<tr>
<td>20</td>
<td>Returns the spooler job number last created by this user. If a job is output to the &amp;HOLD&amp; file (printing mode 3) then the SYSTEM(20) value is not updated. The SYSTEM(20) value is only updated in printing mode 1 (printing to the ^SPOOL global).</td>
</tr>
<tr>
<td>22</td>
<td>Returns PERFORM / EXECUTE level. The default is 0. (For D3 emulation, see below.)</td>
</tr>
<tr>
<td>23</td>
<td>A boolean value that indicates whether the Break key is enabled. Returns 1 if it is enabled. Otherwise, returns 0. The default is enabled.</td>
</tr>
<tr>
<td>24</td>
<td>A boolean value that indicates whether the echoing of input characters is enabled. Returns 1 if it is enabled. Otherwise, returns 0. The default is enabled.</td>
</tr>
<tr>
<td>25</td>
<td>A boolean value that indicates whether the current process is running from a phantom process. Returns 1 if running from a phantom process. Otherwise, returns 0.</td>
</tr>
<tr>
<td>26</td>
<td>Returns the current user prompt character. The default is “?”.</td>
</tr>
<tr>
<td>27</td>
<td>On UNIX® systems, returns the uid (user ID). On other systems, returns 0.</td>
</tr>
<tr>
<td>28</td>
<td>On UNIX® systems, returns the effective user ID. On other systems, returns 0. (For D3 emulation, see below.)</td>
</tr>
<tr>
<td>29</td>
<td>On UNIX® systems, returns the gid (group ID). On other systems, returns 0. (Only supported in Caché and UniVerse.)</td>
</tr>
<tr>
<td>30</td>
<td>On UNIX® systems, returns the effective gid (group ID). On other systems, returns 0. (Only supported in Caché and UniVerse.)</td>
</tr>
<tr>
<td>31</td>
<td>Returns the Caché license order number for Caché and for IN2, INFORMATION, Pick, PIOpen, Prime, and UniVerse emulations. (For D3 emulation, see below.)</td>
</tr>
<tr>
<td>32</td>
<td>Returns the Caché system manager directory pathname. For example, c:\intersystems\cache\mgr.</td>
</tr>
<tr>
<td>33</td>
<td>Returns the contents of the command stack (Caché, UniVerse, PICK emulations only). See <strong>@COMMAND.STACK</strong> system variable for further details. (For D3 and UniData emulations, see below.)</td>
</tr>
<tr>
<td>34</td>
<td>Returns data pending on the input stack. (Only supported in Caché and UniVerse.)</td>
</tr>
<tr>
<td>35</td>
<td>[Only supported in IN2, INFORMATION, PICK, PIOpen, Prime, and UniVerse emulations. See below.]</td>
</tr>
<tr>
<td>36</td>
<td>Returns the current licensed user count. Refer to the %SYSTEM.License.GetUserLimit() method in the <em>InterSystems Class Reference</em>.</td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>40</td>
<td>Returns the current program name as file~program. For a terminal, returns the current MV shell identifier. For example MV BASIC420.mvi, where 420 is the process ID for the current terminal. (Supported for all emulations except D3; in D3 emulation use SYSTEM(157).)</td>
</tr>
<tr>
<td>41</td>
<td>Returns the Caché version number. This is the same as the value returned by the ObjectScript $ZVERSION special variable. (Supported for all emulations.)</td>
</tr>
<tr>
<td>43</td>
<td>Returns the port number of the process holding a lock requested by the current process. After a failed lock request, the STATUS function returns the process ID (pid) of the holder of the lock.</td>
</tr>
<tr>
<td>44</td>
<td>Returns 1 for a Caché MultiValue system, in any emulation except D3.</td>
</tr>
<tr>
<td>49</td>
<td>Returns the current call stack as a dynamic array. The top level is the current routine. The array format is: array&lt;n,1&gt; = the stack level, counting from 1; array&lt;n,2&gt; = the program name specified as file~program; array&lt;n,3&gt; = the source program line number that called the next level. array&lt;n,3&gt; returns 0 if the line cannot be determined; usually this occurs if the routine has been recompiled.</td>
</tr>
<tr>
<td>52</td>
<td>[Only supported in jBASE emulation. See below.]</td>
</tr>
<tr>
<td>91</td>
<td>A boolean value that indicates whether the operating system is Windows. Returns 1 if running on an operating system in the Windows NT family. Otherwise, returns 0.</td>
</tr>
<tr>
<td>99</td>
<td>Returns the POSIX-compliant current universal system time, specified as an integer number of elapsed seconds since midnight of January 1, 1970, in Greenwich Mean Time (GMT). Refer to the ObjectScript $ZDATETIME and $ZDATETIMEH functions in <em>Caché ObjectScript Reference</em>.</td>
</tr>
<tr>
<td>100</td>
<td>Returns Caché version information. The format is platform-dependent. Windows: system-name; config-file-name:name; release; version; hardware-type; release-date; unused; unused; config-file-name; os-name; hardware/serialnum UNIX®: system-name; os-name; config-file-name:name; release; version; hardware; monitor-version; boot-monitor-release-date; config-file-name; os-name; hardware/serialnum For further details, see SYSTEM(100) in <em>Operational Differences between MultiValue and Caché</em>.</td>
</tr>
<tr>
<td>104</td>
<td>Returns the number of active MultiValue users, as reported by the LISTU command.</td>
</tr>
<tr>
<td>157</td>
<td>Same as SYSTEM(40). Supported in all emulations.</td>
</tr>
<tr>
<td>166</td>
<td>Same as SYSTEM(49). Supported in all emulations.</td>
</tr>
<tr>
<td>169</td>
<td>Returns the name of the computer.</td>
</tr>
<tr>
<td>255</td>
<td>Returns the operating system type. For example, “Windows NT”.</td>
</tr>
<tr>
<td>1001</td>
<td>Returns an emulation table number that specifies the emulation type that the program was compiled with (see below).</td>
</tr>
<tr>
<td>1002</td>
<td>Returns current Caché namespace</td>
</tr>
<tr>
<td>1005</td>
<td>Returns a boolean value for screen paging control.</td>
</tr>
<tr>
<td>1017</td>
<td>Returns the operating system name. For example, “Windows”.</td>
</tr>
<tr>
<td>1051</td>
<td>Returns an emulation table number that specifies the emulation type that the program was compiled with (see below).</td>
</tr>
<tr>
<td>1052</td>
<td>Returns the current Caché namespace.</td>
</tr>
<tr>
<td>1053</td>
<td>Returns the client IP address. For example, “127.0.0.1”</td>
</tr>
</tbody>
</table>
Returns the Caché system manager directory pathname. For example, c:\intersystems\cache\mgr\. See SYSTEM(32).

Returns the current namespace pathname. For example, c:\intersystems\cache\mgr\samples\.

Returns a string of four emulation attributes, as follows: An integer code for the emulation in effect when the program was compiled; the name of the emulation type in effect when the program was compiled; an integer code for the current emulation for the MultiValue account; the name of the current emulation type for the MultiValue account.

You can use the ASSIGN statement to modify these system settings.

**Emulation**

SYSTEM(1001) and SYSTEM(1051) return the current emulation as an integer code, as follows: 0=Caché, 1=jBASE, 2=Reality, 3=UniVerse, 4=UniData, 5=PICK, 6=Ultimate, 7=Prime or INFORMATION, 8=PIOpen, 9=POWER95, 10=MVBase, 11=D3, 12=IN2, 13=R83, 14=UDPICK.

SYSTEM(16) returns the current stack level for all MultiValue emulations except Caché, and UniVerse emulation.

- **D3 emulation:**
  - SYSTEM(0) returns 0 or a process ID indicating lock status. For example, following a failed lock request, it returns the process ID (pid) of the process holding a lock requested by the current process.
  - SYSTEM(11) after a READNEXT always returns 0, due to the PICK.SELECT behavior described in READNEXT.
  - SYSTEM(19) returns a unique ID value, composed of the date and time in Caché internal format (DDDDDSSSSSSS) and (if necessary) an incrementing two-character alpha suffix to ensure uniqueness.
  - SYSTEM(22) returns the port number of the current process.
  - SYSTEM(24) defaults to 0.
  - SYSTEM(30) returns the port number of the process holding a lock requested by the current process.
  - SYSTEM(31) returns the last form queue number (a number from 0 upwards, not the form queue name) that was last assigned with the SP.ASSIGN command.
  - SYSTEM(33) returns the call stack (a @VM-delimited stack of routine names) if the current routine is a subroutine; returns nothing if the current routine is a program. D3 also returns the standard SYSTEM(49) call stack.
  - SYSTEM(23), SYSTEM(25), SYSTEM(26), SYSTEM(27), SYSTEM(28), SYSTEM(29), SYSTEM(32), SYSTEM(34), SYSTEM(35), SYSTEM(40), SYSTEM(43), SYSTEM(44), and SYSTEM(52) are not supported in D3 emulation. Use SYSTEM(157) for SYSTEM(40) functionality.

- **jBASE emulation:**
  - SYSTEM(14) in native jBASE checks for pending input from any source; Caché MultiValue users must change this to check both SYSTEM(14) and SYSTEM(10).
  - SYSTEM(52) returns the computer name.
  - SYSTEM(1001) returns the command line as an attribute-delimited string.
  - SYSTEM(29), SYSTEM(31), SYSTEM(32), SYSTEM(33), SYSTEM(34), and SYSTEM(35) are not supported in jBASE emulation.

- **UniData emulation:**
  - SYSTEM(11) returns the SELECT count (the same as the @SELECTED value) when using Select List 0. For any other select list, only @SELECTED is set. Each invocation of READNEXT decrements this SYSTEM(11) count (but not the @SELECTED count).
– SYSTEM(33) returns the current system platform.
– SYSTEM(48) when called by a program being run by the PHANTOM command, SYSTEM(48) returns the name of the item in the &PH& file that is receiving program output.
– SYSTEM(29), SYSTEM(31), SYSTEM(32), SYSTEM(34), SYSTEM(35), and SYSTEM(52) are not supported in UniData emulation.

• UniVerse emulation. Unless otherwise specified, references to UniVerse emulation also apply to PICK, Prime, INFORMATION, PIOpen, and IN2:
  – SYSTEM(11) returns a boolean value that indicates whether the default select list is active.
  – SYSTEM(29) is supported in UniVerse emulation, but is not supported in other emulation modes.
  – SYSTEM(34) is supported in UniVerse emulation, but is not supported in other emulation modes.
  – SYSTEM(35) returns the number of active MultiValue users, as reported by the LISTU command line command.
  – SYSTEM(40) returns the current namespace pathname.
  – SYSTEM(52) is not supported in UniVerse emulation.

See Also

• ASSIGN statement
TAN

Returns the tangent of an angle.

TAN(number)

Arguments

| number | An expression that resolves to a number that specifies an angle in radians. |

Description

TAN takes an angle and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the side adjacent to the angle.

By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set $OPTIONS RADIANS.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example uses the TAN function to return the tangent of an angle:

```plaintext
Dim MyAngle
MyAngle = 1.3;          ! Define angle in degrees.
Print Tan(MyAngle);     ! Return tangent in radians.
```

The following example uses the TAN function to return the cotangent of an angle:

```plaintext
Dim MyAngle, MyCotangent
MyAngle = 1.3;                   ! Define angle in degrees.
MyCotangent = 1 / Tan(MyAngle);  ! Calculate cotangent.
Print MyCotangent;               ! Return in radians.
```

See Also

- ATAN function
- COS function
- SIN function
- TANH function
- Derived Math Functions
- ObjectScript: $ZTAN function
TANH

Returns the hyperbolic tangent of an angle.

TANH(Number)

Arguments

| number | An expression that resolves to a number that specifies an angle in degrees. |

Description

TANH takes an angle and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the side adjacent to the angle.

By default, Caché MVBasic trig functions return results in degrees. To return results in radians, set $OPTIONS RADIANS.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

Examples

The following example uses the TANH function to return the hyperbolic tangent of an angle:

```
Dim MyAngle
MyAngle = 1.3;         ! Define angle in degrees.
Print Tan(MyAngle);    ! Return htan in radians.
```

The following example uses the TANH function to return the cotangent of an angle:

```
Dim MyAngle, MyCotangent
MyAngle = 1.3;                   ! Define angle in degrees.
MyCotangent = 1 / Tan(MyAngle);  ! Calculate cotangent.
Print MyCotangent;               ! Return value in radians.
```

See Also

- **ATAN** function
- **COS** function
- **SIN** function
- **TAN** function
- **Derived Math Functions**
TIME

Returns the current local system time in internal format.

TIME()

Arguments

None. The parentheses are mandatory.

Description

The TIME function returns the current local time in a format such as the following:

29848.349

This represents the elapsed number of seconds since midnight, with fractional seconds. This is the same local time returned by SYSTEM(12). The only difference is that TIME displays the count in elapsed seconds and fractional milliseconds; SYSTEM(12) displays the count in elapsed milliseconds.

The ICONV function can convert a time value with fractional seconds from display format to an internal count of elapsed seconds since midnight with fractional seconds. All other time and date functions use whole seconds as the smallest unit of time.

TIME, TIMEDATE, SYSTEM(12), and @TIME all return a local time value. SYSTEM(99) returns a Coordinated Universal Time (UTC) time value.

Caché MultiValue determines local time (and date) as follows:

• It determines the current Coordinated Universal Time (UTC) from the system clock.
• It adjusts UTC to the local time zone by using the value of the Caché special variable $ZTIMEZONE.
• It applies local time variant settings (such as Daylight Saving Time) for that time zone from the host operating system.

Note: The local time returned by the TIME function is not the same as the local time returned by the @TIME system variable. Both return time in elapsed seconds since midnight. However, TIME returns the current time. @TIME returns the time of invocation of the current routine; the @TIME value does not change during the execution of the current routine. When issued from the MultiValue Shell, @TIME contains the time that the last (prior) command line was invoked. For further details, see the System Variables page of this manual.

Examples

The following example calls the TIME function to return the current system time in internal format, then uses the OCONV function to convert time from internal format to display format. Note that OCONV conversion truncates fractional seconds.

now=TIME()
PRINT now
PRINT OCONV(now, "MTS")

The following example shows the difference between the TIME function and the @TIME system variable:

SLEEP 2
PRINT @TIME, TIME()

The TIME function returns the current time; the @TIME variable returns the time that the SLEEP command was invoked.
See Also

- **TIMEDATE** function
- **OCONV** function
- ObjectScript: **$HOROLOG** special variable
- SQL: **NOW** function
TIMEDATE

Returns the current local date and time.

TIMEDATE()

Arguments

None. The parentheses are mandatory.

Description

The TIMEDATE function returns the current local date and time in the following format:

\[ hh:mm:ss \text{ dd mmm yyyy} \]

Time is represented on a 24-hour clock. Colons are used as the time separator. The date is represented as the number of days, the three-letter abbreviation for the month, and the year. Spaces are used as the date separator.

Note: You can specify the default date format using Caché NLS. Because of operational differences between MV and Caché NLS in the handling of month names, your NLS default date format must represent months as integers.

TIMEDATE does not return fractional seconds. It truncates fractional seconds. To return the local time with fractional seconds, use the TIME function or the SYSTEM(12) function.

Caché MultiValue determines local time (and date) as follows:

- It determines the current Coordinated Universal Time (UTC) from the system clock.
- It adjusts UTC to the local time zone by using the value of the Caché special variable $ZTIMEZONE.
- It applies local time variant settings (such as Daylight Saving Time) for that time zone from the host operating system.

See Also

- TIME function
- OCONV function
- ObjectScript: $HOROLOG special variable
- SQL: NOW function
TRANS

Reads field data from a MultiValue file.

TRANS(mvfile,recID,fieldno,code)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mvfile</td>
<td>The name of a MultiValue file defined in the VOC. An expression that resolves to a string. If there are multiple defined data sections (data files), you can specify mvfile as either &quot;filename,datasection&quot; or simply &quot;datasection&quot;.</td>
</tr>
<tr>
<td>recID</td>
<td>The record ID of the desired record. An expression that resolves to a string (commonly a positive integer). This argument can be multivalued in which case TRANS returns multivalues.</td>
</tr>
<tr>
<td>fieldno</td>
<td>An expression that resolves to either an integer or a non-numeric string. If an integer, fieldno specifies the field number of the field to be read, or, if -1, returns the contents of the entire record. This usage is compatible with most MultiValue systems. If a non-numeric string, fieldno specifies an attribute to look up in the file's dictionary. If that attribute is a &quot;D&quot; data defining entry, TRANS looks up the data using the corresponding field number recorded in the dictionary. This usage is compatible with UniData systems.</td>
</tr>
<tr>
<td>code</td>
<td>A letter code that specifies what to do if the requested record does not exist. An expression that resolves to a quoted string.</td>
</tr>
</tbody>
</table>

Description

The TRANS function returns a field value from a MultiValue file. Unlike a READ statement, you do not have to use the OPEN statement to open the MultiValue file before issuing a TRANS.

The code argument determines how TRANS should respond when you request an invalid field. The following are valid letter codes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Return an empty string if the specified record or field cannot be located.</td>
</tr>
<tr>
<td>V</td>
<td>Return an empty string and generate an error message if the specified record or field cannot be located.</td>
</tr>
<tr>
<td>C</td>
<td>Return the recID value if the specified record or field cannot be located.</td>
</tr>
<tr>
<td>N</td>
<td>Return the recID value if the specified field value is null.</td>
</tr>
</tbody>
</table>

The TRANS and XLATE functions are functionally identical.

Examples

The following example illustrates the use of the TRANS function:

```cache
mydyn = TRANS("TEST.FILE",1,1,"X")
PRINT "the field value: ", mydyn
```
See Also

- XLATE function
- READ statement
- STATUS statement
- Dynamic Arrays
TRIM

Removes leading and trailing characters from a string.

\[
\text{TRIM}(\text{string}\[,\text{char}\[,\text{code}\]])
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to trim. An expression that resolves to a string.</td>
</tr>
<tr>
<td>char</td>
<td>Optional — The character to remove from string. An expression that resolves to a single-character string. The default is to trim blank spaces and tabs.</td>
</tr>
<tr>
<td>code</td>
<td>Optional — The type of trimming to perform, An expression that resolves to a single-character code string. The default is to trim leading, trailing, and redundant characters.</td>
</tr>
</tbody>
</table>

**Description**

The TRIM function trims the specified character from both ends of a string (leading and trailing characters). By default, it trims leading and trailing blank spaces and tabs, and replaces multiple (redundant) spaces (including tabs) with a single space. It returns the resulting trimmed string. The original input string is not changed.

The optional char argument is case-sensitive. It trims the specified character until it encounters the first instance of another character. If char is set to a multi-character string, only the first character is used. If char is omitted or set to a single-character string containing a blank space (" "), blank spaces are trimmed. If char is set to the string empty string (""), string is returned unchanged.

You can use the TRIMB function to remove blank spaces from the back end of a string (trailing blanks). You can use the TRIMF function to remove blank spaces from the front end of a string (leading blanks). Use TRIMS to remove leading, trailing, and multiple embedded blank spaces from all of the elements of a dynamic array.

**Trim Codes**

By default, TRIM removes leading, trailing, and redundant space characters, and tabs. TRIM also removes leading, trailing and redundant space characters if you specify a code of "R" or the empty string ("").

You can perform other types of trim operation by specifying a single-character code string. The following are the available code characters:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>All occurrences of char removed from string.</td>
</tr>
<tr>
<td>B</td>
<td>Both leading and trailing occurrences of char removed.</td>
</tr>
<tr>
<td>D</td>
<td>Duplicate blank spaces and leading and trailing blank spaces removed. char must be specified, but its value is ignored.</td>
</tr>
<tr>
<td>E</td>
<td>Remove trailing spaces. char must be specified, but its value is ignored.</td>
</tr>
<tr>
<td>F</td>
<td>Remove leading spaces. char must be specified, but its value is ignored.</td>
</tr>
<tr>
<td>L</td>
<td>Leading occurrences of char removed.</td>
</tr>
<tr>
<td>R</td>
<td>Redundant, leading, and trailing occurrences of char removed. This is the default.</td>
</tr>
<tr>
<td>T</td>
<td>Trailing occurrences of char removed.</td>
</tr>
</tbody>
</table>

These code characters are not case-sensitive.
Examples

The following example uses the **TRIM** function to trim leading and trailing spaces:

```
MyVar = TRIM(" Caché ")
! MyVar contains "Caché".
PRINT LEN(MyVar),"[":MyVar:"]"
```

The following example uses the **TRIM** function to trim leading and trailing lowercase “a”. In this case, leading a's are trimmed until an uppercase A is encountered and trailing a's are trimmed until a blank space is encountered:

```
MyVar = TRIM("aaaaAnaconda aaaa","a")
! MyVar contains "Anaconda ".
PRINT LEN(MyVar),"[":MyVar:"]"
```

See Also

- TRIMB function
- TRIMF function
- LEFT function
- RIGHT function
- TRIMS function
- Strings
TRIMB

Removes trailing blanks from a string.

**TRIMB**(string)

**Arguments**

| **string** | An expression that resolves to a string. |

**Description**

The **TRIMB** function trims blank spaces from the back end of a string (trailing blanks). It returns the resulting trimmed string.

You can use the **TRIM** function to remove blank spaces (or other repetitive characters) from both ends of a string. You can use the **TRIMF** function to remove blank spaces from the front end of a string (leading blanks).

You can use the **TRIMFS** and **TRIMBS** functions to remove leading or trailing blanks from the elements of a dynamic array.

**Examples**

The following example uses the **TRIMB** function to trim trailing spaces:

```caché
MyVar = TRIMB(" Caché ")
! MyVar contains " Caché".
PRINT LEN(MyVar),"[:MyVar:]"
```

**See Also**

- **TRIM** function
- **TRIMBS** function
- **TRIMF** function
- **LEFT** function
- **RIGHT** function
- **Strings**
TRIMBS

Removes trailing blanks from each element of a dynamic array.

**TRIMBS**(dynarray)

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |

**Description**

The **TRIMBS** function trims trailing blank spaces from each element of a dynamic array. It returns the resulting trimmed dynamic array.

**TRIMBS** does not trim leading blank spaces from dynamic array elements. You can use the **TRIMFS** function to remove leading blank spaces from each element of a dynamic array. You can use **TRIMS** to remove leading, trailing, and multiple embedded blank spaces from all of the elements of a dynamic array.

You can use **TRIM** to remove both leading and trailing blanks from a string. You can use **TRIMB** to remove trailing blanks from a string. You can use **TRIMF** to remove leading blanks from a string.

**Examples**

The following example uses the **TRIMBS** function to trim trailing spaces:

```vm
RawDyn="North   ":@VM:"South   ":@VM:"East":@VM:"West..."
PRINT LENS(RawDyn)
TrimDyn = TRIMBS(RawDyn)
PRINT LENS(TrimDyn)
```

**See Also**

- **LENS** function
- **TRIMFS** function
- **TRIMS** function
- **TRIM** function
- **TRIMB** function
- **TRIMF** function
- Dynamic Arrays
TRIMF

Removes leading blanks from a string.

TRIMF(string)

Arguments

| string | An expression that resolves to a string. |

Description

The TRIMF function trims blank spaces from the front end of a string (leading blanks). It returns the resulting trimmed string.

You can use the TRIM function to remove blank spaces (or other repetitive characters) from both ends of a string. You can use the TRIMB function to remove blank spaces from the back end of a string (trailing blanks).

You can use the TRIMFS and TRIMBS functions to remove leading or trailing blanks from the elements of a dynamic array.

Examples

The following example uses the TRIMF function to trim leading spaces:

MyVar = TRIMF(" Caché ")
! MyVar contains " Caché".
PRINT LEN(MyVar),"[";MyVar;"]"

See Also

- TRIM function
- TRIMB function
- TRIMFS function
- LEFT function
- RIGHT function
- Strings
TRIMFS

Removes leading blanks from each element of a dynamic array.

TRIMFS(dynarray)

Arguments

| dynarray   | An expression that resolves to a dynamic array. |

Description

The TRIMFS function trims leading blank spaces from each element of a dynamic array. It returns the resulting trimmed dynamic array.

TRIMFS does not trim trailing blank spaces from dynamic array elements. You can use the TRIMBS function to remove trailing blank spaces from each element of a dynamic array. You can use TRIMS to remove leading, trailing, and multiple embedded blank spaces from all of the elements of a dynamic array.

You can use TRIM to remove both leading and trailing blanks from a string. You can use TRIMF to remove leading blanks from a string. You can use TRIMB to remove trailing blanks from a string.

Examples

The following example uses the TRIMFS function to trim leading spaces:

RawDyn="   North":@VM:"      South":@VM:"East":@VM:" West..
PRINT LENS(RawDyn)
TrimDyn = TRIMFS(RawDyn)
PRINT LENS(TrimDyn)

See Also

- LENS function
- TRIMBS function
- TRIMS function
- TRIM function
- TRIMB function
- TRIMF function
- Dynamic Arrays
**TRIMS**

Removes leading and trailing spaces from each element of a dynamic array.

```
TRIMS(dynarray)
```

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |

**Description**

The **TRIMS** function trims leading and trailing blank spaces from each element of a dynamic array. It also replaces multiple (redundant) spaces within an element with a single space. It returns the resulting trimmed dynamic array.

To trim only trailing blank spaces from each element, use **TRIMBS**. To trim only leading blank spaces from each element, use **TRIMFS**.

You can use **TRIM** to remove both leading and trailing blanks from a string. You can use **TRIMB** to remove trailing blanks from a string. You can use **TRIMF** to remove leading blanks from a string.

**Examples**

The following example uses the **TRIMS** function to trim leading and trailing spaces:

```
RawDyn="North   ":@VM:"South   ":@VM:"East":@VM:"West...
PRINT LENS(RawDyn)
TrimDyn = TRIMS(RawDyn)
PRINT LENS(TrimDyn)
```

The following example uses the **TRIMS** function to trim redundant spaces within elements:

```
RawDyn="North America":@VM:"Central America":@VM:"South America"
PRINT LENS(RawDyn)
TrimDyn = TRIMS(RawDyn)
PRINT LENS(TrimDyn)
```

**See Also**

- **LENS** function
- **TRIMBS** function
- **TRIMFS** function
- **TRIM** function
- **TRIMB** function
- **TRIMF** function
- **Dynamic Arrays**
UNASSIGNED

Determines if a variable is unassigned.

**UNASSIGNED**(var)

**Arguments**

| var | A user variable. If var is not a valid variable name, MVBasic issues a syntax error. |

**Description**

The **UNASSIGNED** function determines whether a variable is assigned or not assigned. If var is not assigned a value, **UNASSIGNED** returns 1. If var is assigned a value, **UNASSIGNED** returns 0. An assigned value can be a single value, a dynamic array value, or the null string.

The input var can be a local variable, a global variable, or a process-private global variable. It can be with or without subscripts.

**Note:** **UNASSIGNED** should not be used on system variables (@ variables). It always returns 1 for all @ variables, whether or not the @ variable currently has a value.

The **COMMON** statement initializes variables as unassigned in Caché MVBasic. Array variable initialization varies with different MultiValue emulations. You can use the **$KILL** statement to unassign user variables.

The **ASSIGNED** function is the functional opposite of the **UNASSIGNED** function.

**Examples**

The following example tests the assignment of several variables. **UNASSIGNED** returns 0 (assigned) for all of these variables:

```
A=123
B="Fred"
C=1:VM:2:VM:3
D=""
^A="Fruit"
^A(3)="Banana"
^|A="PPV"
PRINT UNASSIGNED (A)
PRINT UNASSIGNED (B)
PRINT UNASSIGNED (C)
PRINT UNASSIGNED (D)
PRINT UNASSIGNED (^A)
PRINT UNASSIGNED (^A(3))
PRINT UNASSIGNED (^|A)
```

**See Also**

- **COMMON** statement
- **ASSIGNED** function
UNICHAR

Returns the character corresponding to the specified character code.

**UNICHAR(charcode)**

**Arguments**

| charcode | An expression that resolves to a base-10 integer that identifies a character. For 8-bit characters, *charcode* must be a positive integer in the range 0 through 255. For 16-bit characters, *charcode* must be a positive integer in the range 256 through 65534. |

**Description**

The UNICHAR function takes a character code and returns the corresponding character. The UNISEQ function takes a character and returns the corresponding character code.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, UNICHAR(10) returns a linefeed character.

**Note:** UNICHAR, CHAR, and BYTE are functionally identical. On Unicode systems both can be used to return 16-bit Unicode characters. On 8-bit systems, these functions return a null string for character codes beyond 255.

The Caché MVBasic UNICHAR function returns a single character. The corresponding ObjectScript $CHAR function can return a string of multiple characters by specifying a comma-separated list of ASCII codes. The Caché MVBasic UNICHARS function takes a dynamic array of ASCII codes and returns the corresponding single characters as a dynamic array.

**Examples**

The following example uses the UNICHAR function to return the character associated with the specified character code:

```mvb
PRINT UNICHAR(65); ! Returns A.
PRINT UNICHAR(97); ! Returns a.
PRINT UNICHAR(37); ! Returns %.
PRINT UNICHAR(62); ! Returns >.
```

The following example uses the UNICHAR function to return the lowercase letter characters of the Russian alphabet on a Unicode version of Caché. On an 8-bit version of Caché it returns a null string for each letter:

```mvb
letter=1072
FOR x=1 TO 32
   PRINT UNICHAR(letter)
   letter=letter+1
NEXT
```

**See Also**

- BYTE function
- CHAR function
- CHARS function
- SEQ function
- UNISEQ function
- ObjectScript: $CHAR function
UNICHARS

Returns the character corresponding to the specified character code for each element of a dynamic array.

UNICHARS(dynarray)

Arguments

| dynarray | An expression that resolves to a dynamic array of base-10 integers that identify characters. For 8-bit characters, each element value must be a positive integer in the range 0 through 255. For 16-bit characters, each element value must be a positive integer in the range 256 through 65534. |

Description

The UNICHARS function takes a dynamic array of character codes and returns a dynamic array containing the corresponding character for each element.

This is the inverse of the UNISEQS function, which takes a dynamic array of characters and returns the corresponding character codes.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, UNICHARS(10) returns a linefeed character.

Note: UNICHARS and CHARS are functionally identical. On Unicode systems both can be used to return 16-bit Unicode characters. On 8-bit systems, these functions return a null string for character codes greater than 255.

Examples

The following example uses the UNICHARS function to return a dynamic array of the characters associated with each specified ASCII character code:

a=65:0VM:66:0VM:67:0VM:68
PRINT UNICHARS(a);  ! returns AýBýCýD

The following example uses the UNICHARS function to return the first four letters of the Greek alphabet. On a Unicode version of Caché it returns the Greek letters in a dynamic array; on an 8-bit version of Caché it returns a dynamic array with a null string for each letter:

b=945:0VM:946:0VM:947:0VM:948
PRINT UNICHARS(b)

See Also

• CHARS function
• CHAR function
• UNISEQS function
• Dynamic Arrays
• ObjectScript: $CHAR function
UNISEQ

Returns the character code corresponding to a specified character.

UNISEQ(char)

Arguments

| char | An expression that resolves to a single character. If char is a string, UNISEQ returns the value of the first character. |

Description

The UNISEQ function takes a character and returns the corresponding Unicode numeric code. Its inverse, the CHAR function takes a numeric code and returns the corresponding character.

The Caché MVBasic UNISEQ function returns the numeric value for a single character. The corresponding ObjectScript $ASCII function can take a string of characters and return the numeric value for a specific character by specifying its position in the string.

Note: UNISEQ and SEQ are functionally identical.

Examples

The following example uses the UNISEQ function to return the numeric code associated with the specified character:

```caché
PRINT UNISEQ('A'); ! Returns 65.
PRINT UNISEQ('a'); ! Returns 97.
PRINT UNISEQ('%'); ! Returns 37.
PRINT UNISEQ('>'); ! Returns 62.
```

The following example uses the UNISEQ function to return lowercase letter characters and associated numeric codes of the Russian alphabet. On a Unicode version of Caché it returns the Russian letters; on an 8-bit version of Caché it returns a -1 (indicating a null string) for each letter:

```caché
letter=1072
FOR x=1 TO 32
    glyph=CHAR(letter)
    PRINT UNISEQ(glyph),glyph
    letter=letter+1
NEXT
```

See Also

- SEQ function
- CHAR function
- ObjectScript: $ASCII function
UNISEQS

Returns the character code for the first character of each element in a dynamic array.

UNISEQS(dynarray)

**Arguments**

| dynarray | An expression that resolves to a dynamic array. |

**Description**

The **UNISEQS** function takes a dynamic array of characters and returns a dynamic array containing the corresponding numeric code for the first character in each element. If an element consists of a string of more than one character, **UNISEQS** returns the numeric value of the first character of that element. If an element is missing or contains the null string, **UNISEQS** returns -1 for that element.

If the first character of a dynamic array element is one of the following dynamic array level delimiters: CHAR(252), CHAR(253), or CHAR(254), **UNISEQS** treats this character as a level delimiter, and returns -1 for the null element(s) established by parsing this character as a level delimiter.

**Note:** **UNISEQS** and **SEQS** are functionally identical. On Unicode systems both can be used to return character codes for 16-bit Unicode characters. On 8-bit systems, these functions return that character code of the first 8 bits of a 16-bit Unicode character.

The **UNICHARS** function is the inverse of **UNISEQS**. It takes a dynamic array of numeric codes and returns the corresponding characters.

The **UNISEQ** function (or **SEQ** function) takes the first character of a string and returns the corresponding numeric code. The **UNISEQS** function returns the numeric value for the first character of each element as a dynamic array element. The corresponding ObjectScript **$ASCII** function can take a string of characters and return the numeric value for a specific character by specifying its position in the string.

**Examples**

The following example uses the **UNISEQS** function to return the numeric codes associated with each character in a dynamic array:

```plaintext
alpha="A":@VM:"B":@VM:"C":@VM:"D"
PRINT UNISEQS(alpha)
  ! returns 65ý66ý67ý68
```

The following example returns the numeric codes associated with four lowercase Russian letters in a dynamic array. On a Unicode system, it returns the Russian character codes. On an 8-bit system, characters beyond 255 are treated as null strings, so **UNISEQS** returns -1 for each element.

```plaintext
russian=CHAR(1072):@VM:CHAR(1073):@VM:CHAR(1074):@VM:CHAR(1075)
PRINT UNISEQS(russian)
```

**See Also**

- **SEQS** function
- **CHARS** function
- **UNICHARS** function
- **SEQ** function
• Dynamic Arrays
• ObjectScript: $ASCII function
UPCASE

Converts alphabetic characters to uppercase.

| UPCASE(string) |

Arguments

| string | An expression that resolves to a string.

Description

The `UPCASE` function returns a string of characters with all lowercase letters converted to uppercase. Characters other than lowercase letters are passed through unchanged. If you specify a null string, `UPCASE` returns a null string.

By default, `UPCASE` performs case conversion on ANSI Latin-1 letters. To perform case conversion on letters in other character sets, you must set the appropriate locale.

The `OCONV` function with the “MCU” option is functionally identical to the `UPCASE` function. To convert uppercase to lowercase, use the `DOWNCASE` function.

Examples

The following example uses the `UPCASE` function to convert lowercase letters to uppercase:

```caché
MyString = "Caché from InterSystems"
PRINT UPCASE(MyString)
! Returns "CACHÉ FROM INTERSYSTEMS"
```

See Also

- `DOWNCASE` function
- `OCONV` function
**XLATE**

Reads field data from a MultiValue file.

\[ \text{XLATE}( \text{mvfile, recID, fieldno, code} ) \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mvfile</td>
<td>The name of a MultiValue file defined in the VOC. An expression that resolves to a string. If there are multiple data files, you can specify \textit{mvfile} as either \textit{&quot;dirname, datafile&quot;} or simply \textit{&quot;datafile&quot;}.</td>
</tr>
<tr>
<td>recID</td>
<td>The record ID of the desired record. An expression that resolves to a string (commonly a positive integer). This argument can be multivalued in which case \textit{XLATE} returns multivalues.</td>
</tr>
<tr>
<td>fieldno</td>
<td>An expression that resolves to either an integer or a non-numeric string. If an integer, \textit{fieldno} specifies the field number of the field to be read, or, if -1, returns the contents of the entire record. This usage is compatible with most MultiValue systems. If a non-numeric string, \textit{fieldno} specifies an attribute to look up in the file's dictionary. If that attribute is a “D” data defining entry, \textit{XLATE} looks up the data using the corresponding field number recorded in the dictionary. This usage is compatible with UniData systems.</td>
</tr>
<tr>
<td>code</td>
<td>A letter code that specifies what to do if the requested record does not exist. An expression that resolves to a code string.</td>
</tr>
</tbody>
</table>

**Description**

The \textit{XLATE} function returns a field value from a MultiValue file. Unlike a \textit{READ} statement, you do not have to use the \textit{OPEN} statement to open the MultiValue file before issuing an \textit{XLATE}.

The \textit{code} argument determines how \textit{XLATE} should respond when you request an invalid field. The following are valid letter codes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Return an empty string if the specified record or field cannot be located.</td>
</tr>
<tr>
<td>V</td>
<td>Return an empty string and generate an error message if the specified record or field cannot be located.</td>
</tr>
<tr>
<td>C</td>
<td>Return the \textit{recID} value if the specified record or field cannot be located or has an empty string value (“”).</td>
</tr>
<tr>
<td>N</td>
<td>Return an empty string if the specified record or field cannot be located.</td>
</tr>
</tbody>
</table>

The \textit{XLATE} and \textit{TRANS} functions are functionally identical.

**Examples**

The following example illustrates the use of the \textit{XLATE} function:

\[
\begin{align*}
\text{mydyn} & = \text{XLATE}(\text{"TEST.FILE"},1,1,X) \\
\text{PRINT} & \text{ "the field value:"},\text{mydyn}
\end{align*}
\]
See Also

- TRANS function
- READ statement
- STATUS statement
- Dynamic Arrays
XTD

Converts a number from hexadecimal to decimal.

**XTD(hexnum)**

**Arguments**

| hexnum | An expression that resolves to a positive hexadecimal integer. If hexnum contains only the characters 0 – 9, it may be specified as a number; if it includes the hexadecimal characters A – F, it must be specified as a string. The hexadecimal characters A – F are not case-sensitive. |

**Description**

The XTD function returns a hexadecimal integer converted to decimal. The *hexnum* value must be a positive hexadecimal integer. XTD returns the corresponding decimal integer value.

If *hexnum* is zero, a negative number, or a non-numeric string, XTD returns 0. If *hexnum* is a fractional number, it is truncated to its integer portion. If *hexnum* is a mixed numeric string, the hexadecimal part is parsed until a non-hexadecimal character is encountered. Thus “7Dwarves” is parsed as 7D. If *hexnum* is the null string, a <FUNCTION> error occurs.

Use DTX to convert from decimal to hexadecimal.

**Examples**

The following examples use the XTD function to return a decimal number:

```
PRINT XTD(12);        ! Returns 12
PRINT XTD("1C");      ! Returns 28
PRINT XTD("1c");      ! Returns 28
PRINT XTD("-1C");     ! Returns 0
PRINT XTD("red");     ! Returns 0
```

**See Also**

- DTX function
Caché MultiValue Basic General Concepts
Whitespace and Comments

Whitespace and comment indicators.

Whitespace

A whitespace character can be a blank space or a tab. Between command arguments, or between an operator and its operands you can specify no whitespace, one whitespace character, or multiple whitespace characters. For example, the following pairs of statements are functionally identical:

```
PRINT"fred";! a comment
PRINT  "fred"   ;  ! a comment
PRINT"butter":"fly"
PRINT   "butter"  :   "fly"
PRINT(4=3)+2
PRINT  ( 4 = 3)  +  2
```

However, if the first command argument is a number, it must either be quoted, enclosed in parentheses, or separated from the command name by one or more whitespace characters. If the first command argument is a variable, it must either be enclosed in parentheses, or separated from the command name by one or more whitespace characters.

An MVBasic statement can begin in column 1, or can be indented with any number of whitespace characters.

Vertical spacing (line breaks) within a command are only permitted following a comma or following a line continuation character. Refer to the Line Continuation page of this manual for further details.

Comments

A comment is text within a program that is not executed. Comments are used for documenting source code. They do not become part of the executable program and do not affect the size or performance of the object code.

A comment can be on a separate program line, or can follow an executable statement on the same line. A comment can appear after a comma in a command containing a line break. There are three ways to indicate a comment on the same line as executable code: the REM statement, a semicolon asterisk (;*), or a semicolon exclamation mark (;!). When indicating a comment on a separate program line, you can use a dollar sign asterisk ($*), an asterisk (*), or an exclamation point (!), in addition to the REM, ;* and ;! forms. Whitespace is permitted (but optional) before a comment indicator, or between the semicolon and the asterisk or exclamation mark.

All MVBasic comments indicators are single-line comments. You must begin each line of a comment with a comment indicator.

Examples

The following examples are all valid comments:

```
PRINT TIMEDATE();  ! comment text
   ;! several lines of
   ;! additional comment text
PRINT "Hello", ;* comment text
   ;* further comments
   "World!"
PRINT "Hello", REM comment text
   " World!"
REM  this is a comment
$* comment text
```

See Also

- REM statement
- Line Continuation
Compiler Directives

Preprocessor statements issued to the MVBasic compiler.

Caché MVBasic supports most, but not all of the compiler directives provided by other flavors of MultiValue. The MultiValue Basic Quick Reference contains a Compiler Directives table showing which of the UniVerse compiler directives are supported by Caché MVBasic. The following are the Caché MVBasic compiler directives:

### #INCLUDE

```
#INCLUDE program
#INCLUDE filename program
#INCLUDE filename,section program
#INCLUDE account,filename, program
#INCLUDE account,filename,section program
```

Inserts MVBasic source code from a specified shared library routine into the program being compiled. The inserted code is compiled along with the program in which it is included. The `program` shared library routine has a `.h` suffix. If `filename` is omitted, defaults to the filename of the current program. The `account` name (namespace name) and the `section` name are optional.

### #PRAGMA

```
#PRAGMA ROUTINENAME=rrr
```

When you compile an MVBasic routine, the system generates a default routine name, with the format `MVB.xxx`. This name applies to the intermediate MVI source code (`xxx.mvi`) and to the object code (`xxx.obj`).

Use `#PRAGMA` to override this default and specify this routine name. You do this by adding the following statement to the source code file: `#PRAGMA ROUTINENAME=rrr`, where “rrr” is the routine name. This routine name must satisfy the naming convention syntax for Cache routines: the first character must be `%` or a letter, and subsequent characters must be letter, a number, or a period.

**CAUTION:** Use care in selecting a routine name, or when copying program code that contains `#PRAGMA ROUTINENAME=rrr`. `#PRAGMA` creates a routine with the specified name even if that name was already assigned to an existing routine. It overwrites the object code for an existing routine with object code for the current routine.

Once a routine name has been associated with a source file, that name will continue to be used, even if the `#PRAGMA` statement is removed. To stop using this associated routine name and have the system generate a new default routine name, specify an empty routine name: `#PRAGMA ROUTINENAME=""`.

This empty routine name should be specified only for the first compile. This removes the associated routine name. The `#PRAGMA` statement should then be removed before subsequent compiles of the source code file. Otherwise the system will continue to generate a new name each time the routine is compiled, instead of each compile replacing the prior existing routine.

### $COPYRIGHT

```
$COPYRIGHT text
```

The `$COPYRIGHT` statement inserts the specified copyright text into the generated object code. This text is a non-executable comment. `text` is a string enclosed in double or single quotes. The `text` string can include Unicode characters.

If there is more than one `$COPYRIGHT` statement in a routine, only the text from the final `$COPYRIGHT` is inserted into the generated object code.
$DEFINE

$DEFINE symbol value

Assigns a value to a symbol used at compile time.

Do not specify a comment on the same line as a $DEFINE statement. $DEFINE uses the entire line as is, including any leading or trailing blank spaces and any comments.

The preprocessor symbol INTERSYSTEMS is automatically defined for all Caché MVBasic compilations.

$IFDEF / $IFNDEF

Performs a logical branch based on whether a symbol is defined ($IFDEF) or not defined ($IFNDEF). Specify a block of dependent code after this statement. You can use or omit a $ELSE clause. Terminate the block of dependent code with a $ENDIF keyword.

The preprocessor symbol INTERSYSTEMS is automatically defined for all Caché MVBasic compilations.

$INCLUDE

A synonym for #INCLUDE.

$INSERT

A synonym for #INCLUDE.

$UNDEFINE

Removes an assigned meaning from a symbol used at compile time. $UNDEFINE reverses the action of $DEFINE.
**MV Data Types**

Data types supported for MultiValue compatibility.

**%MV.Date**

Data type for the MultiValue internal representation of dates. It represents the elapsed number of days since December 31, 1967. This data type extends Caché %Date, which represents the elapsed number of days since December 31, 1840. For further details, refer to the MVBasic DATE function and %MV.Date class in the *InterSystems Class Reference*.

**%MV.Numeric**

Data type for the MultiValue internal representation of numeric values. This data type corresponds to %Numeric, but has an additional DESCALE parameter.

DESCALE only exists as a parameter for %MV.Numeric, and controls descaling — moving the decimal point for numbers stored with implicit decimals. If you expect numbers to be entered accurately with decimals, then you need to descale on input to move the decimal to the internal format (in most cases, remove the decimal).

SCALE is inherited from %Numeric, and controls the number of decimal places that the number is rounded to, usually reducing precision. There's no sense in scaling on input because you can't add precision that isn't there. DESCALE is reversible, because it just moves the decimal. SCALE is not reversible, because it reduces the precision.

A null value is stored in %MV.Numeric as NULL. Descaling is ignored for null values.

For further details, refer to the %MV.Numeric class in the *InterSystems Class Reference*.

**See Also**

- Caché SQL Data Types
Dynamic Arrays

A user-defined structure for storing multiple data values.

Description

A dynamic array is a uniquely named entity used to store and retrieve multiple data values. These data values are called “elements”. These elements can be flat (all on the same level), or in a hierarchical structure. A dynamic array is a string. Its elements are marked by special delimiter characters within the string.

A dynamic array is assigned element values by using the equal sign (=), the same as an ordinary string. The naming conventions for dynamic arrays are the same as for variables. Caché MVBasic does not distinguish between dynamic array names and variable names; you cannot assign the same name to a dynamic array and to a single-value variable.

Note: MVBasic also supports standard arrays, using the DIM statement. These should not be confused with dynamic arrays, which are a unique feature of MultiValue database systems.

The scope of a dynamic array is the current process.

The level of a dynamic array element can be specified either by delimiter character variables (for example, @FM), or by numeric operators (for example, <1,2>). These two ways of specifying the level of dynamic array elements are described below.

You can use the RAISE and LOWER functions to change the level of dynamic array elements.

Dynamic Array Level Delimiter Characters

Dynamic arrays can be assigned element values using the following format:

```
val1:@nM:val2:@nM:val3
```

The dynamic array level is specified by the @nM special variable, which resolves to a single character that is used as a level delimiter. This delimiter character is concatenated into the string between two data values, using the colon (:) string concatenation operator. The level is specified by the first letter of this code variable, as shown in the following table. Levels are listed in descending order:

<table>
<thead>
<tr>
<th>Level code variable</th>
<th>Level abbreviation and name</th>
<th>Character value</th>
</tr>
</thead>
<tbody>
<tr>
<td>@IM</td>
<td>I = Item Mark</td>
<td>CHAR(255)</td>
</tr>
<tr>
<td>@FM or @AM</td>
<td>F = Field Mark or Attribute Mark</td>
<td>CHAR(254)</td>
</tr>
<tr>
<td>@VM</td>
<td>V = Value Mark</td>
<td>CHAR(253)</td>
</tr>
<tr>
<td>@SM or @SVM</td>
<td>S = Subvalue Mark (see Subvalue Considerations, below)</td>
<td>CHAR(252)</td>
</tr>
<tr>
<td>@TM</td>
<td>T = Text Mark</td>
<td>CHAR(251)</td>
</tr>
<tr>
<td>Z</td>
<td></td>
<td>CHAR(250)</td>
</tr>
</tbody>
</table>

Note: Caché MVBasic supports the UniVerse dynamic array levels to CHAR(250). It does not support UniVerse levels below CHAR(250). It does not support UniData dynamic array levels (such as @RM) that are not supported by the UniVerse implementation.

The Text Mark (@TM) character is inserted in a string by the FMT and FMTS functions.

The character values specified in the above table are the English locale default values. The dynamic array level code variables can be mapped to other character values, as specified in your NLS locale definition.
Dynamic Array Level Numeric Operators

You use the <> operators to assigned element values to a dynamic array, extract an element value from a dynamic array, or to replace an element value in a dynamic array. The <> operators use the following formats:

\[
<f>
\]
\[
<f,v>
\]
\[
<f,v,s>
\]

Where f (field), v (value), and s (subvalue) are comma-separated integers representing the position of the desired element (counting from 1). For example, <2,3> indicates the 3rd Value Mark value within the 2nd Field Mark field.

The first dynamic array element is specified by <1>. Specifying <0> means to insert the specified value to the beginning of the dynamic array; this value then becomes the first dynamic array element. Specifying <-1> (or any negative integer) means to insert the specified value at the end of the dynamic array. The use of these integers is shown in the following example:

\[
\begin{align*}
\text{alphabet}<0> &= \text{"B"} \quad \text{\textbar} \quad \text{"B"} \\
\text{alphabet}<0> &= \text{"Z"} \quad \text{\textbar} \quad \text{"Z"} \text{\textbar} \text{"B"} \\
\text{alphabet}<1> &= \text{"A"} \quad \text{\textbar} \quad \text{"A"} \text{\textbar} \text{"B"} \\
\text{alphabet}<3> &= \text{"C"} \quad \text{\textbar} \quad \text{"A"} \text{\textbar} \text{"B"} \text{\textbar} \text{"C"} \\
\text{alphabet}<1> &= \text{"D"} \quad \text{\textbar} \quad \text{"A"} \text{\textbar} \text{"B"} \text{\textbar} \text{"C"} \text{\textbar} \text{"D"}
\end{align*}
\]

The following example assigns the ^fruit global a dynamic array of field elements:

\[
\begin{align*}
\text{^fruit}<1> &= \text{"Apple"} \\
\text{^fruit}<2> &= \text{"Orange"} \\
\text{^fruit}<3> &= \text{"Banana"}
\end{align*}
\]

This is exactly equivalent to:

\[
\text{^fruit}=\text{"Apple"}:@\text{FM}:\text{"Orange"}:@\text{FM}:\text{"Banana"}
\]

To extract an element value from a dynamic array:

\[
\text{var}=\text{dynarray}<f,v,s>
\]

Where dynarray is a dynamic array, and the angle brackets specify by position the element to extract into the var variable.

To replace an element value in a dynamic array:

\[
\text{dynarray}<f,v,s>=\text{newval}
\]

Where dynarray is a dynamic array, and the angle brackets specify by position the element to replace with the newval value. The subscript dynarray<0,v> is parsed as dynarray<1,v>. The subscript dynarray<0,0,s> is parsed as dynarray<1,1,s>. This is true for Caché and all emulations except UniData.

Subvalue Considerations

Caché MultiValue and all emulations allow a simple selection by subvalues on multi-valued fields. UniData emulation also can select by subvalues in single-valued fields. Caché MultiValue supports selection on subvalued fields if the field is defined as a property in an associated class with the MVVASSOCIATION parameter set.

When exploding, UniVerse and UniData explode subvalues, but D3, Reality, and jBASE only explode values. Reality provides a BY-EXP-SUB keyword to explode by subvalues which gives the same result as a simple BY-EXP on UniVerse. For further details, refer to the BY clause in Caché MultiValue Query Language (CMQL) Reference.

When using print limiting, D3 and Reality limit to values where the desired subvalue is the first or only subvalue. UniVerse limits to only the subvalues that have the limiting value.
Labels

A program line identifier.

Description

A label is a unique identifier for a program line. A label must appear in column 1; it cannot be indented. A label can be on a line by itself, or be followed by an MVBasic command on the same line.

The following are the naming conventions for labels:

• A label can contain letters, numbers, the period (.), dollar sign ($), and percent sign (%) characters. The first character of a label must be a letter or a number. If the first character of the label is a letter, the label can contain the underscore (_) character. The underscore character cannot be the last character in a label.

• A label is followed by a colon (:). This colon can be omitted if all of the characters of the label are numbers.

• Letters in labels are case-sensitive.

• A label can be of any length, but only the first 31 characters are significant. The label must be unique within the first 31 characters.

Labels are used by the GOTO statement. This statement may be abbreviated as the GO statement.

A label cannot be used on a program line containing a SUBROUTINE or FUNCTION command.
Line Continuation

Allows a program statement to occupy multiple lines.

Description

By default, a MVBasic program statement can only continue to a second line if it contains a comma. You can specify a line break following a comma. For example:

```
CRT "Hello",
    "World!"
```

However, by specifying a line continuation character at the end of a line, you can place a line break almost anywhere in a program statement and continue the program statement on the next line.

You must enable a line continuation option in order to use line continuation characters. You can enable either (or both) of the two supported line continuation characters: backslash (\) or vertical bar (|). The following $OPTIONS statements enable these line continuation characters:

```
$OPTIONS LINE.CONT.BS\LAS\H
$OPTIONS LINE.CONT.VBAR
```

You can use either or both of these $OPTIONS statements. Like most option statements, you can disable an enabled option by prefixing it with a minus sign. For example $OPTIONS -LINE.CONT.BS\LAS\H.

Once enabled, the specified line continuation character may be used in that MVBasic program. The line continuation character must be the last character in a line. A space or comment is not permitted following a line continuation character. It is recommended that you separate the line continuation character from the preceding characters by a space, though this is not required. You can continue a program statement over any number of lines by specifying a line continuation character at the end of each line.

You can use the backslash character (\) as both a line continuation character and a string quotation character in the same program. For example, the following is valid MVBasic code:

```
$OPTIONS LINE.CONT.BS\LAS\H
CRT \Hello World! \\
    \It's an "awesome" day\n```

For clarity of code, it would be preferable to use the vertical bar (|) line continuation character when the backslash is being used as a quotation character. Regardless of which string quotation characters are used, you cannot use a line continuation character within a string.

Emulation

In Caché and most emulations line continuation is disabled by default.

In jBASE emulation, the default is LINE.CONT.BS\LAS\H enabled.

In UniData emulation, the default is LINE.CONT.VBAR enabled.

See Also

- Whitespace and Comments
MATCH Pattern Matching

A pattern match operator.

\[
\begin{align*}
\text{string} & \ \text{MATCH} & \ \text{code} \\
\text{string} & \ \text{MATCHES} & \ \text{code} \\
\text{string} & \ \text{MATCH} & \ \text{string} \\
\text{string} & \ \text{MATCHES} & \ \text{string}
\end{align*}
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>Any valid string expression.</td>
</tr>
<tr>
<td>code</td>
<td>A pattern match code, specified as a quoted string.</td>
</tr>
</tbody>
</table>

**Description**

The MATCH (or MATCHES) operator has two forms: a pattern match operation (\text{string MATCH code}) and an equality match operation (\text{string MATCH string}).

**Pattern Match Operator**

The MATCH (or MATCHES) operator performs a pattern match test on \text{string} resulting in a boolean value: 1=\text{string matches code}; 0=\text{string does not match code}. For a match to occur, every character of \text{string} must exactly match \text{code}. The exception to this is the null string (""), which matches all character type codes and has a length of 0.

The OCONV and OCONVS functions provide similar pattern matching support.

The following are the available \text{code} values:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>Matches any number of characters of any type. This includes CHAR(250) through CHAR(255), the dynamic array delimiter characters. Also matches the null string (&quot;&quot;). (This code is not supported for OCONV / OCONVS pattern matching.)</td>
</tr>
<tr>
<td>0X</td>
<td>Matches any number of characters of any type. This includes CHAR(250) through CHAR(255), the dynamic array delimiter characters. Also matches the null string (&quot;&quot;).</td>
</tr>
<tr>
<td>nX</td>
<td>Matches exactly ( n ) number of characters of any type.</td>
</tr>
<tr>
<td>0A</td>
<td>Matches any number of alphabetic characters. The alphabetic characters include CHAR(250) through CHAR(255), the dynamic array delimiter characters. Also matches the null string (&quot;&quot;).</td>
</tr>
<tr>
<td>nA</td>
<td>Matches exactly ( n ) number of alphabetic characters.</td>
</tr>
<tr>
<td>0N</td>
<td>Matches any number of number characters, defined as the numbers 0 through 9. Number characters do not include the plus sign, minus sign, or decimal separator. Also matches the null string (&quot;&quot;).</td>
</tr>
<tr>
<td>nN</td>
<td>Matches exactly ( n ) number of number characters.</td>
</tr>
</tbody>
</table>

\text{code} characters are not case-sensitive.

You can specify multiple \text{code} characters to match complex string patterns. For example a \text{code} of "0X3A4N" matches any number of characters of any type, followed by three alphabetic characters, followed by four number characters.
The same code values can be used in an inline prompt, to pattern match test an interactive input value. Inline prompts can be used in MVBasic statements or MultiValue command line commands. They are described in the *Caché MultiValue Commands Reference*.

**Equality Match Operator**

The MATCH (or MATCHES) operator performs an equality match test on string resulting in a boolean value: 1=string matches string; 0=string does not match string. These matches must be identical, and are case-sensitive.

The exception to string equality matching is that the characters CHAR(253) and CHAR(254) (or any string containing them) do not return an equality match. Any string match containing one of these characters returns 0. This exception is provided because these characters are dynamic array delimiter characters.

**Combining Pattern and Equality Matching**

You can use the MATCH (or MATCHES) operator to mix pattern match and equality match operations. An equality match string must be specified as a quoted string, and the entire match code must be a quoted string. Therefore, to combine pattern codes and equality match strings, you must use both double quotes and single quotes. For example, "'('3N') '3N'-'4N" is the pattern code for a telephone number such as (617) 123-4567. You may include single quotes within double quotes (as shown above) or double quotes within single quotes.

**Multiple Patterns**

Caché MVBasic does not support the use of the “{” (right curly brace) character to delimit multiple match patterns. Code from other MultiValue implementations (such as Pick and UniVerse) that uses this syntax must be changed to replace the right curly brace with the @VM (value mark) character.

The following example shows a match to multiple patterns. If a match occurs with either pattern, the THEN clause is taken:

```plaintext
IF F1 MATCHES "'K'...":@VM:"'V'..." THEN GOSUB 100
```

**See Also**

- Strings
- Dynamic Arrays
- The “Pattern Match Operators” section of the WITH clause in the *Caché MultiValue Query Language (CMQL) Reference*
MultiValue Files

A data storage structure.

Description

A MultiValue file is a data storage structure created using Caché global variables. It is a fundamental part of MultiValue database architecture, corresponding to the UniVerse or UniData hashed data or dictionary file.

A MultiValue file is created using the CREATE.FILE verb. It is cataloged in the VOC file as a global variable, and can be concurrently accessed by multiple processes. You can use the FILEINFO function to determine the pathname of the global variable.

The OPEN statement opens a MultiValue file and returns the filevar local variable. This filevar is used for all subsequent MVBasic operations on this MultiValue file:

- WRITE is used to write data to a MultiValue file.
- READ is used to read data from a MultiValue file.
- DELETE is used to delete a data record from a MultiValue file.
- CLEARFILE is used to delete all data records in a MultiValue file.
- SELECT is used to read the record identifiers from a MultiValue file into a select list. These record identifiers can then be individually read using the READNEXT statement.
- CLOSE is used to close a MultiValue file, resetting filevar to null.
- The FILEINFO function is used to determine the status of filevar and other information about a MultiValue file.
Caché Objects

Accessing class methods from MVBasic.

$SYSTEM

You can access methods belonging to $SYSTEM classes from Caché MVBasic by using the -> syntax. The arrow (->) indicates that what precedes it is the name of a class, and what follows it is something belonging to the class, such as a method.

A simple example of this usage in shown in the following:

CRT $SYSTEM.OBJ->Version()

This returns the current Caché Objects version number. This is similar to the information returned by the MVBasic SYSTEM(41) function.

In ObjectScript, the same class method would be invoked using dot syntax, as follows:

WRITE $SYSTEM.OBJ.Version()

For further details on $SYSTEM classes, refer to the InterSystems Class Reference.

See Also

• SYSTEM function
Operators

Arithmetic, logical, and string operators.

Overview

An operator is a symbol that causes an operation to be performed on the two values to either side of it. There are four types of operators: arithmetic, logical, string, and pattern matching. Pattern matching is described in the MATCH reference page.

Spaces are permitted (but not required) between operators and their operands.

The following types of operators are supported:

- Arithmetic Operators
- Logical Operators
- String Operators

Arithmetic Operators

The following are the arithmetic operators supported by Caché MVBasic:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Numeric equality (assignment) operator.</td>
<td>a=5+3</td>
</tr>
<tr>
<td>+</td>
<td>Addition operator.</td>
<td>a=5+3</td>
</tr>
<tr>
<td>++</td>
<td>Increment operator.</td>
<td>a++</td>
</tr>
<tr>
<td>+=</td>
<td>Increment (addition assignment) operator.</td>
<td>a+=3</td>
</tr>
<tr>
<td>–</td>
<td>Subtraction operator.</td>
<td>a=5–3</td>
</tr>
<tr>
<td>--</td>
<td>Decrement operator.</td>
<td>a--</td>
</tr>
<tr>
<td>-=</td>
<td>Decrement (subtraction assignment) operator.</td>
<td>a-=3</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication operator.</td>
<td>a=5*3</td>
</tr>
<tr>
<td>*=</td>
<td>Multiplication assignment operator.</td>
<td>a*=3</td>
</tr>
<tr>
<td>/</td>
<td>Division operator.</td>
<td>a=5/3</td>
</tr>
<tr>
<td>/=</td>
<td>Division assignment operator.</td>
<td>a/=3</td>
</tr>
<tr>
<td>**</td>
<td>Exponentiation operator.</td>
<td>a=5**3</td>
</tr>
<tr>
<td>^</td>
<td>Exponentiation operator.</td>
<td>a=5^3</td>
</tr>
<tr>
<td>( )</td>
<td>Grouping (nesting) operator.</td>
<td>a= ( (5+3)*2) +1</td>
</tr>
</tbody>
</table>

The division operator (/) performs exact division, returning a fractional quotient. To perform integer division, truncating the fractional portion of the quotient, use the DIV function. To return the modulo of integer division, use the MOD function.

You cannot divide a number by 0. Attempting to do so results in a <DIVIDE> error.

The exponentiation operators (** or ^) can perform exponentiation by raising any base number (num) to any power (exponent), subject to the following: If num is non-zero and exponent is 0, exponentiation returns 1. If num and exponent are both 0, exponentiation returns 0. If num is 0 and exponent is a non-zero negative number, exponentiation generates an <ILLEGAL VALUE> error. If num is a non-zero negative number and exponent is a fractional number, exponentiation generates an <ILLEGAL VALUE> error. Very large positive exponent values (such as 9**153) or very small num values with a negative exponent (such as .00005**-.30) may result in an overflow, generating a <MAXNUMBER> error. Very
large negative exponent values (such as $9^{-135}$) or very small num values with a positive exponent (such as $.00005^{30}$) may result in an underflow, returning 0. You can also perform exponentiation using the PWR function.

By default, Caché MVBasic arithmetic operators do not perform vector arithmetic on the elements of dynamic arrays. To perform vector arithmetic, use the ADDS, SUBS, MULS, DIVS, MODS, and PWRS functions. In some MultiValue emulations the arithmetic operators (+, -, *, /, **) do perform vector arithmetic on dynamic arrays, as described below.

By default, Caché MVBasic order of operations is to perform exponentiation, then division, then multiplication, then subtraction, then addition. You can change this order of operations by using parentheses to nest operations. Note that ObjectScript uses a different order of operations: it uses strict left-to-right evaluation of arithmetic operators.

**Emulation**

INFORMATION, jBASE, PIOpen, Prime, and UniData set $OPTIONS VEC.MATH. This causes the five basic arithmetic operators to perform vector arithmetic on dynamic arrays. Thus the + operator is equivalent to the ADDS function. The – operator is equivalent to the SUBS function. The * operator is equivalent to the MULS function. The / operator is equivalent to the DIVS function. The ** operator is equivalent to the PWRS function. These operators perform vector arithmetic when supplied dynamic array arguments, and perform simple arithmetic operations when supplied numeric arguments.

**Logical Operators**

Logical operators result in a boolean result, either 1 (True) or 0 (False). Caché MVBasic supports comparison logical operators (equal to, greater than) and logic operators that associate multiple comparison logical operators (AND, OR).

**Comparison Logical Operators**

Logical operators can compare numbers, strings, etc. String comparisons are case-sensitive. Strings are compared character-by-character. A string is logically “greater than” when a character is higher in collation sequence than its corresponding character. For example, "fred" > "Fred" = 1 (True), because “f” is higher in the ASCII sequence than “F”. "fred" > "fre" = 1 (True), because “d” is higher in the ASCII sequence than null.
<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Equal to operator.</td>
</tr>
<tr>
<td>EQ</td>
<td></td>
</tr>
<tr>
<td>&lt;</td>
<td>Less Than operator.</td>
</tr>
<tr>
<td>LT</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater Than operator.</td>
</tr>
<tr>
<td>GT</td>
<td></td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less Than or Equal to operator.</td>
</tr>
<tr>
<td>LE</td>
<td></td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater Than or Equal to operator.</td>
</tr>
<tr>
<td>GE</td>
<td></td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to operator.</td>
</tr>
<tr>
<td>NE</td>
<td></td>
</tr>
</tbody>
</table>

The following example demonstrates the equality operator:

```
! Strings are case-sensitive:
PRINT "Fred"="Fred" ! Returns 1 (True)
PRINT "Fred"="fred" ! Returns 0 (false)
! Number/Numeric strings equality:
PRINT "7"="7" ! Returns 1 (True)
PRINT +007.00="7" ! Returns 1 (True)
PRINT +007.00="7" ! Returns 1 (True)
! Null string equality:
PRINT "null"="null" ! Returns 1 (True)
PRINT "="="! Returns 1 (True)
PRINT "="=NULL ! Returns 1 (True)
PRINT "="=0 ! Returns 0 (False)
! Unassigned variables equality
! (variables aaa and bbb are unassigned):
PRINT aaa=bbb ! Returns 1 (True)
PRINT aaa="! Returns 1 (True)
PRINT aaa=NULL ! Returns 1 (True)
```

**AND / OR Logical Operators**

The following logical operators are used to specify multiple equality operations:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;</td>
<td>Logical AND operator.</td>
</tr>
<tr>
<td>AND</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logical OR operator.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Left and Right Side Evaluation

MultiValue emulations differ in how to handle evaluation of AND and OR logical operations. Some MultiValue systems support full logical evaluation: both sides of the logical operator are evaluated, regardless of the logical value of the left side operation. Other MultiValue systems support partial logical evaluation (short circuit evaluation):

- **AND operation**: evaluate the left side operation, and if it evaluates to False, do not evaluate the right side operation.
- **OR operation**: evaluate the left side operation, and if it evaluates to True, do not evaluate the right side operation.

Caché MultiValue uses partial logical evaluation by default. The following emulations also default to partial logical evaluation: IN2, INFORMATION, jBASE, PICK, PIOpen, Prime, UDPICK, Ultimate, UniData, and UniVerse. The following emulations default to full logical evaluation: D3, MVBase, R83, Power95, and Reality.

You can use `$OPTIONS FULL.LOGICAL.EVALUATION` to enable full logical evaluation. You can use `$OPTIONS -FULL.LOGICAL.EVALUATION` to enable partial logical evaluation.

Order of Evaluation

Caché MultiValue gives equal precedence to the AND and the OR logical operators. This means that multiple AND and OR logical operations are evaluated in strict left-to-right sequence, unless parentheses are provided to specify evaluation sequence. Caché uses the same strict left-to-right order of evaluation.

String Operators

The following are the string operators supported by Caché MVBasic:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>:</td>
<td>Concatenation operator. Placed between two expressions, strings, or numeric values to be concatenated. When using the : operator you can include or omit blank spaces. When using the CAT operator you must use a blank space when concatenating a variable.</td>
</tr>
<tr>
<td>CAT</td>
<td>Concatenation assignment operator. Placed between a variable name and a value to be concatenated to the variable's value. For example, if <code>a=&quot;abcd&quot;</code> using <code>a:=&quot;efg&quot;</code> results in <code>a=&quot;abcdefg&quot;</code>.</td>
</tr>
<tr>
<td>[:]</td>
<td>Substring extract operator. Placed after a string, the brackets enclose positive integers: <code>string[start,length]</code> specifies the start position and length of the substring to be extracted from the start of the string. <code>string[length]</code> specifies the length of the substring to be extracted from the end of the string. Emulation: IN2: the default setting IN2.SUBSTR makes <code>string[n]</code> equivalent to <code>string[n,1]</code>, specifying the start position (n) from the beginning of the string and a length of 1. Reality: the default setting REAL.SUBSTR causes <code>string[start,-end]</code> to count <code>start</code> from the beginning of the string and to count <code>-end</code> as the ending point, counting from the end of the string; <code>string[-start,-n]</code> counts both the starting and ending points from the end of the string.</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Dynamic array element extract or replacement operator. For further details see the Dynamic Arrays page of this manual.</td>
</tr>
</tbody>
</table>

The following example demonstrates the string concatenation operator:
The following example demonstrates the substring extract operator:

```
x = "The quick brown fox"
! Extract from beginning of string:
PRINT x[5,5]  ! Returns "quick"
PRINT x[5,99] ! Returns "quick brown fox"
PRINT x[1,3]  ! Returns "The"
PRINT x[0,3]  ! Returns "The"
PRINT x["",3] ! Returns "The"
! Extract from end of string:
PRINT x[3]   ! Returns "fox"
PRINT x[1]   ! Returns "x"
PRINT x[0]   ! Returns null string
PRINT x[""] ! Returns null string
```

See Also

- Strings
- Pattern Match Operators
Strings

A delimited data literal.

Description

A string is a data literal delimited by an opening and closing delimiter character. A string can contain any character, except the delimiter character itself. For this reason, MVBasic supports three alternative delimiter characters:

- The double quote character (" ) is most commonly used to delimit a string. It permits the inclusion of single quotes and apostrophes ( ' ) within the string, the inclusion of the backslash, and is compatible with other programming languages. For example: "Tom's string of data"

- The single quote character ( ' ) can be used to delimit a string. It permits the inclusion of double quotes within the string, the inclusion of the backslash, and is compatible with SQL code. For example: 'His "important" data'

- The backslash character ( \ ) can be used to delimit a string. It permits the inclusion of both double quotes and single quotes within the string. It is not compatible with other programming languages. For example: \Tom's "important" data\ 

Strings with these three types of delimiters may be freely mixed. For example, it is possible to concatenate strings with different delimiters, as shown in the following example: 'His "important" data':" isn't very important".

A string is a literal, and is not parsed. The exception to this is when a string is being input as a numeric value.

Strings and Numerics

By default, Caché MVBasic converts numeric strings to numeric and boolean values using the ObjectScript conventions. To perform these conversions using PICK mode conventions (used by all MultiValue system emulation modes) specify OPTIONS PICK.CONVERT.

An empty string in Caché is either converted to a numeric/boolean value of 0, or treated a string of zero length, depending on the function. In PICK.CONVERT mode an empty string is always converted to 0.

A numeric string is a string that contains only numeric characters (the number 0 through 9, a single leading plus or minus sign, the decimal point delimiter, and the letter E used for scientific notation). It may include leading or trailing zeros. A numeric string is always accepted as a numeric. Thus "123.4" is identical to 123.4. In this conversion, a leading plus sign and leading and trailing zeros are removed, and the decimal point is removed if not followed by a fractional value. In Caché mode, multiple leading plus and minus signs are permitted and evaluated. In PICK mode, only a single leading plus or minus sign is evaluated; multiple signs are treated as a mixed numeric string.

A mixed numeric string is a string that contains both numeric and non-numeric characters, with the first character (or characters) in the string being numeric. For example: "7 dwarves" or "12.5 kilometers". The treatment of mixed numeric strings is very different in Caché mode and PICK mode. In Caché mode, the numeric is parsed until the first non-numeric character is encountered. Thus "12.5 kilometers" is parsed as 12.5. The boolean value of a mixed numeric string simply depends on whether the resulting number is zero or non-zero. In PICK mode, a mixed numeric string is never parsed for its numeric value. When a number is expected, a mixed numeric string is always evaluated as 0, and frequently generates an error. When converted to a boolean, a mixed numeric string always returns True, because any string is a non-zero value.

The following examples demonstrate the numeric conversion differences between Caché mode and PICK mode:

; ! Cache Mode
PRINT "" + 3 ; ! returns 3
PRINT "+007" + 3 ; ! returns 10
PRINT "-7" + 3 ; ! returns 10
PRINT "seven" + 3 ; ! returns 10
; ! PICK Mode
$OPTIONS PICK_CONVERT
PRINT "" + 3 ; ! returns 3
PRINT "+007" + 3 ; ! returns 10
PRINT "--7" + 3 ; ! returns 3
PRINT "7dwarves" + 3 ; ! returns 3
System Variables

System-defined @ variables used for storing data values.

System-Defined Variables

Caché MVBasic provides a number of system variables, identified by an @ sign as the first character of their names. These variables are set by MVBasic. Unless otherwise indicated, they cannot be set by user programs. If no value is set, these variables contain the empty string.

MVBasic provides four @ sign variables that are reserved as user-defined variables. These are @USER1, @USER2, @USER3, and @USER4. By default they contain the empty string.

MVBasic also supports three other types of user-defined variables: local variables, global variables, and process-private global variables. For further details, refer to the Variables page in this manual.

A special case of these @ variables are the dynamic array level delimiter characters. These always contain the same single characters, represented by @AM, @FM, @IM, @SM, @SVM, @TM, and @VM. For further details on these special characters, refer to the Dynamic Arrays page in this manual.

Caché MVBasic supports most, but not all of the system variables provided by other flavors of MultiValue. The MultiValue Basic Quick Reference contains an @-Variables table showing which UniVerse system variables are supported by Caché MVBasic. The following are the Caché MVBasic system variables:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@ACCOUNT</td>
<td>The current account name, which is usually identical to the Caché namespace name. Note that the SYSPROG account corresponds to the %SYS namespace.</td>
</tr>
<tr>
<td>@ANS</td>
<td>The answer of the last-executed ITYPE() function. This value is user modifiable.</td>
</tr>
<tr>
<td>@AUTHORIZATION</td>
<td>The current Caché username. This is the same value that is returned by %SYS.ProcessQuery.UserName. This is the username used by the MultiValue Shell start-up routine to match with a corresponding Proc or Paragraph name.</td>
</tr>
<tr>
<td>@COMMAND</td>
<td>The command line that invoked this program. (See Note 2.) This value is user modifiable.</td>
</tr>
<tr>
<td>@COMMAND.STACK</td>
<td>The contents of the command stack, a list of commands issued from the MultiValue Shell as a dynamic array (with @FM delimiters) with most recent items first. See also SYSTEM(33) function.</td>
</tr>
<tr>
<td>@CONV</td>
<td>Used by the CALCULATE function to hold the code string for the OCONV function. This value is user modifiable.</td>
</tr>
<tr>
<td>@CRTHIGH</td>
<td>Number of lines displayed in the terminal window.</td>
</tr>
<tr>
<td>@CRTWIDE</td>
<td>Number of columns displayed in the terminal window.</td>
</tr>
<tr>
<td>@DATA</td>
<td>Returned data, separated by CHAR(13) (carriage return) characters. Provided for compatibility with UniData systems.</td>
</tr>
<tr>
<td>@DATA.PENDING</td>
<td>Returned data, separated by @AM (CHAR(254)) delimiter characters.</td>
</tr>
<tr>
<td>@DATE</td>
<td>The date when the current process started, in internal format (see Note 1). To convert to display format, use the OCONV function. (See Note 1.) This value is user modifiable.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>@DAY</td>
<td>The day of the month when the current process started, specified as an integer. (See Note 1.) This value is user modifiable.</td>
</tr>
<tr>
<td>@DICT</td>
<td>You must set @DICT to the dictionary of the file you will specify in the CALCULATE function. This value is user modifiable.</td>
</tr>
<tr>
<td>@FALSE</td>
<td>The 0 character, representing the boolean value.</td>
</tr>
<tr>
<td>@FILE.NAME</td>
<td>Same as @FILENAME. This value is user modifiable.</td>
</tr>
<tr>
<td>@FILENAME</td>
<td>The pathname specified in the most recent invocation of OPENSEQ. If the sequential file exists, @FILENAME contains pathname as a file pathname. If the sequential file does not exist, @FILENAME contains pathname as a directory pathname. No other validation is performed on the pathname. This @FILENAME value is only changed by another invocation of OPENSEQ. It is not changed by operations such as creating a file, closing a file, or deleting a file. This value is user modifiable.</td>
</tr>
<tr>
<td>@FORMAT</td>
<td>Used by the CALCULATE function to hold the format string for the FMT function. This value is user modifiable.</td>
</tr>
<tr>
<td>@HEADER</td>
<td>Used by the CALCULATE function to hold the header string for the HEADING command. This value is user modifiable.</td>
</tr>
<tr>
<td>@ID</td>
<td>Current record ID. This value is user modifiable.</td>
</tr>
<tr>
<td>@IO.ERROR</td>
<td>The error status of the most recent failed I/O operation. Is not modified by a successful I/O operation. This value is user modifiable. Compare with @IO.STATUS.</td>
</tr>
<tr>
<td>@IO.STATUS</td>
<td>The status of the most recent I/O operation. Contains 0 if the I/O operation succeeded. Contains an error code if the I/O operation failed. This value is user modifiable. Compare with @IO.ERROR.</td>
</tr>
<tr>
<td>@ITYPECACHE</td>
<td>This value is user modifiable.</td>
</tr>
<tr>
<td>@LASTLOGONPROG</td>
<td>The name of the last LOGON procedure, paragraph, or program executed. Updated when a process starts the MV Shell or changes accounts using the LOGTO command. Only valid for processes started from the MV Shell.</td>
</tr>
<tr>
<td>@LEVEL</td>
<td>Nested level of execution. Starts at 0. Reset by ABORT commands.</td>
</tr>
<tr>
<td>@LOGNAME</td>
<td>The operating system user login name. This is the same value that is returned by %SYS.ProcessQuery.OSUserName. @LOGNAME and @USER are synonyms. Also see @AUTHORIZATION.</td>
</tr>
<tr>
<td>@LPTRHIGH</td>
<td>Number of lines on the current output device, either a printer or a terminal window.</td>
</tr>
<tr>
<td>@LPTRWIDE</td>
<td>Number of columns on the current output device, either a printer or a terminal window.</td>
</tr>
<tr>
<td>@ME</td>
<td>A handle to the object reference from within an instance, method, or property. Contains the current class context. Same as the $THIS special variable in ObjectScript. @ME can reference a multidimensional property using arrow syntax, as follows: @ME-&gt;property(subscript). @ME itself is not modifiable, but @ME-&gt;property can be used wherever a command uses a SETTING clause to set an output variable.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>@MONTH</td>
<td>The month of the year when the current process started, specified as an integer. (See Note 1.) This value is user modifiable.</td>
</tr>
<tr>
<td>@MV</td>
<td>The current value counter, only used for columnar listing. Used only in I-descriptors. Same as @NV. This value is user modifiable.</td>
</tr>
<tr>
<td>@NB</td>
<td>Current BREAK level number. 1 is the lowest-level break. Used only in I-descriptors. This value is user modifiable.</td>
</tr>
<tr>
<td>@ND</td>
<td>Number of detail lines since the last BREAK on a break line. Used only in I-descriptors. This value is user modifiable.</td>
</tr>
<tr>
<td>@NI</td>
<td>Current item counter (the number of items listed or selected to Select List 0). Used only in I-descriptors. Same as @RECCOUNT. This value is user modifiable.</td>
</tr>
<tr>
<td>@NS</td>
<td>Current subvalue counter for columnar listing only. Used only in I-descriptors. This value is user modifiable.</td>
</tr>
<tr>
<td>@NV</td>
<td>The current value counter, only used for columnar listing. Used in I-descriptors. Same as @MV. This value is user modifiable.</td>
</tr>
<tr>
<td>@PARASENTENCE</td>
<td>The command line that invoked this program. (See Note 2)</td>
</tr>
<tr>
<td>@PATH</td>
<td>The full pathname for the current account. For a terminal session running the MV shell, the pathname is: c:\cachesys\mgr\user.</td>
</tr>
<tr>
<td>@PORTNO</td>
<td>The current port number, specified as an integer.</td>
</tr>
<tr>
<td>@QWHO</td>
<td>The current account name when a program is run using the MV Shell. @QWHO retains the name of a Q pointer account if that was the login account. @QWHO does not track account changes caused by changing namespaces using ObjectScript commands. For the current account name for programs run using CSP or class methods, use @WHO.</td>
</tr>
<tr>
<td>@RECCOUNT</td>
<td>The current item counter (the number of items listed or selected). Used only in I-descriptors. Same as @NI. This value is user modifiable.</td>
</tr>
<tr>
<td>@RECORD</td>
<td>The current record. This value is user modifiable.</td>
</tr>
<tr>
<td>@RECURn</td>
<td>A set of variables: @RECUR0, @RECUR1, @RECUR2, @RECUR3, and @RECUR4. These values are user modifiable.</td>
</tr>
<tr>
<td>@SELECTED</td>
<td>Number of elements selected from the most recent select list. See the SELECT statement. Defaults to 0. This value is user modifiable.</td>
</tr>
<tr>
<td>@SENTENCE</td>
<td>The command line that invoked this program. (See Note 2)</td>
</tr>
<tr>
<td>@STDFIL</td>
<td>Standard file. The file opened to the default file variable.</td>
</tr>
<tr>
<td>@SYS.BELL</td>
<td>The ASCII bell character (CHAR(7)). Printing this variable rings the bell.</td>
</tr>
<tr>
<td>@SYSTEM.RETURN.CODE</td>
<td>Status code for system processes. Returns 0 for success, -1 for error. This variable is not set by I/O operations; I/O operations set @IO.STATUS and @IO.ERROR. This value is user modifiable.</td>
</tr>
<tr>
<td>@SYSTEM.SET</td>
<td>Status code for system processes. This value is user modifiable.</td>
</tr>
<tr>
<td>@TERM.TYPE</td>
<td>The terminal type for the current terminal. For example, vt220.</td>
</tr>
<tr>
<td>Variable</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>@TIME</td>
<td>The time when the current process started, in internal format (see Note 1). (When issued from the MV terminal shell, this is the time that the last command line was invoked.) @TIME rounds to whole seconds. To return the current time in internal format, use the TIME function. The TIME function includes fractional seconds. To convert from internal format to display format, use the OCONV function. This value is user modifiable.</td>
</tr>
<tr>
<td>@TRANSACTION</td>
<td>An integer that specifies whether a transaction is active. 0 indicates no active transaction.</td>
</tr>
<tr>
<td>@TRUE</td>
<td>The 1 character, representing the boolean value.</td>
</tr>
<tr>
<td>@TTY</td>
<td>The terminal device name (Device). For example:</td>
</tr>
<tr>
<td>@UDTNO</td>
<td>Terminal Number. A unique integer assigned to a terminal job. Corresponds to the port number returned by the LISTME MultiValue command. Exiting and re-entering the MV shell does not change this integer value. Provided for compatibility with UniData systems.</td>
</tr>
<tr>
<td>@UID</td>
<td>User ID (uid) on a UNIX® system. Returns 0 on non-UNIX® systems. Provided for compatibility with UniData systems.</td>
</tr>
<tr>
<td>@USER</td>
<td>The operating system user login name. This is the same value that is returned by <code>%SYS.ProcessQuery.OSUserName</code>. @USER and @LOGNAME are synonyms. Provided for D3 compatibility.</td>
</tr>
<tr>
<td>@USERNO</td>
<td>Same as @USERNO.</td>
</tr>
<tr>
<td>@USERNO</td>
<td>The port number of the current process. (See Note 3)</td>
</tr>
<tr>
<td>@USER.RETURN.CODE</td>
<td>Status code for user processes. This value is user modifiable.</td>
</tr>
<tr>
<td>@USER.TYPE</td>
<td>Returns 0 if the Caché process is an interactive terminal. Returns 1 if the Caché process is a MultiValue phantom process. Returns 2 if neither of the above, for example a process started via the JOB statement. Provided for compatibility with UniData systems.</td>
</tr>
<tr>
<td>@WHO</td>
<td>Name of the current account. @WHO tracks account changes caused by changing namespaces using ObjectScript commands. See also @QWHO.</td>
</tr>
<tr>
<td>@YEAR</td>
<td>The year when the current process started, specified as two digits. The expansion of two-digit years to four digits is governed by the MultiValue CENTURY.PIVOT verb, described in Operational Differences Between MultiValue and Caché. (See Note 1.) This value is user modifiable.</td>
</tr>
<tr>
<td>@YEAR4</td>
<td>The year when the current process started, specified as four digits. (See Note 1.) This value is user modifiable.</td>
</tr>
</tbody>
</table>

**Note 1**

This variable is computed when a program is started and does not change during execution. Time and date variables represent local time and date. Caché MultiValue determines local time and date as follows:

- It determines the current Coordinated Universal Time (UTC) from the system clock.
- It adjusts UTC to the local time zone by using the value of the Caché special variable $ZTIMEZONE.
- It applies local time variant settings (such as Daylight Saving Time) for that time zone from the host operating system.
**Note 2**
The timing and nature of updates to these variables is very emulation dependent.

**Note 3**
Port numbers are an optional site configurable value. The default value is the Caché process number.

**See Also**
- `$MVname` special variables in the *Caché ObjectScript Reference*
- `$MVV(n)` special variables in the *Caché ObjectScript Reference*
User Variables

User-defined variables used for storing data values.

Description

A variable is a unique named entity used to store and retrieve a data value. The following are the available types of variables in Caché MVBasic:

- Local variables, the scope of which is the current process.
- Process-private global variables, the scope of which is the current process.
- Global variables, systemwide in scope.
- Four user-defined @ variables: @USER1, @USER2, @USER3, and @USER4. The scope of these variables is the current process. By default they contain the empty string.
- System variables, identified by an @ character as the first character. These variables are generally not user-modifiable. For further details, refer to the System Variables page in this manual.

Naming Conventions

The following are the naming conventions for local variables:

- MVBasic does not, strictly speaking, have reserved words. Therefore, a local variable may have the same name as a function or a command. For clarity of code, it is strongly suggested that you avoid the names listed in the Reserved Words table in the MultiValue Basic Quick Reference.
- The first character of a local variable name must be a letter, dollar ($), or percent (%) character. Names beginning with $SYSTEM. (in any letter case) are reserved as system elements. Certain names beginning with $ are used as command or function names in MVBasic (for example, $DATA, $GET, $KILL, $LIST, $MERGE, $ORDER) and should be avoided. Names beginning with a % character (except those beginning with %Z or %z) are reserved as system elements. For further details, refer to “Rules and Guidelines for Identifiers” in the Caché Programming Orientation Guide.
- The second and subsequent characters a local variable name may be letters, numbers, the period (.), dollar ($), underscore (_), and percent (%) characters. The last character cannot be an underscore (_) character.
- Letters in local variable names are case-sensitive in Caché and in all MultiValue emulations except D3. D3 only uses all-uppercase variable names. A local variable name defined with lowercase letters in Caché mode is considered undefined in D3 mode. A local variable name defined with lowercase letters in D3 mode is converted to all capital letters. Case sensitivity can be configured using $OPTIONS CASE (to turn on case sensitivity) and $OPTIONS -CASE (to turn off case sensitivity).
- Local variable names are limited to 31 characters. You may specify a name longer than 31 characters, but only the first 31 characters are used. Therefore, a local variable name must be unique within its first 31 characters.

Be aware valid local variable names in MVBasic may not be valid in ObjectScript. For example, in ObjectScript all variable names that begin with a dollar ($) character are system-supplied special variables. For this reason, MVBasic local variable names containing punctuation characters should be avoided whenever possible.

You can use the ObjectScript $ZNAME function to validate an MVBasic local variable name. If you specify $ZNAME(string,0,11), $ZNAME validates string using the MultiValue Basic naming conventions for local variables.

A global variable begins with the caret (^) character, indicating that it is a global variable. A global variable follows the ObjectScript naming conventions, not the MultiValue variable naming conventions. For further details, see the Variables chapter of Using Caché ObjectScript.
A process-private global variable begins with the `^` or `^` characters, indicating that it is a process-private global. The two syntactic forms are equivalent. A process-private global follows the ObjectScript naming conventions, not the MultiValue variable naming conventions. For further details, see the Variables chapter of Using Caché ObjectScript.

Note that in D3 emulation, global variable names and process-private global variable names are case-sensitive, but local variable names are not case-sensitive.

**Assignment of Values**

A variable is assigned a value by using the equal sign (=), as shown in the following examples. Spaces can be included or omitted before or after the equal sign.

```
x="fred"
y=1234.5
z=x:y
```

A variable can be assigned multiple values as a dynamic array. For details on defining a dynamic array, refer to Dynamic Arrays.

**Common Storage Areas**

Caché MVBasic allows you to group user variables into common storage areas. This permits you to set, limit access to, or clear multiple variables with a single command. For further details, refer to the COMMON, CLEARCOMMON, and CLEAR commands.

**Undefined Variables**

By default, if an MVBasic routine references an undefined variable, the system generates an `<UNDEFINED>` error. That is, MVBasic undefined variables are handled the same as Caché undefined variables. They are subject to the current settings of the Management Portal UndefVarBehavior configuration setting, and the Undefined property of the Config.Miscellaneous class and Undefined() method of the %SYSTEM.Process class settings. All of these default to generating an `<UNDEFINED>` error. Go to the Management Portal, select [System] > [Configuration] > [Compatibility Settings]. View and edit the current setting of Undefined. The default is 0 (always throw an error).

You can change this MVBasic default behavior to substitute an empty string for an undefined variable, without signalling an error. You can do this in either of two ways:

- You can use the Caché MVDefined property of the Config.Miscellaneous class to set this behavior on a system wide basis, or the MVUndefined() method of the %SYSTEM.Process class to set this behavior for the current process. Setting these values affects only the handling of MVBasic undefined functions; the handling of Caché undefined functions is unchanged.

- You can use the ObjectScript Undefined() method of the %SYSTEM.Process class to change undefined variable behavior for the current process. This causes all variables (both Caché variables and MVBasic variables) to substitute an empty string.

To set these ObjectScript functions, use the MVBasic $XECUTE statement, as shown in the following example:

```
$XECUTE "DO $ZUTIL(68,72,1)"
```

**Maximum Number of Variables**

A Caché MVBasic routine can contain a maximum of 32,759 private variables, and a maximum of 65,280 public variables. Exceeding these limits results in a compile error.
**VOC Format**

The format for VOC entries.

**Description**

The VOC plays a vital part in the MV command processor and the MV file I/O system. Every word found on a command line and every filename opened is looked up in the VOC to determine its meaning or location.

For new and imported accounts, the VOC is created in a specific global, MV.VOC, and is populated with the contents of the NEWACC file stored in sysprog. All accesses to the VOC by system code will go directly to the global ^MV.VOC whereas any accesses by user code will open the file "VOC" or "MD" and access the global specified in the F pointer (so don't change them from pointing to ^MV.VOC).

**VOC Entry Format**

The first attribute of a VOC item indicates the type of the item:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;F&quot;</td>
<td>File. You can use the LISTF command to list VOC file entries.</td>
</tr>
<tr>
<td>&quot;K&quot;</td>
<td>Keyword. Keywords used in CMQL are listed in the Caché MultiValue Query Language (CMQL) Reference.</td>
</tr>
<tr>
<td>&quot;PA&quot;</td>
<td>Paragraph. You can use the LISTPA command to list VOC paragraph entries.</td>
</tr>
<tr>
<td>&quot;PH&quot;</td>
<td>Phrase. You can use the LISTPH command to list VOC phrase entries.</td>
</tr>
<tr>
<td>&quot;PQ&quot;</td>
<td>PROC command</td>
</tr>
<tr>
<td>&quot;PQN&quot;</td>
<td>New PROC command</td>
</tr>
<tr>
<td>&quot;Q&quot;</td>
<td>Q pointer</td>
</tr>
<tr>
<td>&quot;R&quot;</td>
<td>Remote</td>
</tr>
<tr>
<td>&quot;S&quot;</td>
<td>Sentence. You can use the LISTS command to list VOC sentence entries.</td>
</tr>
<tr>
<td>&quot;V&quot;</td>
<td>Verb</td>
</tr>
</tbody>
</table>

**File Definition Format**

File Definition

001 F
002 data section
003 dict section
004 M if this is a multi data section file
005 primary class name
006 file options
007 list of data section names
008 list of locations of data sections
009 list of class names for data sections

The dict and data sections may contain either global references or directory paths.

The file options are any combination of these chars:

- B — Basic program file. Used to control display in Studio.
**Keyword Definition Format**

**Keyword Definition**

001 "K"
002 Canonical form of the keyword. This is the text that is passed to the parser.
003 Alternate VOC entry to use if this word is used as a verb.

**Verb Definition Format**

**Verb Definition**

001 V
002 Function name
003 Location code
004 Processing Options
005 Parsing Options
006
007 BasicObjectPointer Location
008 ItemID of Basic Program
009 Filename of Basic Program
010 Account of Basic Program

The Location code directs the shell to the correct routine.

The Processing options are a set of single character codes passed to CMQL:

- "A" - output processor uses default output attributes
- "D" - output processor requires a datastream
- "I" - output processor requires entire items
- "J" - output processor requires total, avg and enum (STAT verb)
- "L" - output processor requires a selectlist
- "R" - output processor requires the raw data only, no conversions or formatting
- "S" - output should be sorted by default
- "T" - output processor requires totals only (SUM verb)

The Parsing options control the shell's operation:

- 2 TCL2 format
- A Default to All items if none specified by select list or on the command line
- B Backslashes (\ ) can be used to quote strings
- C Read Item into @Record
- D force read from the Dict of the file.
- E Handling of CRT/PRINT and error messages differs slightly for some verbs, usually CMQL verbs
- F Filename only. Do not look for item IDs.
- J Inhibit TCL1 parse - pass unprocessed line to verb implementation code.
- K basic program is to keep select list 0 available to TCL after execution.
- L Remove parenthesis from the line - for CLEAR-FILE (DATA XXX)
- M Process error Messages before returning the next item.
• N New Item OK
• P Print out item IDs (TCL2)
• Q Query syntax
• R Require Item IDs to be specified. Overrides D3 behavior of assuming '*\' if item spec missing.
• U Take lock for Update