CAMAC Command Language Reference Manual

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This manual describes how to use the CAMAC Command Language Interpreter Utility.

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Preface

Intended Audience

This Manual is intended for users of the system who will need to test and maintain CAMAC equipment.

Document Structure

This document contains instructions for using the CAMAC Command Language (CCL) to communicate directly with CAMAC modules using low level CAMAC commands. The following is a description of the topics covered in this manual.

- Introduction—Provides a general overview of the CCL utility and how it can be used.
- Command Summary—Describes the various categories of commands available.
- Sample Session—Provides a sample session using the utility, demonstrating how CCL might be used.
- Command Descriptions—Provides detailed descriptions of the commands of the utility which are associated with CAMAC. It does not include generic commands that are common to most MDS command language interpreters. For descriptions of these generic commands, see the *MDSplus Command Language Interpreters Reference Manual*.

Associated Documents

There are many commands in the CAMAC Command Utility which are common to all MDSplus Command Interpreter Utilities which are not documented here. See the *MDSplus Command Language Interpreters Reference Manual* for the description of these commands.

New and Changed Features

Original MDS system

This is a new MDSplus manual. The CAMAC Command Utility was provided in the original MDS system and has not been modified for release as an MDSplus utility. The original manual was typeset using TEX and has been converted over to use VAX Document for MDSplus.

CCL Description

The CCL utility is an easy to use, interactive tool for accessing CAMAC modules directly. With CCL, the user can perform essentially all the CAMAC I/O functions available in the CAMAC driver and examine the results of that I/O. CCL is a powerful tool for debugging CAMAC problems and checking out the operation of new module types. Single programmed I/O operations and large DMA read and write operations can be performed. Data can be displayed in graphical as well as tabular form. A wait for LAM (CAMAC Look At Me) function is also provided. To invoke the CCL utility you simply issue the command "CCL" when prompted for a command by the VMS command interpreter, DCL.

This command utility is a "standard" MDS command interpreter utility. This means all commands resemble the familiar format of regular DCL commands consisting of command verbs, qualifiers, and parameters. As a "standard" MDS command interpreter, it also includes "standard" commands providing basic functionality such as key definition, command line recall and edit, spawn, help, indirect command file support, and macro definition and storage. See the *MDSplus Command Language Interpreters Reference Manual* for more information on these commands.

CCL was designed to be a CAMAC debugging and check out tool and was not intended to perform CAMAC data acquisition. For this reason there is no mechanism for storing data read in from CAMAC via CCL commands.

1 Command Summary

The commands in CCL can be grouped based on the types of functions they perform. The first five groups of commands are specific to CAMAC operations and additional information on the command format for these commands can be found in the next section of this manual. The remaining groups are "standard" MDS interpreter commands and are documented in the *MDSplus Command Language Interpreters Reference Manual*.

The next five groups of commands are documented in detail in the Part II section of this manual:

Table 1 CCL COMMANDS

Command	Description
CAMAC I/O	
PIO	Single Programmed I/O
QREP	Repeat Until Desired Q=1 Responses
QSCAN	Repeat With Subaddress/Address Increment
QSTOP	Repeat until Q=0
STOP	Repeat until transfer count
CAMAC LAM Support	
LAMWAIT	Wait for a LAM

Table 1 (Cont.) CCL COMMANDS

Command	Description
CAMAC Default Conditions	
SET MEMORY	Set CAMAC transfers to 16 or 24 bit
SET MODULE	Establish the default module to address
SET XANDQ	Establish the desired X and Q results desired
Data and Status Display	
PLOT	Plot the data
SHOW DATA	List the data in tabular format
SHOW STATUS	Show the status of the last I/O function
Other CAMAC commands	
FINISH	Release all CAMAC I/O channels
SHOW MODULE	Show referenced CAMAC modules

The following groups of commands are provided as "standard" MDS interpreter commands. These commands are documented in detail in the *MDSplus Command Language Interpreters Reference Manual*:

Table 2 Standard MDS Interpreter Commands

Command	Description
Key Definition	
DEFINE/KEY	Define a key
DELETE/KEY	Delete a key definition
SET KEY	Set key definition state
SET INTERRUPT	Set key interrupt mode
SHOW KEY	Show key definition(s)
Command File and Macro Support	
@file-spec	Invoke a command procedure
CREATE LIBRARY	Create a macro library
CREATE SYMBOL	Create a symbol
DEFINE	Define a command macro
[DO/MACRO]	Execute a macro
MODIFY	Modify a macro
SAVE	Save a macro
SET LIBRARY	Establish current macro library
SHOW LIBRARY	Display current macro library
SHOW MACRO	List macro contents
Subprocess Support	
ATTACH	Attach to other process in job
SPAWN	Spawn a subprocess

Table 2 (Cont.) Standard MDS Interpreter Commands

Command	Description
Other Commands	
EXIT	Exit the utility
HELP	Get help on commands
INIT TIMER	Initialize the process timer
SET COMMAND	Add additional commands
SET PROMPT	Change utility prompt string
SET VERIFY	Display commands
SHOW TIMER	Show the process timer
SHOW VM	Show the virtual memory usage
TYPE	Output a message
WAIT	Wait a specified time

2 Sample Session

In the following example, the CCL utility is used to initialize a CAMAC digitizer, give it a stop trigger, read out some of the memory and print the values.

Example 1 Sample CCL dialog

```
$ CCL                              ! Start up CCL
CCL> SET MODULE MY_DIGITIZER       ! Assign CAMAC Module
CCL> SET MEMORY 16                 ! Use 16 bit transfers
CCL> PIO/FUNCTION=9                ! Initialize
CCL> PIO/FUNCTION=25               ! Stop trigger
CCL> LAMWAIT                       ! Wait for LAM
CCL> PIO/FUNCTION=16/ADDRESS=2     ! Select channel
CCL> STOP/FUNCTION=2/COUNT=2048    ! Read in data
CCL> SHOW DATA/END=20              ! List data
000001   1234  1228  1340  1560  1700  2300  3330  4555  6000  6555
000011   6780  7054  7060  7062  7063  7060  7001  6960  6902  6789
CCL> EXIT                          ! Exit CCL
$
```

CCL Command Descriptions

This part contains complete reference descriptions of the CAMAC Command Language Interpreter commands. It does not include descriptions of the standard commands provided by MDSplus command language interpreters. For descriptions of these commands see the *MDSplus Command Language Interpreters Reference Manual*.

FINISH

Release all channels to CAMAC modules.

FORMAT FINISH

QUALIFIERS

None.

restrictions

None.

prompts

None.

PARAMETERS

None.

DESCRIPTION

Each time you address a different CAMAC module in CCL, the I/O channel to that module remains active and subsequent access to that module occurs with less overhead than the initial access. The FINISH command provides a mechanism to release all the I/O channels connected to CAMAC modules.

The FINISH command will not normally be required except for two somewhat rare conditions:

1. Your process runs out of available I/O channels (rare)
2. A module you have connected to has been physically moved and reassigned via the ORNL CTS (CAMAC Topology Supervisor) utility. You will need to do a FINISH command to re-connect to the module in its new location.

EXAMPLE

The following example show the effect of the FINISH command:

```
CCL> SET MODULE MY_8212_1       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_2       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_3       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_4       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_5       ! Select a CAMAC module
   .
   .
   .
CCL> SHOW MODULE                 ! Show connected CAMAC modules
MY_8212_1
MY_8212_2
MY_8212_3
MY_8212_4
MY_8212_5         <default>
CCL> FINISH                      ! Release the CAMAC modules
CCL> SHOW MODULE                 ! Show connected CAMAC modules
CCL>
```

In this example, several modules are selected during a CCL session. The SHOW MODULE command lists the modules current connected. The FINISH command was used to release all the CAMAC modules as shown with the second SHOW MODULE command.

LAMWAIT

Wait for CAMAC LAM (Look At Me) Request.

FORMAT

LAMWAIT *[module-name]*

restrictions

The crate in which the specified module resides must have LAM support. This requires a LAM Encoder module in the crate and LAM's must be software enabled for that crate. Ask your SYSTEM MANAGER if LAM's are enabled on your crate.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The LAMWAIT command will suspend operation of your process until the specified module asserts its LAM signal line to indicate some significant event. If the module does not assert a LAM within the specified timeout period (See the /TIMEOUT qualifier), the command will return just as if the event had occured. Check with the documentation of the specific CAMAC modules to determine which events issue LAM's.

QUALIFIERS

/TIMEOUT=seconds

Specifies how long to wait for the LAM to occur. If this qualifier is omitted a timeout value of 32767 seconds is used.

EXAMPLE

The following is a sample use of the LAMWAIT command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the digitizer
CCL> LAMWAIT                         ! Wait for digitizing to complete
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> STOP/FUNC=2/COUNT=8192/MEM=16   ! Read in the channel data
CCL>
```

In this example, the LAMWAIT is used to wait for the digitizer to complete a scan after receiving a stop trigger.

PIO

CAMAC Programmed I/O request. The PIO command performs a single-action CAMAC I/O request.

FORMAT

PIO *[module-name]*

restrictions

None.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The PIO command enables you to perform a single I/O request to a CAMAC module.

The /FUNCTION qualifier denotes the desired CAMAC operation to perform. Function values of 0 through 7 are typically read operations, 8 through 15 and 24 through 31 are usually control and status operations and 16 through 23 are typically write operations. Read operations request and , if successful, receive 16 or 24 data bits back from the specified module. Write operation send and , if successful, write 16 or 24 bits to the specified module. Control or status operations either receive status information or send control information and no data is passed via the CAMAC data lines.

The actual meaning of the function codes and addresses vary with the type of CAMAC module with which you are communicating. Most CAMAC vendors provide documentation with their CAMAC modules and list a table of the function codes and their meaning. Function codes in these documents are usually designated as F(n), where *n* is the function number.

Data received via read operations can be viewed using the SHOW DATA command.

QUALIFIERS

/ADDRESS=value

Specifies the address value to use when performing the CAMAC operation. Valid CAMAC address values range from 0 to 15. If the /ADDRESS qualifier is omitted, an address of zero is used.

Address values are not affected by the format qualifiers and are expected to be decimal integers.

/BINARY

Specifies that the data value is expressed in binary format, a series of 1's and 0's. For example, the decimal value 6 can be expressed using the /BINARY qualifier as "00000110". The leading zeros are optional.

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/DATA=value

Specifies the data value to use in write operations. The interpretation of the value specified is controlled by the format qualifiers /DECIMAL, /OCTAL, /HEX, and /BINARY.

If the /DATA qualifier is omitted during a write operation, a /DATA=0 is used.

The actual number of data bits sent to the module is either 16 or 24. See the /MEMORY qualifier for more information.

/DECIMAL

Specifies that the data value is expressed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/FUNCTION=value

Specifies the CAMAC function to be performed on the module. Valid CAMAC function values range from 0 to 31 and their meaning varies depending on the type of module you are addressing. If the /FUNCTION qualifier is omitted, an F(0) operation is performed.

Function values are not affected by the format qualifiers and are expected to be decimal integers.

/HEX

Specifies that the data value is expressed in hexadecimal format. For example, the decimal value 31 can be expressed using the /HEX qualifier as "000001F". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/MEMORY=value

Specifies the number of bits to transmit either to or from the specified module. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size transmitted is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is expressed in octal format. For example, the decimal value 31 can be expressed using the /OCTAL qualifier as "0000037". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is assumed to be decimal.

EXAMPLE

The following example shows the use of the PIO command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the module
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> PIO/FUNC=2/MEM=16               ! Read in one data point
CCL>
```

The example above show examples of read, write, and control operations performed with the PIO command. Each PIO command represents a single transaction with the *MY_8212* module.

PLOT

Plot the data returned from the last CAMAC I/O request.

FORMAT

SHOW DATA

restrictions

None.

prompts

None.

PARAMETERS

None.

DESCRIPTION

The PLOT command will plot the data returned from the last block transfer CAMAC I/O request.

Note: The data shown is only the data from the previous CAMAC I/O command. If, for example, you do 100 PIO commands in succession, each reading in a data value, you cannot PLOT the data since the PLOT command will attempt to display only the data returned by the last command, a single value. Only block data transfers (I.E. STOP, QREP, QSTOP and QSCAN) fill in more than one data value.

The number of data values actually plotted is controlled by the /START and /END qualifiers.

QUALIFIERS

/DEVICE=device-name

Specifies the name of the device you want the plot to be displayed on. If omitted, the plot will be displayed on your terminal.

/DEVTYPE=device-type

Specifies the type of output device you are using. Valid device types are DQ640M (RETRO-GRAPHICS), DQ650M (RETRO-GRAPHICS), REGIS (VT125 and VT24x terminals), QMS (QMS laser printer), \ hfill \ break and ZETA8 (ZETA 8 pen plotter).

/END=value

Specifies the index of the last element you want displayed.

If the /END qualifier is omitted, all the data elements will be displayed.

/START=value

Specifies the first element of the data values to be displayed. If omitted, data is displayed beginning with the first data point.

EXAMPLE

The following example shows the use of the plot command to plot data returned from a transient digitizer:

```
CCL> SET MODULE MY_8212                ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=101011/BINARY    ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                        ! Start the module digitizing
CCL> PIO/FUNC=25                       ! Trigger the module
CCL> PIO/FUNC=16/DATA=5                ! Select channel 6
CCL> STOP/FUNC=2/MEM=16/COUNT=8192     ! Read in 8,192 data points
CCL> PLOT/START=2000/END=5000          ! Display some of the data
CCL>
```

The PLOT command above will plot the data returned from the STOP command on the terminal.

QREP

Perform CAMAC Stop on Word Count with Q equal 1 transaction. The QREP command requests a block transfer CAMAC I/O operation. The specified operation is repeated until a specified number of transactions complete with CAMAC Q=1 or the device times out.

FORMAT

QREP *[module-name]*

restrictions

None.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The QREP command enables you to perform multiple transactions with a CAMAC module. The operation is repeated until a specified number of transactions complete with CAMAC Q=1 status. The number of Q=1 transactions required is specified with the /COUNT qualifier. If the specified number of Q=1 transactions do not complete within 5 seconds, the operation will abort completely and the system will issue an error.

The /FUNCTION qualifier denotes the desired CAMAC operation to perform. Function values of 0 through 7 are typically read operations, 8 through 15 and 24 through 31 are usually control and status operations and 16 through 23 are typically write operations. Read operations request and , if successful, receive 16 or 24 data bits back from the specified module. Write operation send and , if successful, write 16 or 24 bits to the specified module. Control or status operations either receive status information or send control information and no data is passed via the CAMAC data lines.

The actual meaning of the function codes and addresses vary with the type of CAMAC module with which you are communicating. Most CAMAC vendors provide documentation with their CAMAC modules and list a table of the function codes and their meaning. Function codes in these documents are usually designated as F(n), where *n* is the function number.

Data received via read operations can be viewed using the SHOW DATA command.

QUALIFIERS /ADDRESS=value

Specifies the address value to use when performing the CAMAC operation. Valid CAMAC address values range from 0 to 15. If the /ADDRESS qualifier is omitted, an address of zero is used.

Address values are not affected by the format qualifiers and are expected to be decimal integers.

/BINARY

Specifies that the data value is expressed in binary format, a series of 1's and 0's. For example, the decimal value 6 can be expressed using the /BINARY qualifier as "00000110". The leading zeros are optional.

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/COUNT=value

Specifies the number of times the operation is to be performed. The value must be between 1 and 16383, if the transaction data size is 24 bits, or between 1 and 32767, if the transaction data size is 16 bits. See the /MEMORY qualifier for specifying the data size.

/DATA=(value, . . . ,value)

Specifies the data values to use in write operations. The interpretation of the value specified is controlled by the format qualifiers /DECIMAL, /OCTAL, /HEX, and /BINARY.

If the /DATA qualifier is omitted during a write operation, a /DATA=0 is used.

If the number of values is less than the number of repetitions specified in the /COUNT qualifier, the remaining repetitions will use a value of zero.

The actual number of data bits sent to the module is either 16 or 24. See the /MEMORY qualifier for more information.

/DECIMAL

Specifies that the data value is expressed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/FUNCTION=value

Specifies the CAMAC function to be performed on the module. Valid CAMAC function values range from 0 to 31 and their meaning varies depending on the type of module you are addressing. If the /FUNCTION qualifier is omitted, an F(0) operation is performed.

Function values are not affected by the format qualifiers and are expected to be decimal integers.

/HEX

Specifies that the data value is expressed in hexadecimal format. For example, the decimal value 31 can be expressed using the /HEX qualifier as "000001F". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/MEMORY=value

Specifies the number of bits to transmit either to or from the specified module. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size transmitted is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is expressed in octal format. For example, the decimal value 31 can be expressed using the /OCTAL qualifier as "0000037". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is assumed to be decimal.

EXAMPLE

The following example shows the use of the QREP command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the module
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> QREP/FUNC=2/MEM=16/COUNT=8192   ! Read in 8192 data points
CCL>
```

The QREP command above will read in 8192 data points from the digitizers memory.

QSCAN

Perform CAMAC Scan Stop on Word Count or X=0 transaction. The QSCAN command requests a block transfer CAMAC I/O operation. The specified operation is repeated until a specified number of transactions complete or a transaction completes with CAMAC X=0.

FORMAT

QSCAN *[module-name]*

restrictions

None.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The QSCAN command enables you to perform multiple transactions with a CAMAC module using the CAMAC Q-Scan technique. The operation is repeated until a specified number of transactions complete or a transaction completes with CAMAC X=0 status. The number of transactions required is specified with the /COUNT qualifier.

The CAMAC Q-Scan technique can span across several modules occupying adjacent crate stations. After each transaction, the CAMAC X and Q are tested. If X=0 the operation terminates. The Q state affect the subaddress and module station used in the next operation. If Q=0 the module station is incremented. If Q=1 the subaddress is incremented by 1. If the resulting subaddress exceeds 15, the subaddress is reset to zero and the module station is incremented.

The /FUNCTION qualifier denotes the desired CAMAC operation to perform. Function values of 0 through 7 are typically read operations, 8 through 15 and 24 through 31 are usually control and status operations and 16 through 23 are typically write operations. Read operations request and , if successful, receive 16 or 24 data bits back from the specified module. Write operation send and , if successful, write 16 or 24 bits to the specified module. Control or status operations either receive status information or send control information and no data is passed via the CAMAC data lines.

The actual meaning of the function codes and addresses vary with the type of CAMAC module with which you are communicating. Most CAMAC vendors provide documentation with their CAMAC modules and list a table of the function codes and their meaning. Function codes in these documents are usually designated as F(n), where *n* is the function number.

Data received via read operations can be viewed using the SHOW DATA command.

QUALIFIERS /ADDRESS=value

Specifies the address value to use when performing the CAMAC operation. Valid CAMAC address values range from 0 to 15. If the /ADDRESS qualifier is omitted, an address of zero is used. Address values are not affected by the format qualifiers and are expected to be decimal integers.

/BINARY

Specifies that the data value is expressed in binary format, a series of 1's and 0's. For example, the decimal value 6 can be expressed using the /BINARY qualifier as "00000110". The leading zeros are optional.

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/COUNT=value

Specifies the number of times the operation is to be performed. The value must be between 1 and 16383, if the transaction data size is 24 bits, or between 1 and 32767, if the transaction data size is 16 bits. See the /MEMORY qualifier for specifying the data size.

/DATA=(value, . . . ,value)

Specifies the data values to use in write operations. The interpretation of the value specified is controlled by the format qualifiers /DECIMAL, /OCTAL, /HEX, and /BINARY.

If the /DATA qualifier is omitted during a write operation, a /DATA=0 is used.

If the number of values is less than the number of repetitions specified in the /COUNT qualifier, the remaining repetitions will use a value of zero.

The actual number of data bits sent to the module is either 16 or 24. See the /MEMORY qualifier for more information.

/DECIMAL

Specifies that the data value is expressed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/FUNCTION=value

Specifies the CAMAC function to be performed on the module. Valid CAMAC function values range from 0 to 31 and their meaning varies depending on the type of module you are addressing. If the /FUNCTION qualifier is omitted, an F(0) operation is performed.

Function values are not affected by the format qualifiers and are expected to be decimal integers.

/HEX

Specifies that the data value is expressed in hexadecimal format. For example, the decimal value 31 can be expressed using the /HEX qualifier as "000001F". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/MEMORY=value

Specifies the number of bits to transmit either to or from the specified module. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size transmitted is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is expressed in octal format. For example, the decimal value 31 can be expressed using the /OCTAL qualifier as "0000037". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is assumed to be decimal.

EXAMPLE

The following example shows the use of the QSCAN command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> QSCAN/FUNC=0/MEM=16/COUNT=80    ! Read in 80 data points
CCL>
```

The QSCAN command above will read in 80 data points from several adjacent digitizers.

QSTOP

Perform CAMAC Stop on Word Count or Q=0 transaction. The QSTOP command requests a block transfer CAMAC I/O operation. The specified operation is repeated until a specified number of transactions complete or a transaction completes with CAMAC Q=0.

FORMAT

QSTOP *[module-name]*

restrictions

None.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The QSTOP command enables you to perform multiple transactions with a CAMAC module. The operation is repeated until a specified number of transactions complete or a transaction completes with CAMAC Q=0 status. The number of transactions required is specified with the /COUNT qualifier. If a transaction completes with Q=0 before the specified number of transactions, the operation is stopped at that point.

The /FUNCTION qualifier denotes the desired CAMAC operation to perform. Function values of 0 through 7 are typically read operations, 8 through 15 and 24 through 31 are usually control and status operations and 16 through 23 are typically write operations. Read operations request and , if successful, receive 16 or 24 data bits back from the specified module. Write operation send and , if successful, write 16 or 24 bits to the specified module. Control or status operations either receive status information or send control information and no data is passed via the CAMAC data lines.

The actual meaning of the function codes and addresses vary with the type of CAMAC module with which you are communicating. Most CAMAC vendors provide documentation with their CAMAC modules and list a table of the function codes and their meaning. Function codes in these documents are usually designated as F(n), where *n* is the function number.

Data received via read operations can be viewed using the SHOW DATA command.

QUALIFIERS /ADDRESS=value

Specifies the address value to use when performing the CAMAC operation. Valid CAMAC address values range from 0 to 15. If the /ADDRESS qualifier is omitted, an address of zero is used.

Address values are not affected by the format qualifiers and are expected to be decimal integers.

/BINARY

Specifies that the data value is expressed in binary format, a series of 1's and 0's. For example, the decimal value 6 can be expressed using the /BINARY qualifier as "00000110". The leading zeros are optional.

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/COUNT=value

Specifies the number of times the operation is to be performed. The value must be between 1 and 16383, if the transaction data size is 24 bits, or between 1 and 32767, if the transaction data size is 16 bits. See the /MEMORY qualifier for specifying the data size.

/DATA=(value, . . . ,value)

Specifies the data values to use in write operations. The interpretation of the value specified is controlled by the format qualifiers /DECIMAL, /OCTAL, /HEX, and /BINARY.

If the /DATA qualifier is omitted during a write operation, a /DATA=0 is used.

If the number of values is less than the number of repetitions specified in the /COUNT qualifier, the remaining repetitions will use a value of zero.

The actual number of data bits sent to the module is either 16 or 24. See the /MEMORY qualifier for more information.

/DECIMAL

Specifies that the data value is expressed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/FUNCTION=value

Specifies the CAMAC function to be performed on the module. Valid CAMAC function values range from 0 to 31 and their meaning varies depending on the type of module you are addressing. If the /FUNCTION qualifier is omitted, an F(0) operation is performed.

Function values are not affected by the format qualifiers and are expected to be decimal integers.

/HEX

Specifies that the data value is expressed in hexadecimal format. For example, the decimal value 31 can be expressed using the /HEX qualifier as "000001F". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/MEMORY=value

Specifies the number of bits to transmit either to or from the specified module. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size transmitted is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is expressed in octal format. For example, the decimal value 31 can be expressed using the /OCTAL qualifier as "0000037". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is assumed to be decimal.

EXAMPLE

The following example shows the use of the QSTOP command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the module
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> QSTOP/FUNC=2/MEM=16/COUNT=8192  ! Read in 8192 data points
CCL>
```

The QSTOP command above will read in 8192 data points from the digitizers memory.

SET MEMORY

Establish the default CAMAC data transfer size for subsequent CAMAC operations.

FORMAT

SET MEMORY *word-size*

restrictions

None.

prompts

None.

PARAMETERS

word-size

Specifies the default CAMAC data transfer size for subsequent CAMAC operations. Valid word sizes are 16 and 24. The word size is the number of bits of data that will be transmitted during each read or write operation. You must specify a word-size of either 16 or 24, no other value is permitted.

DESCRIPTION

The SET MEMORY command specifies the word size used in each CAMAC transmission. CAMAC hardware is capable of transmitting up to 24 bits of information with each read or write operation. On a VAX computer, the normal binary data sizes are 8, 16, and 32 bit words. If you select 24 bits for CAMAC transmissions, the data on the VAX is stored or read from 32 bit words. If you select 16 bits, the data on the VAX is store or read from 16 bit words. While this is important in coding application programs for direct communication with the CAMAC hardware, it is not very important when using CCL since the data handling is taken care of for you. The only time the default setting of 24 bits may need to be changed is in large block I/O operations. With a setting of 24 bits, you can only specify a block I/O count of 16383. Whereas with 16 bit data size, the system will handle up to 32767 word block I/O transaction.

QUALIFIERS

None.

EXAMPLE

The following is a sample use of the SET MEMORY command:

```
CCL> SET MEMORY 16                  ! Set data transfer size to 16 bits
CCL> SET MODULE MY_8212             ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                     ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK           ! Enable the external clock
CCL> PIO/FUNC=25                    ! Trigger the digitizer
CCL> LAMWAIT                        ! Wait for digitizing to complete
CCL> PIO/FUNC=16/DATA=5             ! Select channel 6
CCL> STOP/FUNC=2/COUNT=8192         ! Read in the channel data
CCL>
```

In this example, the SET MEMORY is used to select the 16 bit data size for subsequent commands.

SET MODULE

Establish the default CAMAC module for subsequent CAMAC operations.

FORMAT

SET MODULE *module-name*

restrictions

None.

prompts

Module: module-name

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The SET MODULE command specifies a CAMAC module to be referenced in subsequent CAMAC operations using commands such as PIO, STOP, QREP, QSCAN, QSTOP and LAMWAIT.

QUALIFIERS

None.

EXAMPLE

The following is a sample use of the SET MODULE command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the digitizer
CCL> LAMWAIT                         ! Wait for digitizing to complete
CCL> PIO/FUNC=16/DATA=6              ! Select channel 6
CCL> STOP/FUNC=2/COUNT=8192/MEM=16   ! Read in the channel data
CCL>
```

In this example, the SET MODULE is used to select the default module on which to perform CAMAC operations.

SET XANDQ

Establish the expected state of CAMAC X and Q for error detection in subsequent CAMAC I/O commands.

FORMAT

SET XANDQ

restrictions

None.

prompts

None.

PARAMETERS

None.

DESCRIPTION

The SET XANDQ command permits you to select expected CAMAC X and Q states for subsequent CAMAC I/O operations. When CCL is first invoked, the expected X and Q states are set to "ANY", which means no checking of the X and Q states are made. By selecting the either the "YES" or "NO" expected states, the X and/or Q states are checked after CAMAC I/O operations and if the resultant X and Q states do not match the expected states, the system issues an error message.

QUALIFIERS

/Q=expected-state

Specifies the expected state of the CAMAC Q line for subsequent CAMAC I/O operations.

If you specify /Q=YES, any subsequent CAMAC I/O operation which completes with Q=0 will cause the system to generate an error message.

If you specify /Q=NO, any subsequent CAMAC I/O operation which completes with Q=1 will cause the system to output an error message.

If you specify /Q=ANY, the default if the /Q qualifier is omitted, no error message will be generated regardless of the Q state as long as there was no serial highway problems and the expected X state was returned.

/X=expected-state

Specifies the expected state of the CAMAC X line for subsequent CAMAC I/O operations.

If you specify /X=YES, any subsequent CAMAC I/O operation which completes with X=0 will cause the system to generate an error message.

If you specify /X=ANY, the default if the /X qualifier is omitted, no error message will be generated regardless of the X state as long as there was no serial highway problems and the expected Q state was returned.

EXAMPLES

The following example shows the use of the SET XANDQ command:

1

```
EXAMPLE
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the MEMORY digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the MEMORY
CCL> LAMWAIT                         ! Wait for digitizing to complete
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> SET XANDQ/Q=YES                 ! Read in the channel data
CCL> STOP/FUNC=2/COUNT=8192          ! Read in the channel data
CCL> STOP/FUNC=2/COUNT=8192          ! Read in the channel data
%CCL-W-CAMAC_ERROR, Error occurred during camac operation - type SHOW STATUS for more detail
CCL> SHOW STATUS
%SERCAM-I-BCNT, Serial transaction count: 16384
-SERCAM-I-RBCNT, Serial reply list count: 0
-SERCAM-I-RAWSCT, Serial Control Register: 6487
-SERCAM-I-SCTSTOP, serial Stop mode
-SERCAM-I-RAWSES, Serial Error/Status Register: 2021
-SERCAM-I-SESNOSQ, serial reply: No Q received
-SERCAM-I-SESSX, serial reply: X received
CCL>
```

In this example, the SET XANDQ command is used to have the system issue an error message if the STOP operation does not complete with Q=1. The first STOP operation was successful but the second one did not return a Q=1.

SHOW DATA

List the data returned from the last CAMAC I/O request.

FORMAT SHOW DATA

restrictions *None.*

prompts *None.*

PARAMETERS *None.*

DESCRIPTION

The SHOW DATA command will list the data returned from the last CAMAC I/O request. The format of the data displayed can be selected with the /BINARY, /DECIMAL, /HEX and /OCTAL qualifiers. Block data transfers will fill in data values, one value per transfer. The PIO command will just fill in the first data value.

Note: The data shown is only the data from the previous CAMAC I/O command. If, for example, you do 100 PIO commands in succession, each reading in a data value, a SHOW DATA command will display only the data returned by the last PIO command as data value element one. Only block data transfers (I.E. STOP, QREP, QSTOP and QSCAN) fill in more than one data value.

The number of data values actually listed if controlled by the /START and /END qualifiers and the data transfer bit size. The first line displayed is the first line which contains the index of the /START qualifier and the last line displayed is the line which contains the index of the /END qualifier.

QUALIFIERS

/BINARY

Specifies that the data value is displayed in binary format, a series of 1's and 0's. For example, the decimal value 6 will be displayed using the /BINARY qualifier as "00000110".

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is displayed in decimal.

/END=value

Specifies the index of the last element you want displayed. The last line displayed will contain the data element number specified by this value. Trailing data may be displayed to fill out the line.

If the /END qualifier is omitted, only one line of data elements will be displayed.

/DECIMAL

Specifies that the data value is to be displayed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is displayed in decimal.

/HEX

Specifies that the data value is to be displayed in hexadecimal format. For example, the decimal value 31 will be displayed using the /HEX qualifier as "000001F".

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is displayed in decimal.

/MEMORY=value

Specifies the number of bits in each data word. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size displayed is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is to be displayed in octal format. For example, the decimal value 31 will be displayed using the /OCTAL qualifier as "0000037".

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is displayed in decimal.

/START=value

Specifies the first element of the data values to be displayed. If omitted, data is displayed beginning with the first data point.

EXAMPLES

The following example shows the use of the SHOW DATA command:

```
1
```

```
EXAMPLE
CCL> SET MEMORY 16                    ! Select 16 bit memory transfers
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY   ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                       ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK             ! Enable the external clock
CCL> PIO/FUNC=25                      ! Trigger the module
CCL> PIO/FUNC=16/DATA=5               ! Select channel 6
CCL> STOP/FUNC=2/MEM=16/COUNT=8192    ! Read in 8192 data points
CCL> SHOW DATA/START=23/END=31        ! Display some of the data
000023       1234   1228   1340   1560   1700   2300   3330   4555   6000   6555
CCL> SHOW DATA/START=23/END=31/BINARY ! Display the same data in binary
000023          10011010010      10011001100      10100111100       1000011000
000027          11010100100     100011111100     110100000010    1000111001011
000031        1011101110000    1100110011011    1010101111110   11110101101111
CCL>
```

The SHOW DATA command will display some of the data returned from the STOP command.

SHOW MODULE

Show the modules that have been referenced by a SET MODULE command or any of the CAMAC I/O commands.

FORMAT

SHOW MODULE

restrictions

None.

prompts

None.

PARAMETERS

None.

DESCRIPTION

Each time you address a different CAMAC module in CCL, the I/O channel to that module remains active and subsequent access to that module occurs with less overhead than the initial access. The SHOW MODULE command will list the names of all the modules that have been addressed since the invocation of CCL or since the last FINISH command. The default module, the module which will be addressed if the module-name is omitted from CAMAC I/O commands, is highlighted.

QUALIFIERS

None.

EXAMPLES

The following example shows the use of the SHOW MODULE command:

```
1
```

```
CCL> SET MODULE MY_8212_1       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_2       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_3       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_4       ! Select a CAMAC module
   .
   .
   .
CCL> SET MODULE MY_8212_5       ! Select a CAMAC module
   .
   .
   .
CCL> SHOW MODULE                ! Show connected CAMAC modules
MY_8212_1
MY_8212_2
MY_8212_3
MY_8212_4
MY_8212_5         <default>
CCL> FINISH                     ! Release the CAMAC modules
CCL> SHOW MODULE                ! Show connected CAMAC modules
CCL>
```

In this example, several modules are selected during a CCL session. The SHOW MODULE command lists the modules current connected. The FINISH command was used to release all the CAMAC modules as shown with the second SHOW MODULE command.

SHOW STATUS

The SHOW STATUS command will display the status of the last CAMAC I/O request.

FORMAT

SHOW STATUS

restrictions

None.

prompts

None.

PARAMETERS

None.

DESCRIPTION

The SHOW STATUS command displays the status of the last CAMAC I/O request. The information displayed includes the number of bytes of data that was transmitted or received, the serial highway control and status registers, the type of transaction that was performed, the state of the CAMAC X and Q indicators, and if an error was detected, an informational message indicating the type of error detected.

QUALIFIERS

None.

EXAMPLE

The following example shows the use of the SHOW STATUS command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
CCL> SET MEMORY 16                   ! Select 16 bit memory transfers
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY   ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                       ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK             ! Enable the external clock
CCL> PIO/FUNC=25                      ! Trigger the module
CCL> PIO/FUNC=16/DATA=5               ! Select channel 6
CCL> STOP/FUNC=2/MEM=16/COUNT=8192    ! Read in 8192 data points
%CCL-W-CAMAC_ERROR, Error occurred during camac operation - type SHOW STATUS for more detail
CCL> SHOW STATUS
%SERCAM-I-BCNT, Serial transaction count: 16384
-SERCAM-I-RBCNT, Serial reply list count: 0
-SERCAM-I-RAWSCT, Serial Control Register: 6487
-SERCAM-I-SCTSTOP, serial Stop mode
-SERCAM-I-RAWSES, Serial Error/Status Register: 2021
-SERCAM-I-SESNOSQ, serial reply: No Q received
-SERCAM-I-SESSX, serial reply: X received
CCL>
```

In this example, the SHOW STATUS command displays the status of the

previous STOP command. The error was generated because no Q was received. As indicated in the SHOW STATUS output.

STOP

Perform CAMAC Stop on Word Count transaction. The STOP command requests a block transfer CAMAC I/O operation. The specified operation is repeated a specified number of times.

FORMAT

STOP *[module-name]*

restrictions

None.

prompts

None.

PARAMETERS

module-name

Specifies the CAMAC module to be referenced. The *module-name* must have been assigned using the ORNL CTS (CAMAC Topology Supervisor) utility. If omitted, the command will reference the module specified in the last SET MODULE command. If you omit the *module-name* and no default module has been established using the SET MODULE command, the system will issue an error message.

DESCRIPTION

The STOP command enables you to perform multiple transactions with a CAMAC module. The operation is repeated the number of times specified with the /COUNT qualifier regardless of the Q status of each repetition.

The /FUNCTION qualifier denotes the desired CAMAC operation to perform. Function values of 0 through 7 are typically read operations, 8 through 15 and 24 through 31 are usually control and status operations and 16 through 23 are typically write operations. Read operations request and , if successful, receive 16 or 24 data bits back from the specified module. Write operation send and , if successful, write 16 or 24 bits to the specified module. Control or status operations either receive status information or send control information and no data is passed via the CAMAC data lines.

The actual meaning of the function codes and addresses vary with the type of CAMAC module with which you are communicating. Most CAMAC vendors provide documentation with their CAMAC modules and list a table of the function codes and their meaning. Function codes in these documents are usually designated as F(n), where *n* is the function number.

Data received via read operations can be viewed using the SHOW DATA command.

QUALIFIERS /ADDRESS=value

Specifies the address value to use when performing the CAMAC operation. Valid CAMAC address values range from 0 to 15. If the /ADDRESS qualifier is omitted, an address of zero is used.

Address values are not affected by the format qualifiers and are expected to be decimal integers.

/BINARY

Specifies that the data value is expressed in binary format, a series of 1's and 0's. For example, the decimal value 6 can be expressed using the /BINARY qualifier as "00000110". The leading zeros are optional.

This qualifier should not be used with the /DECIMAL, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/COUNT=value

Specifies the number of times the operation is to be performed. The value must be between 1 and 16383, if the transaction data size is 24 bits, or between 1 and 32767, if the transaction data size is 16 bits. See the /MEMORY qualifier for specifying the data size.

/DATA=(value, . . . ,value)

Specifies the data values to use in write operations. The interpretation of the value specified is controlled by the format qualifiers /DECIMAL, /OCTAL, /HEX, and /BINARY.

If the /DATA qualifier is omitted during a write operation, a /DATA=0 is used.

If the number of values is less than the number of repetitions specified in the /COUNT qualifier, the remaining repetitions will use a value of zero.

The actual number of data bits sent to the module is either 16 or 24. See the /MEMORY qualifier for more information.

/DECIMAL

Specifies that the data value is expressed in decimal format, a base 10 integer.

This qualifier should not be used with the /BINARY, /HEX, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/FUNCTION=value

Specifies the CAMAC function to be performed on the module. Valid CAMAC function values range from 0 to 31 and their meaning varies depending on the type of module you are addressing. If the /FUNCTION qualifier is omitted, an F(0) operation is performed.

Function values are not affected by the format qualifiers and are expected to be decimal integers.

/HEX

Specifies that the data value is expressed in hexadecimal format. For example, the decimal value 31 can be expressed using the /HEX qualifier as "000001F". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /OCTAL qualifiers. If no format qualifier is present, the data is assumed to be decimal.

/MEMORY=value

Specifies the number of bits to transmit either to or from the specified module. Two data sizes are supported in the hardware, 16 or 24 bits. Use either "16" or "24" for value with the /MEMORY qualifier.

If the /MEMORY qualifier is omitted, the data size transmitted is defaulted to that specified in a SET MEMORY command. See the description of the SET MEMORY command for more details.

/OCTAL

Specifies that the data value is expressed in octal format. For example, the decimal value 31 can be expressed using the /OCTAL qualifier as "0000037". The leading zeros are optional.

This qualifier should not be used with the /BINARY, /DECIMAL, or /HEX qualifiers. If no format qualifier is present, the data is assumed to be decimal.

EXAMPLE

The following example shows the use of the STOP command:

```
CCL> SET MODULE MY_8212              ! Select a LeCroy 8212 digitizer
   .
   .
   .
CCL> PIO/FUNC=17/DATA=100011/BINARY  ! Set the PTS, NOC, and Clock rate
CCL> PIO/FUNC=9                      ! Start the module digitizing
CCL> PIO/FUNC=25 MY_CLOCK            ! Enable the external clock
CCL> PIO/FUNC=25                     ! Trigger the module
CCL> PIO/FUNC=16/DATA=5              ! Select channel 6
CCL> STOP/FUNC=2/MEM=16/COUNT=8192   ! Read in 8192 data points
CCL>
```

The STOP command above will read in 8192 data points from the digitizers memory.

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