# MONOPULSE BEACON TEST SET

# IEEE-488 COMMAND SET


Document No. 100606, Rev. B

February 13, 2003

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BY:_____ _____
Date

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## Implementation Notes

Multiple Commands on one line

Multiple commands can be issued at one time; they must be separated by semi-colons (';'). Commands are processed one at a time in left-to-right order, and no further commands will be processed until the entire group has been processed.

Any information returned by the commands is output in order, one line per command.

For example:

```
ALARM?;ANTALARM?;MODE STANDBY
```

could return

```
0,8;ON
```

Maximum Command Length

The maximum size of a command line is 3000 bytes. A command line is any sequence of bytes that are terminated by a carriage return and/or EOI. A command line may contain more than one command as shown in the previous section. The maximum command line size is enough for the largest individual command; however length constraints may prevent some large commands being chained together on one line.

Parameter Separators

To conform with IEEE-488 conventions, this document uses a comma (',') as the parameter separator. However, the MBTS will also accept a space character as a parameter separator.

Replies will always use commas to separate multiple data items, regardless of what type of parameter separator was used when issuing a command.

Write Protect for Flash Calibration Parameters

The PCC Module DIP switch labeled "USER 1" controls whether or not data can be written to the FLASH Calibration data memory. If the switch is off (logic "1") it prevents writes; if it is on (logic "0") it allows writes. It returns a **`WRITE PROTECT`** error if an attempt is made to write when the FLASH is protected.

This affects the CALABOFFSET, CALBITLVL, CALPULSEPWR, CALSOTABLE, CALTEMPLIMIT, CALTGTTABLE, and CALUCATTEN commands. It does not affect the CALPWROFFSET command.

Hex (H) Value Command Response Option

Most status commands respond with a decimal value. Those commands marked with (H) can, optionally, return the hexadecimal value of the response in place of the decimal value. To use this command option insert a space and then "h" after the normal command entry.

## Documentation Notes

Each command has a table, like that shown in Figure 1, that identifies during which modes the command or query can be issued, and also instances in which the command can be issued but the information provided by the command will not be immediately used.

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| COMMAND | ✘ | | | | ▼ | ▼ | ▼ | ✘ | |
| QUERY? | | | | | | | | | ✘ |

**Figure. 1**

### *The conditions:*

**Command or Query**
The command name or query name being described.

**Standby Mode**
**Ring Mode**
**Azimuth Mode**
**Boresight Mode**
**CW Mode**
**Cal Mode**
**Ref Mode**
When the MBTS is in the corresponding operational Mode.

**Cal. Write Protect**
When the FLASH Calibration data Write Protect DIP switch is in the "Protect" position.

**Xilinx Load Fail**
When the MBTS has been unable to load the Xilinx FPGA's with any valid configuration data pattern.

### *The symbols:*

✘ The command will be rejected. For one of the mode columns, the error **`WRONG MODE`** will be returned. For *Cal. Write Protect*, the error **`WRITE PROTECT`** will be returned. For *Xilinx Load Fail*, the error **`INTERNAL ERROR`** will be returned.

▼ The command will be accepted, but the information contained in the command will not be immediately acted upon. For example, the TGTAZ command to set the Target Azimuth can be issued while the MBTS is in Ring mode, and will be accepted, but the value provided will not be used until the MBTS is commanded to enter Azimuth mode.

## *ALARM* – Return Alarm Status (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| ALARM? | | | | | | | | | |

Syntax:

**ALARM?** *Returns the current contents of the Alarm register.*

Description:

The ALARM query returns the latched and the current state of the alarm register, then clears all bits in the latched register that are not set in the current register. The latched register contains events for all alarms that have occurred since the last time either the alarm register was read or a *CLS command was acted upon.

Examples:

Query: **ALARM?**{CR}{LF}
Response: **0,8**{CR}{LF}

Query: **ALARM?**{CR}{LF}
Response: **20,20**{CR}{LF}

Query Response Format:

**l,s**
*Where* **l** *and* **s** *are in the range* **0** *to* **63**. *The values are encoded as follows:*

| | | |
|---|---|---|
| **32** | **ANT APG ALARM** | *The antenna rotation pulses are not valid (wrong number of pulses/rev).* |
| **16** | **ANT ROTATE ALARM** | *The antenna is out of the valid speed range.* |
| **8** | **FAN FAILED** | *The MBTS internal fan has failed.* |
| **4** | **CAL FAILED** | *MBTS was unable to adjust the outputs to their reference point.* |
| **2** | **BIT TEMP ALARM** | *The internal temperature as reported by the BIT module is beyond limits.* |
| **1** | **BIT PWR ALARM** | *The power supply voltages as reported by the BIT module are beyond limits.* |

**l** *is the latched version of the alarm status, and* **s** *is the current alarm status.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Cleared by *CLS.

## *ANT* - Antenna Type

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| ANT | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| ANT? | | | | | | | | | |

Syntax:

**ANT t,b** *Select new antenna type and beamshaping on/off*
or
**ANT?** *Return current antenna type and beamshaping mode*

Where:

**t** **OFF** - Disable beam shaping
**TERMINAL** - 5-foot terminal open array
**ENROUTE** - 6-foot enroute array
**ASR11** - ASR-11/MSSR LVA
**USER** - User-defined

**b** Beam shaping compensation. **ON** or **OFF**. Must be **OFF** if **t** is **OFF**.

Description:

The ANT command selects which antenna beam pattern to use when generating azimuth-gated replies. It also controls whether the reply is subject to beam-shaping compensation.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **ANT OFF,OFF;**{CR}{LF}

Command: **ANT TERMINAL,OFF;**{CR}{LF}

Command: **ANT ENROUTE,ON;**{CR}{LF}

Command: **ANT ASR11,ON;**{CR}{LF}

Command: **ANT USER,OFF;**{CR}{LF}

Query: **ANT?**{CR}{LF}
Response: **ENROUTE,ON**{CR}{LF}

Query Response Format:

**n,b**{CR}{LF}
*Where* **n** *is the antenna type (as described above) and* **b** *is beamshaping compensation, either* **ON** *or* **OFF**.

Default Value:

**OFF,OFF**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **NOT POSSIBLE** | If the User-defined beam pattern was requested and the FLASH data is corrupt. |

## *ANTALARM* - Controls Rotation Alarm and Reply Suppression

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| ANTALARM | | | | | | | | | |
| ANTALARM? | | | | | | | | | |

Syntax:

**ANTALARM n** *Turn the Antenna Rotation Alarm on or off*
or
**ANTALARM?** *Return the current state of the Antenna Alarm enable*

Where:
**n** **ON** or **OFF**

Description:

The Antenna Rotation Alarm signals that the antenna is not spinning within specified limits (4 to 15 rpm). An asserted ANTALARM state suppress the generation of reply signals. If the ANTALARM is OFF, however, reply signals may be generated even if the antenna is not rotating within specified limits.

**ON** means the data from the Azimuth Pulse Generator , as measured at the selected APG input, is tested for an antenna rotation rate of between 4 to 15 rpm, and for the correct number of pulses per revolution (4096 in ACP mode, 16384 in IACP mode) An Antenna Speed alarm is set (see the ALARM query), and the generation of replies to interrogations is suppressed, if an out of bounds condition is detected.

**OFF** means that antenna alarms are not generated and that MBTS replies are not suppressed. Note that the status returned by the ALARM query will correctly reflect the state of the antenna rotation and APG alarms.

Examples:

Command: **ANTALARM ON;**{CR}{LF}

Command: **ANTALARM OFF;**{CR}{LF}

Query: **ANTALARM?**{CR}{LF}
Response: **ON**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is* **ON** *or* **OFF**

Default Value:

**ON**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *APGNORTH* - Set APG Northmark Offset

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| APGNORTH | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| APGNORTH? | | | | | | | | | |

Syntax:

**`APGNORTH n,m`** *Set new Northmark Offset*
or
**`APGNORTH?`** *Return current Northmark Offsets (all channels)*

Where:
**`n`** APG input channel, "A" (channel A), "B" (channel B) or "U" (unbalanced)
**`m`** Offset to magnetic north, 0 to 16383 in IACP units

Description:

The APGNORTH command creates an offset between the ARP pulse of the antenna APG and the azimuth position of the target constellation generated by the MBTS.

The first parameter specifies the input channel for which the north mark should be set. Channel A and channel B are the two RS-422 (differential) inputs, and "U" is the unbalanced (single-ended) input.

The second parameter specifies the offset from the channel's ARP pulse to true north. The offset is specified in IACP units, with a range of 0 to 16383. If the specified antenna sends ACP pulses instead of IACP pulses, the value is divided by four inside the MBTS.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until the azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`APGNORTH A,0;`**{CR}{LF}

Command: **`APGNORTH B,16300;`**{CR}{LF}

Command: **`APGNORTH U,221;`**{CR}{LF}

Query: **`APGNORTH?`**{CR}{LF}
Response: **`A,0,B,16300,U,221`**{CR}{LF}

Query Response Format:

**`A,ma,B,mb,U,mu`**{CR}{LF}
*Where* **`ma`**, **`mb`**, *and* **`mu`** *are the APG Northmark Offset for inputs A, B, and U respectively, in IACP units from 0 to 16383.*

Default Value:

**A,0,B,0,U,0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *APGSEL* - APG Select

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| APGSEL | | | | | | | | | ✘ |
| APGSEL? | | | | | | | | | |

Syntax:

**`APGSEL n,t`** *Select new APG input source*
or
**`APGSEL?`** *Return current APG input*

Where:
**`n`** APG input channel, **`A`** (channel A), **`B`** (channel B) or **`U`** (unbalanced)
**`t`** ACP/IACP input type, **`ACP`**, **`IACP`** or **`AUTO`**

Description:

The APGSEL command selects data input from one of the three sets of MBTS APG input channels. Channel A and channel B are RS-422 (differential) inputs, and "U" is the unbalanced (single-ended) inputs.

If AUTO mode is selected, the returned value for the sensed ACP/IACP type will be "UNKNOWN" until the MBTS has determined the data type, ACP or IACP.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until the azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`APGSEL A,IACP;`**{CR}{LF}

Command: **`APGSEL B,ACP;`**{CR}{LF}

Command: **`APGSEL U,AUTO;`**{CR}{LF}

Query: **`APGSEL?`**{CR}{LF}
Response: **`B,AUTO,ACP`**{CR}{LF}

Query Response Format:

**n,t,s**{CR}{LF}
*Where* **n** *is either* **A**, **B**, *or* **U** *for the A, B, or Unbalanced input respectively;* **t** *is the selected ACP/IACP type as described above, and* **s** *is the sensed ACP/IACP type.*

Default Value:

| | |
|---|---|
| **A,IACP** | *Channel A input selected in IACP mode* |

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *AZ* - Current Azimuth

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| AZ? | | | | | | | | | |

Syntax:

**AZ?** *Return current antenna azimuth and error flag*

Description:

The AZ command returns the current antenna azimuth and error flag.

Examples:

Query: **AZ?**{CR}{LF}
Response: **12224,0**{CR}{LF}

Query: **AZ?** {CR}{LF}
Response: **3120,0**{CR}{LF}

Query: **AZ?** {CR}{LF}
Response: **0,1**{CR}{LF}

Query Response Format:

**a,e**{CR}{LF}
*Where* **a** *is the azimuth in IACP units, 0 to 16383 for IACP units, and* **e** *is the Antenna Azimuth error flag:* **0** *for no error, or* **1** *for error (see also ANTALARM command and ALARM? Query).*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## *AZEXTNT* - Azimuth Extent

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| AZEXTNT | ▼ | ▼ | | ▼ | ▼ | ▼ | ▼ | | ✘ |
| AZEXTNT? | | | | | | | | | |

Syntax:

**`AZEXTNT n.n`** *Set target azimuth extent*
or
**`AZEXTNT?`** *Return current target azimuth extent*

Where:
n.n Target extent, in degrees, 2.0 to 5.0 in 0.2° steps

Description:

The AZEXTNT command sets azimuth extent (width) of every target when the MBTS is in azimuth-gated reply mode. This value is not used when in ring-reply mode.

The azimuth extent must always be specified with the decimal point and the fractional digit, even when the fractional digit is zero. For example, a target extent of 3 degrees must be specified as "3.0". The query response always returns the decimal point and the fractional digit.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until the azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`AZEXTNT 3.2;`**{CR}{LF}

Command: **`AZEXTNT 4.8;`**{CR}{LF}

Query: **`AZEXTNT?`**{CR}{LF}
Response: **`4.8`**{CR}{LF}

Query Response Format:

**`n.n`**{CR}{LF}
*Where* **`n.n`** *is the azimuth extent in degrees.*

Default Value:

**`2.0`**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *BEAMSHAPE* - Antenna Beam-Shaping Table

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BEAMSHAPE | ▼ | ✘ | ✘ | ✘ | ✘ | | ✘ | | |
| BEAMSHAPE? | | | | | | | | | |

Syntax:

**BEAMSHAPE** $p_{-127}, p_{-126}, p_{-125}, p_{-124}, \ldots p_{127}, p_{128}$
*Download new user-defined antenna beam shape pattern*

or

**BEAMSHAPE?** *Return current user-defined antenna beam shape pattern*

Where:

**p** relative power level, from 0 to -95.5 dB of attenuation in 0.5 dB steps

Description:

The BEAMSHAPE command downloads the user-defined beam pattern. This use of this beam pattern is selected by entering an ANT USER command.

The MBTS must be in either STANDBY or CAL mode to use this command (see the MODE command).

Examples:

Command: **BEAMSHAPE -95.5,-94.0,-93.0,-90.0, ... –91.5;**{CR}{LF}

Query: **BEAMSHAPE?**{CR}{LF}
Response: **-95.5,-94.0,... ,-95.5**{CR}{LF}

Query Response Format:

$p_{-127}, p_{-126}, p_{-125}, p_{-124}, \ldots p_{127}, p_{128}$ {CR}{LF}

*Where a* **p** *value is returned for each of the 256 azimuth values from -127 to +128;* **p** *is the relative power level, from 0 to -95.5 dB in 0.5 dB steps.*

Default Value:

Loaded from FLASH ROM as stored by last BEAMSHAPE command.

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |

## *BER* - Bit Error Rate Test

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BER | | ✘ | ✘ | ✘ | ✘ | ✘ | ✘ | | ✘ |
| BER? | | | | | | | | | |

Syntax:

**`BER n,m`** *Start a Bit Error Rate test on* **`n`***, where* **`n`** *is* **`ISI`** *or* **`OFF`***;* **`m`** *is the desired number of effective data bits in powers of 10, range 1 to 9 (must be 0 for* **`OFF`***).*

or

**`BER?`** *Return current BER results*

Description:

The BER command starts or stops a Bit Error Rate test..

The BER query returns the most recent BER results from either a BER command, a *TST? Command, or the automatic *TST? performed upon power-up or reset. While a BER test is in progress, the BER? Query returns the intermediate results.

The BER command assigns an "effective number of data bits" to each interrogation. ATCRBS interrogations without a P4 are 3 bits, ATCRBS interrogations with a P4 are 5 bits, and Mode S interrogations are 58 bits. The MBTS sends a random sequence of ATCRBS and Mode-S interrogations, selected from the following list:

Mode 2
Mode 3/A with narrow P4
Mode C with wide P4
Mode S All-Call
Mode B
Mode S Roll-Call

The current mode must be STANDBY in order to initiate a bit error rate test (see the MODE command).

Examples:

Command: **`BER ISI,4;`**{CR}{LF}

Command: **`BER OFF,0;`**{CR}{LF}

Query: **`BER?`**{CR}{LF}
Response: **`1,2,4023,0,0`**{CR}{LF}

Query Response Format:

**`f,isierrs,isicnt,rgcerrs,rgccnt`**
W*here* **`f`** *is the "BER in progress" flag;* **`1`** *is in-progress,* **`0`** *is complete.*
**`isierrs`** *is the number of ISI errors*
**`isicnt`** *is the total number of interrogations*
**`rgcerrs`** *is the number of RGC errors (always 0, this test not implemented)*
**`rgccnt`** *is the total number of replies (always 0, this test not implemented)*

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **TIME OUT** | The command timed out. |

## *BITCMD* - BIT Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BITCMD | | | | | | | | | ✘ |
| BITCMD? | | | | | | | | | |

Syntax:

**BITCMD n** *Passes a command through to the BIT module*
or
**BITCMD?** *Return most recent BIT command response*

Description:

The BITCMD command passes a command through the PCC Module to the BIT module and returns the BIT module's response. See the BIT Module Command Set, FSE document number 100682, for a listing of all supported BIT Module commands.

The PCC automatically adds the packet delimiters ("{" and "}") when sending the command to the BIT module.

Note that the BIT module returns parameters separated by spaces, not commas.

The BITCMD query returns an empty string if communications with the BIT have failed or no command was successfully sent.

Examples:

Command: **BITCMD SIGLVL**{CR}{LF}
Response: **0 0 -15.12,1234,1237**{CR}{LF}

Query: **BITCMD?**{CR}{LF}
Response: **0 0 -15.12,1234,1237**{{CR}{LF}

Query Response Format:

**n**
W*here* **n** *is whatever was last transmitted by the BIT module as the response to a command.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**TIME OUT** The command timed out.

## *BITRESET* - BIT Reset Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BITRESET | | | | | | | | | ✘ |

Syntax:

**BITRESET** *Resets the BIT module*

Description:

The BITRESET command sends a processor reset signal to the BIT module.

Note that it takes 6 seconds for the BIT module to reboot and respond to additional commands.

Examples:

Command: **BITRESET**{CR}{LF}

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## *BITSTS* - BIT Status

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BITSTS? | | | | | | | | | |

Syntax:

**BITSTS?** *Return current BIT results*

Description:

The BITSTS command returns the most recent status information from the BIT module.

Note that the BIT module returns parameters separated by spaces, not commas.

The BITSTS query returns an empty string if communications with the BIT have failed.

Examples:

Query: **BITSTS?**{CR}{LF}
Response: **0 0 +4.092 1 -5.102 1 +15.202 0 28.3 1 0 0 70.000 L 1100.0 L**{CR}{LF}

Query: **BITSTS?**{CR}{LF}
Response: **0 0 +5.053 1 -4.983 1 +15.804 0 28.1 1 0 0 79.200 U 1080.0 L**{CR}{LF}

Query Response Format:

**n**
W*here* **n** *is the response produced by the BIT Module* **STATUS** *and* **PLLSTATUS** *commands. See the BIT Module Command Set, FSE document number 100682, for a listing of all supported BIT Module commands.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**TIME OUT** The command timed out.

## *BORESIGHT* - Off-Boresight-Angle Table

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| BORESIGHT | | ✘ | ✘ | ✘ | ✘ | | ✘ | | |
| BORESIGHT? | | | | | | | | | |

Syntax:

**BORESIGHT** $d_{-127},p_{-127},d_{-126},p_{-126},\ldots\ d_{127},p_{127},d_{128},p_{128}$
*Download new user-defined OBA pattern*

or

**BORESIGHT?** *Return current user-defined antenna beam shape pattern*

Where:

**d** delta power level relative to sum power level, from +12.00 to –41.75 dB in 0.25 dB steps
**p** phase, either 0 or 180 degrees

Description:

The BORESIGHT command downloads the user-defined off-boresight-angle pattern. This beam pattern sets the monopulse (Delta to Sum power ratio and phase) characteristics for target replies. It is selected for use, inin the Azimuth Gated Target Mode, by the ANT USER command. The Boresight table contains 256 values, one for each boresight position from –127 to +128.

Note that Delta/Sum power ratios greater than +6 dB require the adjustment of the Target and Aux Delta/Sum attenuators.

The MBTS must be in either STANDBY or CAL mode to use this command (see the MODE command).

Examples:

Command: **BORESIGHT -41.00,0,-41.25,0,-40.75,0... –40.25,180, -41.75,180;**{CR}{LF}

Command: **BORESIGHT -5.00,0,-5.00,0,-5.00,0,... –5.00,180;**{CR}{LF}

Query: **BORESIGHT?**{CR}{LF}
Response: **-25.75,0,-25.25,0, ... -35.75,180**{CR}{LF}

Query Response Format:

**d,p,d,p,d,p, ... d,p,d,p**{CR}{LF}
*Where one set of* **d** *and* **p** *values is returned for each of the 256 azimuth values from -127 to +128;* **d** *is the power level, from +12.00 to –41.75 dB in 0.25 dB steps, and* **p** *is the phase, either* **0** *or* **180**.

Default Value:

Loaded from FLASH ROM as stored by the most recent BORESIGHT command.

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |

## **CAL* - Force recalibration for temperature and frequency

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CAL? | | ✘ | ✘ | ✘ | ✘ | | ✘ | | ✘ |

Syntax:

***CAL?** *Causes a recalibration for temperature and frequency, and returns the results of the recalibration.*

Description:

The *CAL? query causes the MBTS to recalibrate the RF section for the current ambient temperature and output frequency. It does this by routing the RF output of the Sum Channel Upconverter to the BIT module, measures the level of this signal, and then compensates for the current conditions based on the CALBITLVL settings.

The *CAL? query can compensate for up to ±4.0 dB of signal level drift. If the output level changes by more than this amount, the *CAL? query returns an error and sets the calibration offset to 0 dB.

A successful recalibration is indicated by a query response of 0. The CAL FAILED event in the ALARM status register is set if the calibration fails.

The MBTS must be in STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Query: ***CAL?**{CR}{LF}
Response: **0**{CR}{LF}

Query: ***CAL?**{CR}{LF}
Response: **1**{CR}{LF}

Query Response Format:

**n**
*Where* **n** *is* **0** *for successful calibration,* **1** *for Sum level calibration error.*

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **INTERNAL** | BIT module communication failed. |
| **TIME OUT** | The command timed out. |

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

BIT communication errors will cause the *CAL? status to show “CAL FAILED.”

## *CALABOFFSET* - Calibration Offset from Output A to Output B

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALABOFFSET | | X | X | X | X | | X | X | |
| CALABOFFSET? | | | | | | | | | |

Syntax:

**CALABOFFSET n.nn** *Set new offset of Output Channel B relative to Output Channel A*
or
**CALABOFFSET?** *Return current offset of Output Channel B relative to Output Channel A*

Where:
**n.nn** offset power level setting of Channel B from Channel A , from +3.00 to –3.00 dB in 0.25 dB increments

Description:

The CALABOFFSET command sets a power level offset between the levels generated by Output Channel A and Output Channel B.

The calibration data stored by the CALSOTABLE and CALTGTTABLE commands is determined by the performance of Output Channel A. Output power level is adjusted by the value of the CALABOFFSET when Output Channel B is active.

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALABOFFSET 2.25;**{CR}{LF}

Command: **CALABOFFSET -3.00;**{CR}{LF}

Query: **CALABOFFSET?**{CR}{LF}
Response: **-3.00**{CR}{LF}

Query Response Format:

**n.nn**{CR}{LF}
*Where* **n.nn** *is the offset between Output A and Output B, from +3.00 to –3.00 dB.*

Default Value:

Loaded from FLASH ROM. Adjusted at factory as needed.

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |
| **WRITE PROTECT** | The FLASH RAM is write protected.. |

## *CALBITLVL* - Calibration of BIT RF Level Detector

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALBITLVL | | X | X | X | X | | X | X | |
| CALBITLVL? | | | | | | | | | |

Syntax:

**CALBITLVL s,0,0** *Set new A/D value for calibration of the output power level, from 0 to 4095.*
or
**CALBITLVL?** *Return current A/D calibration value*

Where:
**s** reference A/D value to use for the adjustment of the Sum Channel output signal level.

Description:

The CALBITLVL command sets the A/D value that is used as a comparative reference for signals detected and measured in the BIT Module during the calibration process. The signal level used to determine the reference CALBITLVL value is 0 dBm. The calibration process is invoked by the use of the *CAL? query.

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALBITLVL 3024,0,0;**{CR}{LF}

Command: **CALBITLVL 3125,0,0;**{CR}{LF}

Query: **CALBITLVL?**{CR}{LF}
Response: **1665,0,0**{CR}{LF}

Query Response Format:

**s,0,0**{CR}{LF}
*Where* **s** *is the A/D value measured in the BIT module necessary for the Sum channel to be at its reference power level.*

Default Value:

*Loaded from FLASH ROM as stored by the most recent CALBITLVL command.* Adjusted at factory as needed.

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.
**NOT POSSIBLE** The data could not be saved successfully to FLASH.
**WRITE PROTECT** The FLASH RAM is write protected.

## *CALPULSEPWR* - Calibration Pulse Power Offset

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALPULSEPWR | | X | X | X | X | | X | X | |
| CALPULSEPWR? | | | | | | | | | |

Syntax:

**`CALPULSEPWR n.nn`** *Set new offset for pulsed modes*
or
**`CALPULSEPWR?`** *Return current offset for pulsed modes*

Where:
**`n.nn`** offset from steady-state power level, from 0.00 to +4.00 dB in 0.25 dB increments

Description:

The CALPULSEPWR command sets a factor to compensate for differences between CW and pulsed output signal levels. This value is added to the target signal level and compensates for the effects of rise time limiting circuits found within the Reply Generator Module.

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **`CALPULSEPWR 2.25;`**{CR}{LF}

Command: **`CALPULSEPWR 3.00;`**{CR}{LF}

Query: **`CALPULSEPWR?`**{CR}{LF}
Response: **`3.00`**{CR}{LF}

Query Response Format:

**`n.nn`**{CR}{LF}
*Where* **`n.nn`** *is the offset between steady-state and pulsed modes, from 0.00 to +4.00 dB.*

Default Value:

Loaded from FLASH ROM. Adjusted at factory as needed.

Possible Error Conditions:

| | |
|---|---|
| **`PARAM CNT`** | The wrong number of parameters was supplied. |
| **`BAD PARAM`** | A supplied parameter is out of the acceptable range. |
| **`WRONG MODE`** | The command is not possible in the current mode. |
| **`NOT POSSIBLE`** | The data could not be saved successfully to FLASH. |
| **`WRITE PROTECT`** | The FLASH RAM is write protected.. |

## *CALSOTABLE* - Calibration Sum/Omni vs. Target Table

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALSOTABLE | | ✘ | ✘ | ✘ | ✘ | | ✘ | ✘ | |
| CALSOTABLE? | | | | | | | | | |

Syntax:

**`CALSOTABLE n.nn,n.nn,n.nn,... n.nn,n.nn`** *Set offset to Target attenuator values for each value of the Sum/Omni attenuator from +20 to -27 dB (48 entries).*

or

**`CALSOTABLE?`** *Returns the current sum/omni vs. target offset table*

Where:

**`n.nn`** power offset, from –2.00 to +2.00 dB in 0.25 dB steps

Description:

The CALSOTABLE command loads a new offset table that compensates the Target output level at all possible Sum/Omni output power ratio settings (+20 to -27 dB).

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **`CALSOTABLE,0.00,0.25,0.00,-0.25,0.50,0.00,0.00,`**
**`0.25,0.00,0.25,0.00,-0.25,-0.50,0.00,0.00,0.25,`**
**`0.00,0.25,0.00,-0.25,-0.50,0.00,0.00,0.25,0.00,`**
**`0.25,0.00,-0.25,-0.50,0.00,0.00,0.25,0.00,0.25,`**
**`0.00,-0.25,-0.50,0.00,0.00,0.25,,0.00,0.25,0.00,`**
**`-0.25,-0.50,0.00,0.00,0.25;`**{CR}{LF}

Query: **`CALSOTABLE?`**{CR}{LF}
Response: **`0.00,0.25,0.00,-0.25,-0.50,0.00,0.00,0.25,0.00,`**
**`0.25,0.00,-0.25,-0.50,0.00,0.00,0.25,0.00,0.25,`**
**`0.00,-0.25,-0.50,0.00,0.00,0.25,0.00,0.25,0.00,`**
**`-0.25,-0.50,0.00,0.00,0.25,0.00,0.25,0.00,-0.25,`**
**`-0.50,0.00,0.00,0.25,,0.00,0.25,0.00,-0.25,-0.50,`**
**`0.00,0.00,0.25`**{CR}{LF}

Query Response Format:

**`n.nn,n.nn,n.nn,... n.nn,n.nn`**{CR}{LF}
*Where* **`n.nn`** *is the offset to the Target attenuators, from –2.00 to +2.00 dB.*

Default Value:

Loaded from FLASH ROM. Adjusted at factory as needed.

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH |
| **WRITE PROTECT** | The FLASH RAM is write protected. |

## *CALSTS* – Return recalibration status

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALSTS? | | | | | | | | | |

Syntax:

**CALSTS?** *Returns the status of the calibration.*

Description:

The CALSTS? query returns the current status of the calibration, including whether or not the calibration was successful, the amount of offset applied to each output, and the temperature at the last calibration.

Examples:

Query: **CALSTS?**{CR}{LF}
Response: **0,-1.75,0,0,26**{CR}{LF}

Query: **CALSTS?**{CR}{LF}
Response: **1,0,0,0,28**{CR}{LF}

Query Response Format:

**sts,s.ss,o.oo,d.dd,t**
*Where:*
**sts** *is* **0** *for successful calibration, or* **1** *for failure.*
**s.ss** *is the current Sum offset in dB, from –4.00 to +4.00 dB in 0.25 dB steps*
**o.oo** *is the current Omni offset in dB*
**d.dd** *is the current Delta offset in dB*
**t** *is the temperate in degrees Celsius at the last calibration*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## *CALTEMPLIMIT* - Calibration Temperature Limit

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALTEMPLIMIT | | X | X | X | X | | X | X | |
| CALTEMPLIMIT? | | | | | | | | | |

Syntax:

**CALTEMPLIMIT n** *Set temperature limit*
or
**CALTEMPLIMIT?** *Return current temperature limit*

Where:
**n** temperature limit, from 1 to 100, in degrees Celsius

Description:

The CALTEMPLIMIT command sets the limit of the maximum temperature variation since the last RF power level calibration (see *CAL? query) before a "RECAL SUGGESTED" event is signaled via the SRQ. Temperature calibration (*CAL?) keeps MBTS output signal levels within specified limits, and is recommended when the "RECAL SUGGESTED" SRQ is asserted. .

Examples:

Command: **CALTEMPLIMIT 5;**{CR}{LF}

Command: **CALTEMPLIMIT 10;**{CR}{LF}

Query: **CALTEMPLIMIT?**{CR}{LF}
Response: **10**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the temperature change limit in degrees Celsius from 1 to 100.*

Default Value:

Loaded from FLASH ROM. Factory default is 3.

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**NOT POSSIBLE** The data could not be saved successfully to FLASH

## *CALTGTTABLE* - Calibration Table of Target vs. Absolute Output Power

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALTGTTABLE | | X | X | X | X | | X | X | |
| CALTGTTABLE? | | | | | | | | | |

Syntax:

**CALTGTTABLE n,n,n,... n,n** *Applies a Target attenuator value to each absolute output power level setting, from +10 to -85 dBm in 0.5 dB steps (191 entries). If no Target attenuator value is found that matches a power level setting within 0.5 dB , the closest attainable attenuator value, offset by a value of +1000, is used for the table entry.*

or

**CALTGTTABLE?** *Returns the current target vs. absolute power table*

Where:

**n** attenuator value, from 0 to 511, or 1000 to 1511 to indicate the closest uncalibrated value.

Description:

The CALTGTTABLE command loads a table that applies a Target attenuator value to each absolute power level, +10 to -85 dBm in 0.5 dB steps (191 entries). This table compensates for inaccuracies or non-linearity in the Target attenuator. . The first value corresponds to a target level of +10.0 dBm, and the last value corresponds to a target level of –85.0 dBm.

Because the Target attenuator uses two 32dB attenuators instead of a 32dB and a 64dB attenuator valid Target attenuator values range from 0 to 255, and then 384 to 511, instead of from the expected range of from 0 to 384. Values from 256 to 383 are accepted but produce the same output power levels as values from 128 to 255.

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALTGTTABLE 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20,**
**22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50,**
**52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80,**
**82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110,**
**112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140,**
**142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170,**
**172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200,**
**202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230,**
**232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 384, 386, 388,**
**390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418,**
**420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448,**
**450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478,**
**480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508**
{CR}{LF}

Query: **CALSOTABLE?**{CR}{LF}

Response:

**0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110,112,114,116,118,120,122,124,126,128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,180,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230,232,234,236,238,240,242,244,246,248,250,252,254,384,386,388,390,392,394,396,398,400,402,404,406,408,410,412,414,416,418,420,422,424,426,428,430,432,434,436,438,440,442,444,446,448,450,452,454,456,458,460,462,464,466,468,470,472,474,476,478,480,482,484,486,488,490,492,494,496,498,500,502,504,506,508**
{CR}{LF}

Query Response Format:

**n,n,n,... n,n**{CR}{LF}
*Where* **n** *is the Target attenuator value, from 0 to 511.*

Default Value:

Loaded from FLASH ROM. Adjusted at factory as needed.

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |
| **WRITE PROTECT** | The FLASH RAM is write protected. |

## *CALUCATTEN* - Calibration Up Converter Attenuators

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CALUCATTEN | | X | X | X | X | | X | X | |
| CALUCATTEN? | | | | | | | | | |

Syntax:

**CALUCATTEN p,s.s,o.o,d.d** — *Sets Upconverter attenuator values for output* **p** *to* **s.s** *dB for the Sum Up Converter,* **o.o** *dB for the Omni Up Converter, and* **d.d** *dB for the Delta Up Converter.*

or

**CALUCATTEN?** — *Return current up converter attenuator defaults*

Where:

- **p** is the output Channel, either **A** or **B**
- **s.s** is the Sum Upconverter attenuator value, from 0 to 15.5 dB in 0.5 dB steps
- **o.o** is the Omni Upconverter attenuator value, from 0 to 15.5 dB in 0.5 dB steps
- **d.d** is the Delta Upconverter attenuator value, from 0 to 15.5 dB in 0.5 dB steps

Description:

The CALUCATTEN command sets the level of signal attenuation within each Upconverter (Sum, Omni, and Delta) Module. These values can be specified individually for either output Channel A or B.

The MBTS must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALUCATTEN A,7.0,6.5,8.0;**{CR}{LF}

Command: **CALUCATTEN B,4.5,5.0,4.5;**{CR}{LF}

Query: **CALUCATTEN?**{CR}{LF}
Response: **A,7.0,6.5,8.0,B,4.5,5.0,4.5**{CR}{LF}

Query Response Format:

**A,s.s,o.o,d.d,B,s.s,o.o,d.d** {CR}{LF}
*Where* **s.s** *is the Sum Up Converter default attenuator value, from 0 to 15.5 dB in 0.5 dB steps;* **o.o** *is the Omni Up Converter default attenuator value, from 0 to 15.5 dB in 0.5 dB steps;* **d.d** *is the Delta Up Converter default attenuator value, from 0 to 15.5 dB in 0.5 dB steps.*

Default Value:

Loaded from FLASH ROM. Adjusted at factory as needed.

Possible Error Conditions:

- **PARAM CNT** The wrong number of parameters was supplied.
- **BAD PARAM** A supplied parameter is out of the acceptable range.
- **WRONG MODE** The command is not possible in the current mode.
- **NOT POSSIBLE** The data could not be saved successfully to FLASH.
- **WRITE PROTECT** The FLASH RAM is write protected.

## **CLS* - Clear Status Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *CLS | | | | | | | | | |

Syntax:

***CLS** *Clears the status registers.*

Description:

The CLS command clears SRQ/RQS bits and other error condition flags in the PLL, ALARM, *ESR, CMDSTS and INTERR registers.

**THIS COMMAND SHOULD BE USED WITH EXTREME CAUTION!** It clears all the events in each register. A better solution is to issue the PLL?, ALARM?, *ESR?, CMDSTS?, and INTERR? queries to read and clear each register.

Example:

Command: ***CLS**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## *CMDSTS* – Return Command Status (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CMDSTS? | | | | | | | | | |

Syntax:

**CMDSTS?** *Returns the current contents of the Command Status register.*

Description:

The CMDSTS query returns the current state of the command status register. The register is cleared by a query except for the AMP Conflict and TRIG Conflict entries. This register contains events for all command errors that have occurred since the last time the command status register was read or the most recent *CLS command. The Trig Conflict alert is issued when the Range and Internal Trigger rate settings are incompatible. The Amplitude Conflict alert is created when the selected Sum power level cannot support a chosen D/S ratio or S/O ratio.

Examples:

Query: **CMDSTS?**{CR}{LF}
Response: **0**{CR}{LF}

Query: **CMDSTS?**{CR}{LF}
Response: **32**{CR}{LF}

Query Response Format:

**n**
*Where* **n** *is in the range* **0** *to* **1023**. *The values are encoded as follows:*

| | | |
|---|---|---|
| **512** | **TRIG CONFLICT** | *Internal trigger rate incompatible with Range setting* |
| **256** | **AMP CONFLICT** | *S/O or D/S ratio setting not compatible with Sum level setting* |
| **128** | **OPTION CONFLICT** | *Attempt to enter AZ mode while internal trigger selected.* |
| **64** | **WRITE PROTECT** | *Calibrate data command issued while Write Protect DIP switch was set.* |
| **32** | **TIME OUT** | *Command has timed out* |
| **16** | **NOT POSSIBLE** | *Command is not possible, i.e. setting requested cannot be achieved because of other settings made, etc.* |
| **8** | **WRONG MODE** | *Command was issued while we were not in a compatible mode, i.e. Debug command while not in Debug mode, etc.* |
| **4** | **BAD PARAM** | *Parameter is outside of the acceptable range for that parameter.* |
| **2** | **PARAM CNT** | *Wrong number of parameters supplied for command* |
| **1** | **NO COMMAND** | *Command is not recognized.* |

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Cleared by *CLS.

## *CODE* - Reply Code

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| CODE | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| CODE? | | | | | | | | | |

Syntax:

**`CODE m,c,f1,f2,x,spi,id`** *Set reply code for given reply type*
or
**`CODE?`** *Return current reply code settings*

Where:

**`m`** Reply mode, as follows:
- **`3`** - Mode 3/A reply
- **`2`** - Mode 2 reply
- **`B`** - Mode B reply
- **`C`** - Mode C reply
- **`S`** - Mode S All-Call reply
- **`SA`** - Mode S Altitude (altitude reply)

**`c`** Code value, the format depends on the mode as follows:
- **`3`**, **`2`**, **`B`**, **`C`** - 0000 to 7777 (octal, see bit ordering below)
- **`S`** - 000000 to FFFFFF (hexadecimal) Aircraft Address (AA) code
- **`SA`** - 0000 to FFFF (hexadecimal) 25' altitude and aircraft status information – see below

**`f1`** Generate F1 pulse, **`0`**=no, **`1`**=yes (not used for Mode-S and must be 0)
**`f2`** Generate F2 pulse, **`0`**=no, **`1`**=yes (not used for Mode-S and must be 0)
**`x`** Generate x pulse, **`0`**=no, **`1`**=yes (not used for Modes-S and SA and must be 0)
**`spi`** Generate SPI pulse, **`0`**=no, **`1`**=yes (used for all modes except Mode-S must be 0)
**`id`** for Mode SA: this bit used to set the Aircraft Status value 0 = Airborne 1 = On Ground
for Mode 3/A: this bit manually controls the Alert bit in Mode S replies; 0 = OFF, 1 = ON. The Alert signal controlled through this means is set until cleared by another Mode 3/A command.
For all other modes: must be set to **0**

NOTE: The Mode S Roll Call ID information, used in a Mode S identity reply (DF=5), is the same as the Mode 3/A code entry. The MBTS responds to changes to the Mode 3/A code value by setting the Alert bit in Mode S responses for a period of 18 seconds. The MBTS does not automatically set a permanent Alert bit when ID values of 7500, 7600, or 7700 are loaded. Use the id bit in the Mode 3/A CODE command to perform this function.

The "SA" option must be used to enter Mode S Roll Call altitude information. Mode SA and Mode C altitude values should be loaded concurrently to keep Mode S and ATCRBS altitude reply information compatible. If non-valid Mode C altitude gray code values are loaded the 25 foot encoded Mode S altitude value should be set to –1000 feet.

Description:

The CODE command sets the reply code contents for the various possible reply codes. These codes are used in both the ring-reply and the azimuth-gated reply modes. In azimuth-reply mode, the Mode S All-Call (AA) code value applies to the first target. This is incremented by one for each additional Mode-S target in an antenna revolution.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Bit Order:

For Mode C replies, the code value is the gray coded altitude data. For all ATCRBS replies, the MBTS re-orders the code bits as described in International Civil Aviation Organization (ICOA) Annex 10, *Volume IV – Surveillance Radar and Collision Avoidance Systems* and FAA document 1010.51A, *U.S. National Aviation Standard for the IFF Mark X (SIF)/Air Traffic Control Radar Beacon System Characteristics*. The code value is a four-digit octal number, with each octal digit containing three bits. The digits are labeled "A" through "D" from left to right (the left-most digit is "A"). The bits within each digit are labeled "1", "2" or "4", corresponding to the bit position within the digit (bit "1" is the least-significant bit and bit "4" is the most-significant). During the reply, the code bits are sent in the following order:

C1 A1 C2 A2 C4 A4 X(**) B1 D1 B2 D2 B4 D4

Where C1 is the first data bit following the F1 framing pulse. The "**" indicates a bit controlled by the "x" parameter in the CODE command. Using the examples from Section 2.6.6.1 of FAA document 1010.51A (referenced above), here are example translations to the required Code command format:

| ATCRBS Code value (octal) | Bits Set | Reply bit order |
|---|---|---|
| 3600 | A1, A2, B2, B4 | f1 0 1 0 1 0 0 x 0 0 1 0 1 0 f2 spi |
| 2057 | A2, C1, C4, D1, D2, D4 | f1 1 0 0 1 1 0 x 0 1 0 1 0 1 f2 spi |
| 0301 | B1, B2, D1 | f1 0 0 0 0 0 0 x 1 1 1 0 0 0 f2 spi |

For Mode S replies, in MBTS System Revision level F and subsequent revisions, Mode S Roll Call is implemented. This includes the ability to generate surveillance altitude (DF=4) and identity (DF=5) replies. Identity (ID field) information is taken directly from the Mode 3/A code entry. 25' and 100'altitude information must be entered, as defined below, through the use of the "SA" command option. The "SA" option also includes the ability to activate the use of a non-timed SPI bit and to set the aircraft Airborne or On Ground condition. A metric altitude encoding control setting is defined but is not implemented.
Mode "S" command entry is unaltered from previous software versions.

Mode "SA" - The code value is a 4 digit hex number (code value = 0000 to 1FFF).
For 100 foot altitude encoding the data format is similar to that of a Mode C ATCRBS reply and the following bit order applies:

[0, 0, 0, C1] [A1 C2, A2 C4] [A4, M, B1, Q] [B2, D2, B4, D4]

M sets metric encoding (not implemented), always set to 0
Q sets 25' altitude encoding, 0= 100' encoding, 1= 25' encoding

For 25 foot altitude encoding the data format is as following:

[0, 0, 0, X] [X X, X X] [X, M, X, Q] [X, X, X, X]

X is the binary equivalent of the altitude (-1,000' to +50,175')
M sets metric encoding, always set to 0
Q sets 25' altitude encoding, 0= 100' encoding, 1= 25' encoding

Altitude limits are –1,000 feet (code value = [0000][0000][000Q][0000]) and +50,175 feet (code value = [0001][1111][101Q][1111]).

The "SA" altitude entry should be closely linked with the Mode C code entry. The MBTS does not link altitude entries through these commands.

The SPI bit of the "SA" command option sets or clears the SPI bit in the Mode S reply. The SPI bit in the "S" option is non-functional and should always be set to 0.

For more information on altitude encoding see section 2.2.13.1.2 of RTCA/DO-181C (MOPS for ATCRBS/Mode S Airborne Equipment).

Examples:

Command: **CODE 2,2417,1,1,0,1,0;**{CR}{LF}

Command: **CODE C,2057,1,1,0,0,0;**{CR}{LF}

Command: **CODE S,15C24F,0,0,0,0,0;**{CR}{LF}

Query: **CODE?**{CR}{LF}
Response: **3,5442,1,1,0,0,0,2,2417,1,1,0,1,0,B,3254,1,1,0,0,0,**
**C,2057,1,1,0,0,0,S,15C24F,0,0,0,0,0**{CR}{LF}

Query Response Format:

**3,c,f1,f2,x,spi,id,2,c,f1,f2,x,spi,id,B,c,f1,f2,x,spi,id,**
**C,c,f1,f2,x,spi,id,S,c,f1,f2,x,spi,id**{CR}{LF}
*Where a complete set of data is returned for each of the five modes, in the order Mode 3, Mode 2, Mode B, Mode C, and Mode S.*

Default Value:

Mode **3, c=0000, f1=1, f2=1, x=0, spi=0, id=0**
Mode **2, c=0000, f1=1, f2=1, x=0, spi=0, id=0**
Mode **B, c=0000, f1=1, f2=1, x=0, spi=0, id=0**
Mode **C, c=0000, f1=1, f2=1, x=0, spi=0, id=0**
Mode **S, c=000000, f1=0, f2=0, x=0, spi=0, id=0**
Mode **SA, c=0000, f1=0, f2=0, x=0, spi=0, id=0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *DIPSW* – Get Current State of DIP Switches

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| DIPSW? | | | | | | | | | ✘ |

Syntax:

**DIPSW?** *Return the current DIP Switch settings*

Description:

The DIPSW? Query returns the current value of the DIP switches on the PCC module of the MBTS.

Examples:

Query: **DIPSW?**{CR}{LF}
Response: **208**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the current value of the DIP switches, from 0 to 255.*
*These values are encoded as follows:*

| | | |
|---|---|---|
| **128** | **USER3** | |
| **64** | **USER2** | |
| **32** | **USER1** | *CAL Flash Write Protect* |
| **16** | **ADDRESS5** | *IEEE-488 Address bit 5* |
| **8** | **ADDRESS4** | *IEEE-488 Address bit 4* |
| **4** | **ADDRESS3** | *IEEE-488 Address bit 3* |
| **2** | **ADDRESS2** | *IEEE-488 Address bit 2* |
| **1** | **ADDRESS1** | *IEEE-488 Address bit 1* |

*The USER2 and USER3 entries are encoded as follows:*

| **USER3** | **USER2** | |
|---|---|---|
| **0** | **0** | *Normal boot sequence* |
| **0** | **1** | *Force Flash Download from aux serial port* |
| **1** | **0** | *Ignore user code and attempt factory code.* |
| **1** | **1** | *Force factory code at 0x8000 to run, ignoring errors.* |

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## **ESE* – Events Status Enable

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *ESE | | | | | | | | | |
| *ESE? | | | | | | | | | |

Syntax:

***ESE n** *Set the Events Status Enable register to* **n**
or
***ESE?** *Return the current Events Status Enable register value*

Where:
**n** is Events Status Enable register value, from 0 to 255

Description:

The *ESE command controls which bits in the Events Status Register are allowed to set the ESB bit in the *STB register. A one in a corresponding bit position means that bit in the ESR can cause the ESB bit in *STB to be set; a zero means that the event bit will be set in the ESR but will not cause the ESB bit to be set.

To have the ESB bit in *STB generate an SRQ, set the corresponding bit in the *SRE register.

Examples:

Command: ***ESE 192;**{CR}{LF}

Command: ***ESE 0;**{CR}{LF}

Query: ***ESE?**{CR}{LF}
Response: **208**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the Events Status Enable register value, from 0 to 255.*

Default Value:

**0** *(all disabled)*

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## **ESR* – Events Status Register (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *ESR? | | | | | | | | | |

Syntax:

***ESR?** *Return the current Events Status Register value*

Description:

The *ESR query returns the current value of the Events Status Register and clears it. This register contains events that have occurred since the last time the Events Status register was read or since the most recent *CLS command.

Example:

Query: ***ESR?;**{CR}{LF}
Response: **100**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the Events Status Enable register value, from 0 to 255. The values are encoded as follows:*

| | | |
|---|---|---|
| **128** | **PON** | *Power-on. This event is set upon power-on.* |
| **64** | **USER REQ** | *User Request. This event is set if the MBTS starts or stops operation or if Alert or Lockout events are active (flags in OP).* |
| **32** | **CMD ERROR** | *Command Error. This flag is set if the NO COMMAND flag is set in CMDSTS.* |
| **16** | **EXEC ERROR** | *Execution Error. This flag is set if the PARAM CNT or BAD PARAM flags are set in CMDSTS.* |
| **8** | **DEV ERROR** | *Device Error. This flag is set if the WRONG MODE, NOT POSSIBLE, TIMEOUT, WRITE PROTECT, OPTION CONFLICT, AMP CONFLICT,or TRIG CONFLICT flags are set in CMDSTS.* |
| **4** | **QUERY ERROR** | *Query Error. Not used by the MBTS.* |
| **2** | **REQ CONTROL** | *Request Control. Not used by the MBTS.* |
| **1** | **OP COMPLETE** | *Operation Complete. Set by the *OPC command.* |

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Cleared by *CLS. Part of the IEEE-488.2-1992 Command Set.

## *EXTTRIGDLY* – External Trigger Delay

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| EXTTRIGDLY | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| EXTTRIGDLY? | | | | | | | | | |

Syntax:

**EXTTRIGDLY n** *Set external trigger delay to n*
or
**EXTTRIGDLY?** *Return current external trigger delay*

Where:

**n** Amount of external trigger delay in units of 62.5 ns, from 0 to 48000 (0 to 3.0 ms), where 0 corresponds to a minimum possible delay of 500nS from external trigger in to external trigger out (±25nS).

Description:

The EXTTRIGDLY command sets the delay between the external trigger signal and the ISI signaling the RGC for a reply.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **EXTTRIGDLY 100;**{CR}{LF}

Command: **EXTTRIGDLY 32172;**{CR}{LF}

Query: **EXTTRIGDLY?**{CR}{LF}
Response: **2080**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the external trigger delay, in units of 62.5 ns.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *FACTORYCAL* – Restore Calibration Data from Factory FLASH Memory Area

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| FACTORYCAL | | ✘ | ✘ | ✘ | ✘ | | ✘ | ✘ | |

Syntax:

**FACTORYCAL** *Restore Calibration data from Factory FLASH calibration data area*

Description:

The FACTORYCAL command copies the calibration data currently in the Factory calibration data area into the User calibration data area.

The Factory calibration data area provides a "safe" copy of the calibration data to use in case the "user" area becomes corrupted or is set to an undesirable state. If the user area fails its integrity check, the MBTS uses the Factory data.

This command is only available in STANDBY or CAL mode (see the MODE command).

Examples:

Command: **FACTORYCAL;**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |
| **WRITE PROTECT** | The FLASH RAM is write protected. |

## *FLASH* – Download Program to FLASH Memory

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| FLASH | | X | X | X | X | X | X | | |

Syntax:

**`FLASH program xyzzy`** *Start FLASH program mode*

Description:

The FLASH command starts the PCC in Flash Program Download mode. In this mode the PCC module communicates using a serial program download protocol.

This command is only available in STANDBY mode (see the MODE command).

This command is not available on the IEEE-488 port. It is only available on the two serial ports.

NOTE: After accepting the FLASH command, the PCC stops processing commands on both serial ports and the IEEE-488 port.

Examples:

Command: **`FLASH program xyzzy;`**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **`PARAM CNT`** | The wrong number of parameters was supplied. |
| **`BAD PARAM`** | A supplied parameter is out of the acceptable range. |
| **`WRONG MODE`** | The command is not possible in the current mode. |
| **`NOT POSSIBLE`** | The data could not be saved successfully to FLASH. |

## *FLASHCAL* – Transfer Calibration Data to Factory FLASH Memory Area

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| FLASHCAL | | X | X | X | X | | X | X | |

Syntax:

**FLASHCAL** *Copy Calibration data into Factory FLASH calibration data area*

Description:

The FLASHCAL command copies the calibration data currently in the User calibration data area into the Factory calibration data area.

The Factory calibration data area provides a "safe" copy of the calibration data to use in case the "user" area becomes corrupted. When the user area fails its integrity check, the MBTS uses the Factory data.

This command is only available in STANDBY or CAL mode (see the MODE command).

Examples:

Command: **FLASHCAL;**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |
| **NOT POSSIBLE** | The data could not be saved successfully to FLASH. |
| **WRITE PROTECT** | The FLASH RAM is write protected. |

## **IDN* – Identification Query

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *IDN? | | | | | | | | | |

Syntax:

**`*IDN?`** *Return the Identification string for the MBTS.*

Description:

The *IDN query returns the identification string for the MBTS, in accordance with the IEEE-488.2-1992 Command Set. The identification string includes Manufacturer, Model, Serial Number, and Firmware Level. The MBTS always returns a serial number of zero.

If the Xilinx Load fails, the MBTS returns 0 for all FPGA and BIT versions.

Example:

Query: **`*IDN?`**{CR}{LF}
Response: **`FREESTATE ELECTRONICS INC,FS-1210,0,1.20-1-2-1-1.10-3`**{CR}{LF}

Query Response Format:

**`FREESTATE ELECTRONICS INC,FS-1210,0,p.pp-c-i-r-b.bb-f`** {CR}{LF}
*The values are encoded as follows:*

- **`p.pp`** is the PCC firmware version
- **`c`** is the PCC CPU FPGA version
- **`i`** is the PCC ISI FPGA version
- **`r`** is the PCC RGC FPGA version
- **`b.bb`** is the B.I.T. Controller firmware version
- **`f`** is the B.I.T FPGA version

Default Value:

N/A

Possible Error Conditions:

**`PARAM CNT`** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## *IDRFREQ* – Set Interrogator Frequency

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| IDRFREQ | | | | | | | | | ✘ |
| IDRFREQ? | | | | | | | | | |

Syntax:

**`IDRFREQ nnnn.n`** *Set IDR input frequency*
or
**`IDRFREQ?`** *Return current IDR input frequency*

Where:
**`nnnn.n`** Input frequency, in MHz, from 1020.0 to 1040.0 in 0.2 MHz steps

Description:

The IDRFREQ command sets the IDR input frequency.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`IDRFREQ 1030.4;`**{CR}{LF}

Command: **`IDRFREQ 1021.0;`**{CR}{LF}

Query: **`IDRFREQ?`**{CR}{LF}
Response: **`1021.0`**{CR}{LF}

Query Response Format:

**`nnnn.n`**{CR}{LF}
*Where* **`nnnn.n`** *is the input frequency in MHz.*

Default Value:

**`1030.0`**

Possible Error Conditions:

**`PARAM CNT`** The wrong number of parameters was supplied.
**`BAD PARAM`** A supplied parameter is out of the acceptable range.

## *IDRSRC* - Set Interrogation Source

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| IDRSRC | | | | | | | | | ✘ |
| IDRSRC? | | | | | | | | | |

Syntax:

**IDRSRC n** *Selects interrogation signal source*
or
**IDRSRC?** *Return current interrogation signal source*

Where:
**n** Interrogation source, as follows:
**INA** - Channel A input
**INB** - Channel B input
**SUMA** - SUM Channel input A
**SUMB** - SUM Channel input B
**BIT** - BIT module

Description:

The IDRSRC command determines the source used in interrogation decoding (see also the TRIG command).

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **IDRSRC INA;**{CR}{LF}

Command: **IDRSRC SUMA;**{CR}{LF}

Command: **IDRSRC BIT;**{CR}{LF}

Query: **IDRSRC?**{CR}{LF}
Response: **BIT**{CR}{LF}

Query Response Format:

**n**
*Where* **n** *is* **INA**, **INB**, **SUMA**, **SUMB** *or* **BIT**.

Default Value:

"**INA**"

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *INTERR* – Internal Error Events Register (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| INTERR? | | | | | | | | | |

Syntax:

**INTERR?** *Return the current Internal Error Events Register value*

Description:

The INTERR query returns the current value of the Internal Error Events Register and clears it. This register contains events that have occurred since the last time the Internal Error Events register was read or the most recent *CLS command (except for XILINX LOAD FAIL, which is permanent until PCC reset). These errors are errors detected during power-up testing, or by running the *TST command.

Example:

Query: **INTERR?**{CR}{LF}
Response: **-21442**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the Internal Error Events register value, from –32768 to 32767. The values are encoded as follows:*

| | | |
|---|---|---|
| **sign** | **PROG ROM BAD** | *An error was detected in the downloadable User Program (FLASH) ROM. (Does not check Factory Program area).* |
| **16384** | **CAL FLASH BAD** | *The User Calibration Constants area of the FLASH ROM does not pass its checksum test.* |
| **8192** | **XILINX BAD** | *An error was detected in the downloadable User Xilinx FPGA data area. (Does not check Factory Xilinx FPGA area).* |
| **4096** | **BER INTEROG FAIL** | *The Bit Error Rate Test failed on the Interrogation side.* |
| **2048** | **BER REPLY FAIL** | *The Bit Error Rate Test failed on the Reply side (reserved for future use).* |
| **1024** | **CAL FACTORY BAD** | *An error was detected in the Factory Calibration Constants area of the FLASH ROM.* |
| **512** | **XILINX LOAD FAILED** | *The PCC was unable to successfully download a Xilinx pattern (either both copies of the Xilinx FPGA data areas in the FLASH ROM are corrupt, or there is an FPGA hardware problem).* |
| **256** | **PAM ATTEN FAILED** | *The PAM control attenuator failed self-test.* |
| **128** | **PHASE MOD FAILED** | *The Phase modulator failed self-test.* |
| **64** | **ADS ATTEN FAILED** | *The Aux Delta/Sum attenuator failed self-test.* |
| **32** | **DS ATTEN FAILED** | *The Delta/Sum attenuator failed self-test.* |
| **16** | **SO ATTEN FAILED** | *The Sum/Omni attenuator failed self-test.* |
| **8** | **TGT ATTEN FAILED** | *The Target attenuator failed self-test.* |
| **4** | **SUP ATTEN FAILED** | *The Sum Up Converter attenuator failed self-test.* |
| **2** | **OUP ATTEN FAILED** | *The Omni Up Converter attenuator failed self-test.* |
| **1** | **DUP ATTEN FAILED** | *The Delta Up Converter attenuator failed self-test.* |

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## *INTSID* - Mode S Interrogator ID

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| INTSID | ▼ | | | ▼ | ▼ | ▼ | ▼ | | ✘ |
| INTSID? | | | | | | | | | |

Syntax:

**INTSID n** *Set Mode S interrogator ID*
or
**INTSID?** *Return current Mode S interrogator ID*

Where:
**n** Interrogator ID, from 0 to 63.

Description:

The INTSID command sets the Mode S interrogator ID that is used in all modes in which it is not determined by the demodulated interrogation data, i.e. in INTernal or EXTernal trigger modes, the ID specified by INTSID provides the ID of the interrogator. Values greater than 15 automatically set the PR and CL fields in the Mode S reply.

Examples:

Command: **INTSID 2;**{CR}{LF}

Command: **INTSID 15;**{CR}{LF}

Command: **INTSID 4;**{CR}{LF}

Query: **INTSID?**{CR}{LF}
Response: **3**{CR}{LF}

Query Response Format:

**m** {CR}{LF}
*Where* **m** *is the interrogator ID for Mode S.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *INTTRIGPRF* - Internal Trigger Pulse Repetition Frequency

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| INTTRIGPRF | ▼ | | ▼ | | ▼ | ▼ | ▼ | | ✘ |
| INTTRIGPRF? | | | | | | | | | |

Syntax:

**`INTTRIGPRF n`** *Sets internal trigger pulse repetition frequency*
or
**`INTTRIGPRF?`** *Return current internal trigger pulse repetition frequency*

Where:
**`n`** Trigger frequency in Hz, 10 to 1000 in 5 Hz steps

Description:

The INTTRIGPRF command sets the internal trigger repetition rate.

Examples:

Command: **`INTTRIGPRF 500;`**{CR}{LF}

Command: **`INTTRIGPRF 725;`**{CR}{LF}

Query: **`INTTRIGPRF?`**{CR}{LF}
Response: **`725`**{CR}{LF}

Query Response Format:

**`n`**
*Where* **`n`** *is the trigger repetition rate in Hz, from 10 to 1000.*

Default Value:

**`10`**

Possible Error Conditions:

**`PARAM CNT`** The wrong number of parameters was supplied.
**`BAD PARAM`** A supplied parameter is out of the acceptable range.

## *INTTYPE* – Set Interrogation Type

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| INTTYPE | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| INTTYPE? | | | | | | | | | |

Syntax:

**INTTYPE m** *Set interrogation type*
or
**INTTYPE?** *Return current interrogation type settings*

Where:
**m** Interrogation type, as follows:
- **3** - Mode 3/A
- **2** - Mode 2
- **B** - Mode B
- **C** - Mode C
- **S** - Mode S All Call
- **SA** - Mode S Altitude
- **SI** - Mode S Identity

Description:

The INTTYPE command sets the reply type for all modes in which it is not determined by the data, i.e. in INTernal or EXTernal trigger modes, the type specified by INTTYPE determines the type of interrogation. When triggering is from RF or Mode Pair signals the interrogation type is determined from the received interrogation..

Examples:

Command: **INTTYPE 2;**{CR}{LF}

Command: **INTTYPE C;**{CR}{LF}

Command: **INTTYPE S;**{CR}{LF}

Query: **INTTYPE?**{CR}{LF}
Response: **3**{CR}{LF}

Query Response Format:

**m** {CR}{LF}
*Where* **m** *is the interrogation mode.*

Default Value:

Mode **2**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *MANLVL* – Set RF Output signal levels

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| MANLVL | ▼ | | | | | | | | ✘ |
| MANLVL? | | | | | | | | | |

Syntax:

**`MANLVL n,m.mm`** *Sets power level of Output n to m.mm*
or
**`MANLVL?`** *Return current setting of all Outputs*

Where:

**`n`** is Output, **`T`** for Target (Sum) power level, **`S`** for Sum/Omni ratio, **`D`** for Delta/Sum ratio.

**`m`** Power level, +10.0 to –85.0 dBm in 0.5 dB steps for Target; +20.0 to –27 dB in 1 dB steps for Sum/Omni; +12.00 to –42.00 dB in 0.25 dB steps for Delta/Sum

Description:

The MANLVL command sets the signal level for the Target (Sum) output, the Sum/Omni ratio, and the Delta/Sum ratio. Sum and Sum/Omni ratio settings are applicable to all operational modes. Delta/Sum settings are applicable only when the MBTS is not operating in Azimuth-gated mode. In this case the D/S ratio is automatically calculated from the antenna table selected for use (see the ANT command).

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`MANLVL T,42.5;`**{CR}{LF}

Command: **`MANLVL D,22.25;`**{CR}{LF}

Query: **`MANLVL?`**{CR}{LF}
Response: **`T,42.5,S,8,D,22.25`**{CR}{LF}

Query Response Format:

**T,t.t,S,s,D,d.dd**{CR}{LF}
*where* **t.t**, **s**, *and* **d.dd** *are the Target, Sum/Omni, and Delta/Sum power levels, respectively.*

Default Value:

**T,0.0,S,20,D,0.00**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **NOT POSSIBLE** | The device cannot achieve the request outputs. |

## *MANPHASE* – Manual Output Phase

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| MANPHASE | ▼ | | | | | | | | ✘ |
| MANPHASE? | | | | | | | | | |

Syntax:

**MANPHASE n** *Set output phase*
or
**MANPHASE?** *Return current output phase*

Where:
**n** Output phase, either 0 or 180 degrees

Description:

The MANPHASE command sets the phase relationship of the Sum and Delta outputs. When in the Azimuth gated mode the selected antenna pattern automatically sets the phase relationship of the Sum and Delta outputs (see the ANT command).

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **MANPHASE 0;**{CR}{LF}

Command: **MANPHASE 180;**{CR}{LF}

Query: **MANPHASE?**{CR}{LF}
Response: **180**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the phase, either 0 or 180 degrees.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *MODE* – MBTS Mode

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| MODE | | | | | | | | | ✘ |
| MODE? | | | | | | | | | |

Syntax:

**`MODE n`** *Set mode*
or
**`MODE?`** *Return current mode*

Where:

| | | |
|---|---|---|
| **`n`** | **`STANDBY`** | - Disable interrogation replies, route outputs to dummy load and BIT module |
| | **`RING`** | - Enter "ring reply" mode |
| | **`AZ`** | - Enter "azimuth-gated" reply mode |
| | **`BORESIGHT`** | - Enter Boresight calibration mode |
| | **`CW`** | - Enter CW Reference Output mode |
| | **`CAL`** | - Enter Calibration mode |
| | **`REF`** | - Enter Reference (1060 MHz) mode |

Description:

The MODE command sets the current MBTS operational mode.

Changing operational modes disables all outputs (they are switched to the BIT setting). An OUTPUTSELECT command must be issued to route signals to an output interface.

The MBTS uses the following default settings whenever it enters each of the following modes:

STANDBY
- Outputselect to BIT
- Disable reply generation
- Reference output disabled
- Issue a “STOP OP”

RING
- Reply frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Enable reply generation
- Reference output disabled
- Attenuators and target tables reloaded with current information

AZ
- Reply frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Enable reply generation (after “first target”)
- Reference output disabled
- Issue a “STOP OP”, then “START OP” on northmark
- Attenuators and target tables reloaded with current information

BORESIGHT
- Reply frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Enable reply generation (after "first target")
- Reference output disabled
- Issue a "STOP OP", then "START OP" on northmark
- Attenuators and target tables reloaded with BORESIGHT-specific data

CW
- Disable replies
- Reply frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Phase output set to MANPHASE setting
- PAM output enabled
- Reference output disabled
- Issue a "STOP OP"
- Attenuators reloaded with current information

CAL
- Disable replies
- Reply frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Phase output set to MANPHASE setting
- Reference output disabled
- Issue a "STOP OP"
- Attenuators reloaded with current information

REF
- Disable replies
- Reference frequency set to 1060 MHz.
- Outputselect to BIT
- Reference output enabled
- Issue a "STOP OP"
- Attenuators reloaded with current information

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **MODE STANDBY;**{CR}{LF}

Command: **MODE RING;**{CR}{LF}

Command: **MODE AZ;**{CR}{LF}

Query: **MODE?**{CR}{LF}
Response: **RING**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is* **STANDBY**, **AZ**, **RING**, **BORESIGHT**, **CW**, *or* **CAL**.

Default Value:

**STANDBY**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **OPTION CONFLICT** | Change to AZ mode attempted while in internal trigger mode. |

## *OP* – Return Operational Status (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| OP? | | | | | | | | | |

Syntax:

**OP?** *Returns the latched and current operational status.*

Description:

The OP query returns the current operational state of the MBTS, as well as latch history about any past states since the OP command was last issued. Reading this register clears the latched values.

Examples:

Query: **OP?**{CR}{LF}
Response: **4,STARTED**{CR}{LF}

Query: **OP?**{CR}{LF}
Response: **7,STOPPED**{CR}{LF}

Query Response Format:

**n,m**
*Where* **n** *is in the range* **1** *to* **31**. *The values are encoded as follows:*

| | | |
|---|---|---|
| *16* | *ALERT* | *Mode S alert signal is active (alert set by change in Mode S ID field, timed for 18 seconds)* |
| *8* | *LOCKOUT* | *Mode S reply lockout active on at least 1 target (lockout set by interrogator, timed for18 seconds)* |
| **4** | **STOP OP** | *Set when the MBTS stops generating replies.* |
| **2** | **SUSPEND** | *Set when the MBTS is suspended waiting for Northmark* |
| **1** | **START OP** | *Set when the MBTS starts operation, i.e. commences sending replies.* |

*Where* **m** *is the current operational state, either* **STARTED**, **SUSPENDED**, *or* **STOPPED**. *The text message is not affected by the value of the upper two data bits.*

Default Value:

**4,STOPPED**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## **OPC* – Operation Complete Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *OPC? | | | | | | | | | |

Syntax:

***OPC** *Set the Operation Complete event in the Event Status Register (ESR).*
or
***OPC?** *Return the Operation Complete flag*

Description:

The *OPC command causes the Operation Complete event to be set in the Event Status Register. If the enable masks are set appropriately, this can cause an SRQ. This command could be used to signal the processor when a lengthy series of commands has completed execution.

For example:

```
MODE CAL;*SRE 32;*ESE 1;CALTGTTABLE .....;*OPC;
```

| | |
|---|---|
| **MODE CAL;** | Enter CAL mode |
| ***SRE 32;** | Enable ESB to generate SRQ |
| ***ESE 1;** | Enable OPC bit in ESR to generate ESB |
| **CALTGTTABLE .....;** | Load new target calibration table into FLASH |
| ***OPC;** | Causes SRQ when FLASH update is complete |

Examples:

Command: ***OPC**{CR}{LF}

Query: ***OPC?**{CR}{LF}
Response: **1**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is always a* **1** *if this command is executing.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## *OUTPUTSELECT* – Select Output

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUTSELECT | ✘ | | | | | | ✘ | | ✘ |
| OUTPUTSELECT? | | | | | | | | | |

Syntax:

**OUTPUTSELECT n** *Select Output A, Output B, or the BIT module*
or
**OUTPUTSELECT?** *Return the current output selection*

Where:
**n** Output selection, either **A**, **B**, or **BIT**.

Description:

The OUTPUTSELECT command controls the routing of the RF outputs. BIT is equivalent to standby or Dummy Load.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **OUTPUTSELECT A;**{CR}{LF}

Command: **OUTPUTSELECT B;**{CR}{LF}

Command: **OUTPUTSELECT BIT;**{CR}{LF}

Query: **OUTPUTSELECT?**{CR}{LF}
Response: **BIT**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the either* **A**, **B**, *or* **BIT**.

Default Value:

**BIT**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *PASSTHROUGH* - BIT Passthrough Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| PASSTHROUGH | | | | | | | | | ✘ |

Syntax:

**PASSTHROUGH** *Enters passthrough mode to the BIT module*

Description:

The PASSTHROUGH command enters a mode where all data entered from the serial port is passed to the BIT module, and vice versa, until the "terminate" sequence is received. To terminate PASSTHROUGH mode, send no characters for at least 0.5 seconds, then send three tilde characters ('~'), then no characters for at least 0.5 seconds. You should then see the normal PCC prompt.

When exiting PASSTHROUGH mode, the PCC forces the BIT command port into "terse" mode.

This command is only valid on the two serial ports. It is not allowed on the IEEE-488 port and will generate an UNKNOWN COMMAND error.

NOTE: While in PASSTHROUGH mode, the PCC stops processing commands from the other serial port and from the IEEE-488 port.

Examples:

Command: **PASSTHROUGH**{CR}{LF}
Response: **Hit '~' to exit.** {CR}{LF}

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**UNKNOWN COMMAND** The command was entered from the IEEE-488 port.

## *PLL* – PLL Alarm Register (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| PLL? | | | | | | | | | |

Syntax:

**PLL?** *Return the current PLL Alarm Register value*

Description:

The PLL query returns the current value of the PLL Alarm Events and latched PLL Alarm Events registers and clears the latched PLL Alarm Events register. The latched PLL Alarm Events register contains events that have occurred since the last time the latched PLL Alarm Events register was read, or the most recent *CLS command.

The PLL ERROR bit in the STB is set whenever a PLL unlock condition exists (i.e. when either the current or latched status words are non-zero).

Examples:

Query: **PLL?**{CR}{LF}
Response: **134,134**{CR}{LF}

Query: **PLL?**{CR}{LF}
Response: **20,4**{CR}{LF}

Query Response Format:

**l,s**{CR}{LF}
*Where* **l** *and* **s** *are the PLL Alarm register value, from 0 to 31. The values are encoded as follows:*

| | | |
|---|---|---|
| **16** | **70BIT PLL** | *The 70 MHz PLL in the BIT module is out of lock.* |
| **8** | **1100BIT PLL** | *The 1100 MHz PLL in the BIT module is out of lock.* |
| **4** | **IDR PLL** | *The Interrogator PLL is out of lock.* |
| **2** | **RGC PLL** | *The Reply Generator PLL is out of lock.* |
| **1** | **REF PLL** | *The Reference PLL is out of lock.* |

**l** *is the latched version of the PLL Alarm register, and* **s** *is the current error status.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## *PULSEPOS* - Reply Pulse Position

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| PULSEPOS | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| PULSEPOS? | | | | | | | | | |

Syntax:

**PULSEPOS n** *Set reply pulse position*
or
**PULSEPOS?** *Return current reply pulse position*

Where:
**n** pulse position in nanoseconds, -250 to 250 in 50 ns steps

Description:

The PULSEPOS command sets the reply pulse positions (rising edge) relative to the ideal position. This parameter applies to all ATCRBS pulses and to the Mode-S preamble pulses, except for the first (P1) pulse. The Mode-S 56 and 112-bit data pulses cannot be modified.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **PULSEPOS -200;**{CR}{LF}

Command: **PULSEPOS 150;**{CR}{LF}

Query: **PULSEPOS?**{CR}{LF}
Response: **150**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the pulse position offset, from -250 to +250 ns in 50nS steps.*

Default Value:

**0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *PULSEWID* - Reply Pulse Width

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| PULSEWID | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| PULSEWID? | | | | | | | | | |

Syntax:

**PULSEWID n** *Set reply pulse width*
or
**PULSEWID?** *Return current reply pulse width*

Where:
**n** pulse width in nanoseconds, -250 to 250 in 50 ns steps

Description:

The PULSEWID command sets the reply pulse widths relative to the ideal width. This parameter applies to all ATCRBS pulses and to the Mode-S preamble pulses. The Mode-S 56 and 112-bit data pulses cannot be modified. This command alters the trailing edge of the pulses (the leading edge is determined by the PULSEPOS command).

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **PULSEWID -200;**{CR}{LF}

Command: **PULSEWID 150;**{CR}{LF}

Query: **PULSEWID?**{CR}{LF}
Response: **150**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the pulse width offset, from -250 to +250 ns in 50nS steps.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *RANGE* - Target Range

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RANGE | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| RANGE? | | | | | | | | | |

Syntax:

**RANGE n** *Set target range*
or
**RANGE?** *Return current target range*

Where:
**n** target range, from 10 to 64000 in Range Units of 62.5 nSec

Description:

The RANGE command sets the target range (distance from the radar). The MBTS uses this value for the delay from the "zero range" reference of the interrogation to the start of the reply in all modes that generate replies.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

There are approximately 198 Range Units per nautical mile.

Examples:

Command: **RANGE 3000;**{CR}{LF}

Command: **RANGE 200;**{CR}{LF}

Query: **RANGE?**{CR}{LF}
Response: **200**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the range in units of 62.5 nS, from 8 to 64000.*

Default Value:

**6400**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *RAWLVL* – Directly set the attenuators

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWLVL | X | X | X | X | | | X | | X |
| RAWLVL? | X | X | X | X | | | X | | X |

Syntax:

**`RAWLVL n,m`** *Sets attenuator n to m*
or
**`RAWLVL?`** *Return current setting of all attenuators*

Where:
**`n`** is Attenuator, **`T`** for Target, **`S`** for Sum/Omni, **`D`** for Delta, and **`A`** for Aux Delta/Sum
**`m`** Attenuator setting, 0 to 511, 0 to 63, 0 to 255 or 0 to 7 for T, S, D, & A respectively

Description:

The RAWLVL command directly sets the Target, Sum, Delta, and Aux Delta/Sum attenuators. Settings are not relative to each other, nor do they represent an absolute power level. These values are not modified by calibration constants. A zero value corresponds to zero attenuation. This command is active in CAL and CW modes.

Setting a bit in the raw level command turns on the corresponding attenuator. The PCC software takes care of inverting the control lines that are active low.

T for Target:

| | |
|---|---|
| 1 | 0.25 dB |
| 2 | 0.5 dB |
| 4 | 1 dB |
| 8 | 2 dB |
| 16 | 4 dB |
| 32 | 8 dB |
| 64 | 16 dB |
| 128 | 32 dB A |
| 256 | 32 dB B |

S for Sum/Omni:

| | |
|---|---|
| 1 | 1 dB |
| 2 | 2 dB |
| 4 | 4 dB |
| 8 | 8 dB |
| 16 | 16 dB |
| 32 | 32 dB |

D for Delta/Sum:

| | |
|---|---|
| 1 | 0.25 dB |
| 2 | 0.5 dB |
| 4 | 1 dB |
| 8 | 2 dB |
| 16 | 4 dB |
| 32 | 8 dB |
| 64 | 16 dB A |
| 128 | 16 dB B |

A for Aux Delta/Sum:

| | |
|---|---|
| 1 | 1 dB |
| 2 | 2 dB |
| 4 | 4 dB |

Examples:

Command: **RAWLVL T,422;**{CR}{LF}

Command: **RAWLVL D,225;**{CR}{LF}

Query: **RAWLVL?**{CR}{LF}
Response: **T,422,S,41,D,225,A,4**{CR}{LF}

Query Response Format:

**T,t,S,s,D,d,A,a**{CR}{LF}
*where* **t**, **s**, **d**, *and* **a** *are the Target, Sum/Omni, Delta/Sum, and Aux Delta/Sum attenuator settings, respectively.*

Default Value:

**T,40,S,0,D,24,A,0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode. |

## *RAWPAM* – Directly control the PAM output

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWPAM | X | X | X | X | | | X | | X |
| RAWPAM? | X | X | X | X | | | X | | X |

Syntax:

**RAWPAM n** *Set the PAM either* **ON** *or* **OFF**
or
**RAWPAM?** *Return current PAM setting*

Where:
**n** Either **ON** or **OFF**

Description:

The RAWPAM command directly sets the state of the PAM circuit in the Reply Generator Module. This command is only active in CAL or CW mode.

Examples:

Command: **RAWPAM ON;**{CR}{LF}

Command: **RAWPAM OFF;**{CR}{LF}

Query: **RAWPAM?**{CR}{LF}
Response: **OFF**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the state of the output, either* **ON** *or* **OFF**.

Default Value:

**ON**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.

## *RAWPHASE* – Directly control the Phase output

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWPHASE | X | X | X | X | | | X | | X |
| RAWPHASE? | X | X | X | X | | | X | | X |

Syntax:

**RAWPHASE n** *Set output phase*
or
**RAWPHASE?** *Return current output phase*

Where:
**n** Output phase, either 0 or 180 degrees

Description:

The RAWPHASE command sets the phase relationship of the Sum and Delta signals. This command is only active in CAL or CW mode.

Examples:

Command: **RAWPHASE 0;**{CR}{LF}

Command: **RAWPHASE 180;**{CR}{LF}

Query: **RAWPHASE?**{CR}{LF}
Response: **180**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the phase, either 0 or 180 degrees.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.

## *RAWREFLVL* – Directly set the Reference attenuator

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWREFLVL | X | X | X | X | | | | | X |
| RAWREFLVL? | X | X | X | X | | | | | X |

Syntax:

**RAWREFLVL m** *Sets Reference attenuator to m*
or
**RAWREFLVL?** *Return current setting of the reference attenuator*

Where:
**m** Reference attenuator setting, 0 to 31.

Description:

The RAWREFLVL command directly sets the Reference attenuator. Settings are not relative, nor do they represent an absolute power level. These values are not modified by calibration constants. A 0 value corresponds to zero attenuation, and 31 is maximum attenuation. Also see the REFLVL command.

Examples:

Command: **RAWREFLVL 22;**{CR}{LF}

Command: **RAWREFLVL 5;**{CR}{LF}

Query: **RAWREFLVL?**{CR}{LF}
Response: **24**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the Reference attenuator setting.*

Default Value:

**0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.

## *RAWRGCFREQ* – Set Reply Generator Frequency

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWRGCFREQ | | | | | | | | | ✘ |
| RAWRGCFREQ? | | | | | | | | | |

Syntax:

**RAWRGCFREQ nn.nn** *Set RGC output frequency*
or
**RAWRGCFREQ?** *Return current RGC output frequency*

Where:
**nn.nn** Output frequency, in MHz, from 65.00 to 75.00 in 0.05 MHz steps (50 KHz)

Description:

The RAWRGCFREQ command sets the signal frequency of Reply Generator Module outputs. Note that the REPLYFREQ command will reset- the RGC frequency to 70 MHz.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **RAWRGCFREQ 70.40;**{CR}{LF}

Command: **RAWRGCFREQ 71.00;**{CR}{LF}

Query: **RAWRGCFREQ?**{CR}{LF}
Response: **71.00**{CR}{LF}

Query Response Format:

**nn.nn**{CR}{LF}
*Where* **nn.nn** *is the output frequency in MHz.*

Default Value:

**70.00**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *RAWUCLVL* – Directly set the Up Converter Attenuators

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RAWUCLVL | ✘ | ✘ | ✘ | ✘ | | | ✘ | | ✘ |
| RAWUCLVL? | | | | | | | | | |

Syntax:

**RAWUCLVL n,m** *Set the Up Converter attenuator* **n** *to* **m** *, where* **n** *is* **S** *for Sum,* **O** *for Omni, or* **D** *for Delta.*

or

**RAWUCLVL?** *Return current up converter attenuator settings*

Where:

**n** is the Up Converter, **S** for Sum, **O** for Omni, or **D** for Delta
**m** is the Up Converter attenuator value, from 0 to 31

Description:

The RAWUCLVL command directly sets the attenuation values for the Sum, Omni, and Delta Upconverters. Settings are not relative, nor do they represent an absolute power level. These values are not modified by calibration constants. A zero value corresponds to zero attenuation, and 31 corresponds to maximum attenuation. Also see the CALUCATTEN command.

Examples:

Command: **RAWUCLVL S,21;**{CR}{LF}

Command: **RAWUCLVL D,4;**{CR}{LF}

Query: **RAWUCLVL?**{CR}{LF}
Response: **S,21,O,7,D,4**{CR}{LF}

Query Response Format:

**S,s,O,o,D,d** {CR}{LF}
*Where* **s** *is the Sum Up Converter attenuator value, from 0 to 31;* **o** *is the Omni Up Converter attenuator value, from 0 to 31; and* **d** *is the Delta Up Converter default attenuator value, from 0 to 31.*

Default Value:

**S,0,O,0,D,0**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.

## *REFFREQ* – Set Reference Frequency

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| REFFREQ | X | X | X | X | X | X | | | X |
| REFFREQ? | | | | | | | | | |

Syntax:

**`REFFREQ nnnn.n`** *Set Reference output frequency*
or
**`REFFREQ?`** *Return current Reference output frequency*

Where:
**`nnnn.n`** Output frequency, in MHz, from 1010.0 to 1070.0 MHz in 0.2 MHz steps

Description:

The REFFREQ command sets the Reference output frequency.

This command only works in REF mode (see the MODE command).

Examples:

Command: **`REFFREQ 1060.4;`**{CR}{LF}

Command: **`REFFREQ 1031.0;`**{CR}{LF}

Query: **`REFFREQ?`**{CR}{LF}
Response: **`1052.0`**{CR}{LF}

Query Response Format:

**`nnnn.n`**{CR}{LF}
*Where* **`nnnn.n`** *is the output frequency in MHz.*

Default Value:

**`1020.0`**

Possible Error Conditions:

**`PARAM CNT`** The wrong number of parameters was supplied.
**`BAD PARAM`** A supplied parameter is out of the acceptable range.

## *REFLVL* – Set the Reference attenuator

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| REFLVL | X | X | X | X | | | | | X |
| REFLVL? | | | | | | | | | |

Syntax:

**REFLVL m** *Sets Reference attenuator to power level* **m**
or
**REFLVL?** *Return current setting of the reference power level*

Where:
**m** Reference power level, from +8 to –23 dBm in 1dB steps.

Description:

The REFLVL command sets the level of the RF signal at the front panel of the Reference Module.

Examples:

Command: **REFLVL -12;**{CR}{LF}

Command: **REFLVL 5;**{CR}{LF}

Query: **REFLVL?**{CR}{LF}
Response: **4**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the Reference power level.*

Default Value:

**8**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *REFOE* –Control the Reference Output Enable output

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| REFOE | X | X | X | X | | | | | X |
| REFOE? | | | | | | | | | |

Syntax:

**REFOE n** *Set the Reference Output Enable output either* **ON** *or* **OFF**
or
**REFOE?** *Return current Reference Output Enable output setting*

Where:
**n** Either **ON** or **OFF**

Description:

The REFOE command directly sets the state of the Reference Output control. This command is only active in CAL, REF, and CW modes.

Examples:

Command: **REFOE ON;**{CR}{LF}

Command: **REFOE OFF;**{CR}{LF}

Query: **REFOE?**{CR}{LF}
Response: **OFF**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the state of the output, either* **ON** *or* **OFF**.

Default Value:

**OFF**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.
**WRONG MODE** The command is not possible in the current mode.

## *REPLYFREQ* – Set the Frequency of the MBTS Reply Signal

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| REPLYFREQ | | | | | | | | | ✘ |
| REPLYFREQ? | | | | | | | | | |

Syntax:

**REPLYFREQ nnnn.n** *Set Reply frequency*
or
**REPLYFREQ?** *Return current Reply frequency*

Where:
**nnnn.n** Output frequency, in MHz, from 1080.0 to 1100.0 in 0.2 MHz steps

Description:

The REPLYFREQ command sets the output frequency of the Reply signal. The Reply Generator signal is forced to 70 MHz, and the Reference Module signal is set to the appropriate frequency to generate the MBTS output signal at the correct frequency.

If the RAWRGCFREQ command is used, the REPLYFREQ? query will return the correct value, the RGC frequency plus the reference frequency.

Note: Because of interaction with the RAWRGCFREQ command, the query response returns two decimal places. The query may also return values that are impossible to obtain using only the REPLYFREQ command (e.g. 1090.05).

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **REPLYFREQ 1090.4;**{CR}{LF}

Command: **REPLYFREQ 1081.0;**{CR}{LF}

Query: **REPLYFREQ?**{CR}{LF}
Response: **1081.60**{CR}{LF}

Query Response Format:

**nnnn.nn**{CR}{LF}
*Where* **nnnn.nn** *is the output frequency in MHz.*

Default Value:

**1090.0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

Implementation Notes:

The RGC frequency gets reset to 70.0 MHz on every mode change.

## **RST* – Reset

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *RST | | | | | | | | | |

Syntax:

***RST** *Reset the MBTS*

Description:

The *RST command causes the MBTS to generate a hardware reset. This resets the PCC and BIT processors and reloads the PLLs, attenuators, and switches with their power-on default settings.

Example:

Command: ***RST**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## *RUNTIME* – Return seconds of Run Time

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| RUNTIME? | | | | | | | | | |

Syntax:

**RUNTIME?** *Return the number of seconds of run time*

Description:

The RUNTIME query returns the number of seconds since the MBTS was powered on or reset (via the *RST command or a watchdog timeout). This value is a an unsigned 32-bit number, therefore it will roll over after 4,294,967,296 seconds or approximately 136 years of continuous operation.

Example:

Query: **RUNTIME?**{CR}{LF}
Response: **1253**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the number of seconds the MBTS has been operational.*

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

## **SRE* - Service Request Enable

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *SRE | | | | | | | | | |
| *SRE? | | | | | | | | | |

Syntax:

***SRE n** *Set new service request enable mask*
or
***SRE?** *Return current service request enable mask*

Where:
**n** 0 to 255 (decimal), see description below

Description:

The SERVICE REQUEST ENABLE command controls the conditions that generate a service request (SRQ) on the IEEE-488 bus. Each bit position controls the corresponding bit in the status register (STB). Setting the mask bits to a one enable service requests for that condition. Setting the mask bits to zero disables service requests. The service request mask is set to zero on power-up or when a *Device Clear* command is received.

Note: The MBTS will automatically clear the RQS/MSS bit in the *SRE register if it was set. This is not an error. For example:

***SRE 255;SRE?**

returns

**191**

Examples:

Command: ***SRE 192;**{CR}{LF}

Command: ***SRE 0;**{CR}{LF}

Query: ***SRE?**{CR}{LF}
Response: **0**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the Service Request Enable mask, from 0 to 255.*

Default Value:

**0** *(all disabled)*

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## **STB* – Status Byte (H)

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *STB? | | | | | | | | | |

Syntax:

***STB?** *Return the current Status Byte*

Description:

The *STB query returns the current value of the Status Byte. This register contains events that have occurred since the last time the Status Byte was read.

Example:

Query: ***STB?**{CR}{LF}
Response: **211**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*Where* **n** *is the Status Byte value, from 0 to 255. The values are encoded as follows:*

| | | |
|---|---|---|
| **128** | **INT ERR** | *Internal Error. Details returned by INTERR?* |
| **64** | **RQS/MSS** | *RQS.* |
| **32** | **ESB** | *Extended Status Byte. Details returned by *ESR?* |
| **16** | **MAV** | *Message Available.* |
| **8** | **ALARM** | *Alarm. Details returned by ALARM?* |
| **4** | | *(not used)* |
| **2** | **PLL ERROR** | *PLL Alarm. Details returned by PLL?* |
| **1** | **RECAL SUGGESTED** | *Output signal levels should be recalibrated (use the *CAL command).* |

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## *TGTAZ* - Target Azimuth

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| TGTAZ | ▼ | ▼ | | ▼ | ▼ | ▼ | ▼ | | ✘ |
| TGTAZ? | | | | | | | | | |

Syntax:

**TGTAZ n** *Set target azimuth*
or
**TGTAZ?** *Return current target azimuth*

Where:
**n** Azimuth in IACP units, 0 to 16383

Description:

The TGTAZ command sets the azimuth position of the center of the first (and possibly only) target. This target position is applicable only to replies generated when the MBTS is in azimuth-gated reply mode. When there is only one target, this value specifies the azimuth of that target. When there is more than one target, all targets are evenly spaced around the azimuth circle at the applied Range setting. Note that the target at the TGTAZ position may not generate the first reply after receipt of the Northmark signal. For example, if TGTAZ is 4096 and TGTCNT is 16, a reply will be generated by the target at 0 (at the Northmark),. The target at 4096, the "first" target as set by the TGTAZ command, will have the Mode S Aircraft Address specified by the CODE command. The Aircraft Address of each additional target is sequentially incremented from this value.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **TGTAZ 12192;**{CR}{LF}

Command: **TGTAZ 45;**{CR}{LF}

Query: **TGTAZ?**{CR}{LF}
Response: **45**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is the azimuth of the first target in IACP units, from 0 to 16383.*

Default Value:

**0**

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *TGTCNT* - Target Count

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| TGTCNT | ▼ | ▼ | | ▼ | ▼ | ▼ | ▼ | | ✘ |
| TGTCNT? | | | | | | | | | |

Syntax:

**TGTCNT n** *Set number of targets*
or
**TGTCNT?** *Return current number of targets*

Where:
**n** 1, 2, 4, 8, 16 or 32

Description:

The TGTCNT command sets the number of targets that the MBTS simulates when in azimuth-gated reply mode.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **TGTCNT 1;**{CR}{LF}

Command: **TGTCNT 16;**{CR}{LF}

Query: **TGTCNT?**{CR}{LF}
Response: **16**{CR}{LF}

Query Response Format:

**n**{CR}{LF}

Default Value:

**8**

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**BAD PARAM** A supplied parameter is out of the acceptable range.

## *TGTMIX* - Target Type Mix

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| TGTMIX | ▼ | | | ▼ | ▼ | ▼ | ▼ | | ✘ |
| TGTMIX? | | | | | | | | | |

Syntax:

**`TGTMIX n`** *Set target type mix*
or
**`TGTMIX?`** *Return current target type mix*

Where:
**`n`** Target type mix, one of the following:
"**`ATCRBS`**" - ATCRBS targets only
"**`S`**" - Mode-S targets only
"**`BOTH`**" - 50/50 split of ATCRBS and Mode-S targets

Description:

The TGTMIX command sets the MBTS to create replies emulating the protocols of an ATCRBS or a Mode S transponder.

For the Azimuth-gated mode, if the TGTMIX is BOTH, the first target (at the location set by the TGTAZ command) will be an ATCRBS target. If the TGTCNT is set to 1 and TGTMIX is set to BOTH, then only ATCRBS replies will be generated.

For Ring mode, if TGTMIX is set to BOTH, the MBTS will respond as an ATCRBS target to all ATCRBS interrogations. The MBTS will respond with a Mode-S reply only to Mode-S interrogations.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`TGTMIX ATCRBS;`**{CR}{LF}

Command: **`TGTMIX S;`**{CR}{LF}

Command: **`TGTMIX BOTH;`**{CR}{LF}

Query: **`TGTMIX?`**{CR}{LF}
Response: **`BOTH`**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is* **ATCRBS**, **S**, *or* **BOTH**.

Default Value:

"**ATCRBS**"

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |

## *TRIG* - Trigger Source

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| TRIG | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| TRIG? | | | | | | | | | |

Syntax:

**TRIG n** *Sets the reply generation trigger source*
or
**TRIG?** *Returns the current trigger source setting*

Where:

**n** Trigger mode, as follows
"**RFIN**" - Use decoded RF interrogations from an RF input
"**MODE**" - Use mode pair triggers from the EXT/MODE input
"**INT**" - Use internally generated triggers (not allowed in AZ mode)
"**EXT**" - Use external triggers from the EXT/MODE input

Description:

The TRIG command determines the trigger mode and source. When the trigger mode is "RFIN", the RF source is determined by the IDRSRC command setting.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **TRIG RFIN;**{CR}{LF}

Command: **TRIG MODE;**{CR}{LF}

Command: **TRIG INT;**{CR}{LF}

Command: **TRIG EXT;**{CR}{LF}

Query: **TRIG?**{CR}{LF}
Response: **EXT**{CR}{LF}

Query Response Format:

**n**
*Where* **n** *is* **RFIN**, **MODE**, **INT**, *or* **EXT**.

Default Value:

"**RFIN**"

Possible Error Conditions:

| | |
|---|---|
| **PARAM CNT** | The wrong number of parameters was supplied. |
| **BAD PARAM** | A supplied parameter is out of the acceptable range. |
| **WRONG MODE** | The command is not possible in the current mode (AZ). |

## *TRIGPW* - Trigger Pulse Width

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| TRIGPW | ▼ | | | | ▼ | ▼ | ▼ | | ✘ |
| TRIGPW? | | | | | | | | | |

Syntax:

**`TRIGPW n.n`** *Sets internal trigger pulse width*
or
**`TRIGPW?`** *Return current internal trigger pulse width*

Where:
**`n.n`** Trigger pulse width in micro-seconds, 0.1 to 5.0 μs in 0.1 μs steps.

Description:

The TRIGPW command sets the trigger pulse width on the "TRIGGER OUT" BNC connector.

If this command is issued while the MBTS is in an operational mode, the MBTS will go off-line and stop generating replies to interrogations while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. The MBTS will then enter a SUSPENDED state (which will cause a SUSPENDED event to become active) until azimuth position is re-established. A START OPERATION event will then be generated and normal MBTS operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **`TRIGPW 2.8;`**{CR}{LF}

Command: **`TRIGPW 4.6;`**{CR}{LF}

Query: **`TRIGPW?`**{CR}{LF}
Response: **`4.6`**{CR}{LF}

Query Response Format:

**`n`**
*Where* **`n`** *is the trigger pulse width in micro-seconds, from 0.1 to 5.0 in 0.1 μs steps.*

Default Value:

**`0.1`**

Possible Error Conditions:

**`PARAM CNT`** The wrong number of parameters was supplied.
**`BAD PARAM`** A supplied parameter is out of the acceptable range.

## **TST* – Self-Test Query

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *TST? | | ✘ | ✘ | ✘ | ✘ | ✘ | ✘ | | ✘ |

Syntax:

***TST?** *Return the result of the Self-Test.*

Description:

The *TST query forces the MBTS to perform a complete self-test diagnostic routine. The result of the self-test is returned in the command response. Self-test results are also reflected in the INTERR register. The BER limit for that portion of the self-test is $1x10^{-3}$.

The MBTS must be in STANDBY mode to run this command (see the MODE command).

Example:

Query: ***TST?**{CR}{LF}
Response: **1**{CR}{LF}

Query Response Format:

**n**{CR}{LF}
*where* **n** *is* **0** *if no errors occurred during self-test, otherwise* **1**.

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.
**WRONG MODE** The command is not possible in the current mode.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## **WAI* – Wait to Continue Command

| Command or Query | Standby Mode | Ring Mode | Azimuth Mode | Bore-sight Mode | CW Mode | Cal Mode | Ref Mode | Cal. Write Protect | Xilinx Load Fail |
|---|---|---|---|---|---|---|---|---|---|
| *WAI | | | | | | | | | |

Syntax:

***WAI** *Wait to Continue*

Description:

The *WAI causes the MBTS to stop processing commands from a communications port until all active operations are complete. The MBTS will continue to process commands from other communication interfaces.

Currently, the *WAI command has no effect unless the MBTS is running a BER test.

Example:

Command: ***WAI**{CR}{LF}

Default Value:

N/A

Possible Error Conditions:

**PARAM CNT** The wrong number of parameters was supplied.

Implementation Notes:

Part of the IEEE-488.2-1992 Command Set.

## STATUS REGISTERS