FREESTATE ELECTRONICS, INC.

ADS-B TEST SET

IEEE-488 COMMAND SET

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**ADS-B TEST SET
IEEE-488 COMMAND SET**

<u>REVISION HISTORY</u>

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Implementation Notes

Multiple Commands on One Line

Multiple commands can be issued at one time. If multiple commands are issued, 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?;REFOE?;MODE STANDBY

could return

    0,8;OFF

Maximum Command Length

The maximum size of a command line is 4900 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 to IEEE-488 conventions, this document uses a comma (',') as the parameter separator. However, the ADS-B Test Set 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, CALTEMPLIMIT, CALTGTTABLE, and CALUCATTEN commands.

Parameters in [Brackets]

Parameters shown in brackets are optional. The most common optional parameter is an 'M' on commands controlling transmission functionality. In these cases, leaving the parameter off the command selects the primary channel or the first Reply Generator Module, while including the 'M' parameter selects the second Reply Generator Module.

Channels

The ADS-B Test Set is configured with two signal generation channels. The primary channel signal is sourced in the primary Reply Generator Module. The second channel is generated within the second Reply Generator.

When the first parameter of a command is an 'M', that command is applied to the second channel.

Documentation Notes

Each command has a table, like that shown in Figure 1, which identifies the mode in which the command or query can be issued. It also identifies 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
COMMAND	✘		▼	▼	▼	▼	✘	✘	
QUERY?								✘	✘

Figure. 1

The conditions:

Command or Query

      The command name or query name being described.

Standby Mode
Pulse Mode
CW Mode
Cal Mode
Ref Mode
Playback Mode

      When the ADS-B Test Set is in the corresponding operational Mode.

Cal. Write Protect

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

BERT Running

      When the ADS-B Test Set is running a Bit Error Rate Test.

Xilinx Load Fail

      When the ADS-B Test Set 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 TDATA command can be issued while the ADS-B Test Set is in Standby mode, and will be accepted; but the value provided will not be used until the ADS-B Test Set is commanded to enter Pulse mode.

ALARM – Return Alarm Status

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 in hexadecimal, 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: **30,0**{CR}{LF}

    Query: **ALARM?**{CR}{LF}
    Response: **14,14**{CR}{LF}

Query Response Format:

    l,s

*Where **l** and **s** are in the range **0** to **3f**. The values are encoded as follows:*

4	**CAL FAILED**	*ADS-B Test Set 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.

BADBITLIST – Mode S 112 Data Bad Bit List

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
BADBITLIST	▼		▼	▼	▼	▼			✘
BADBITLIST?									

Syntax:

BADBITLIST [M,]t,b1[,b2[,b3[,b4[,b5[,b6[,b7[,b8]]]]]]]   *Set bad bit list*
  or
BADBITLIST? [M]   *Return bad bit list*

Where:
t   = **O, D,** or **I** (for Off, Drop, or Invert)
b1, b2, b3 = 0 to **112**

Description:

The BADBITLIST command allows the creation of erroneous transmission data sets so as to test the error correction capability of ADS-B receivers. This command affects all squitter and type S112 transmissions for the selected signal generation channel. Up to 8 erroneous bits of data may be selected for use, with each error being described by a bit number and error type. One bit number must always be sent; a bit number of zero is ignored. When set to Off, or if all bit numbers are zero, the bad bit function is disabled. When set to Drop, no RF pulse is transmitted during the selected bit interval. When set to Invert, the RF pulse is generated so as to occupy the time slot of the inverted data bit. Introducing error bits does not change the transmitted CRC.

Examples:

Command: **BADBITLIST O,0**{CR}{LF}

Command: **BADBITLIST M,D,108,4**{CR}{LF}

Query: **BADBITLIST? M**{CR}{LF}
Response: **D,4,108**

Query Response Format:

t,b1[,b2[,b3[,b4[,b5[,b6[,b7[,b8]]]]]]]{CR} {LF}
The bit numbers are sorted with only non-zero values transmitted.

Default Value:

O,0

Possible Error Conditions:

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

BER - **Bit Error Rate Test**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
BER		✗	✗	✗	✗	✗			✗
BER?									

<u>Syntax:</u>

> **BER t,p**
>   or
> **BER?**   *Return current BER results*

Where:
>   **t**   Function, as follows:
>   **OFF**   Terminate any BER test currently running.
>   **RGC1**   Tests primary channel generation circuitry.
>   **RGC2**   Tests secondary channel generation circuitry.
>   **ALL**   Run a sequence of BER tests on both RGC1 and RGC2.
>
>   **p**   The length of the BER test as defined by the desired number of effective data bits in powers of 10, range 1 to 9 (must be 0 for **OFF**).

<u>Description:</u>

The BER test is a Built-In-Test process that checks the ability of ADS-B instrument to create properly timed and formatted pulsed RF transmissions. During this process, a random sequence of ATCRBS and Mode-S pulsed RF signals, created in the Reply Generator Module, are converted to 1090 MHz in an Upconverter Module and then detected within the BIT Module. The detected data is compared against expected data within the PCC Module.

The BER command starts or stops a Bit Error Rate test. The ALL parameter will first run the RGC2 test and then the RGC1 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 RGCx commands assign an "effective number of data bits" to each transmission as indicated below.

Type	**bits**
ATCRBS	13
Mode S 56 bit	60
Mode S 112 bit	116

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

<u>Examples:</u>

Command: **BER ALL,4**{CR}{LF}

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

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

Query Response Format:

`t,errs,cnt`
    `errs` *is the number of errors*
    `cnt` *is the total effective number of data bits*

t	**Function**
0	Off
1	RGC1 BER test running
2	RGC2 BER test running

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 No. 101611, 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 Module 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	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 six 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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 Module 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 101611, 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.

*CAL - Force Recalibration for Temperature and Frequency

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 ADS-B Test Set to recalibrate the RF section for the current ambient temperature and output frequency. It does this by routing the RF output of each Upconverter to the BIT Module, measuring the amplitude of this signal, and then adjusting signal level to compensate for the current conditions using the CALBITLVL setting as a reference.

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 ADS-B Test Set 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 a calibration error on signal generator channel 1, and* **2** *for a calibration error on signal generator channel 2.*

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALABOFFSET		✗	✗		✗	✗	✗		
CALABOFFSET?									

Syntax:

> **CALABOFFSET [M,]n.n** *Set new offset of Output B relative to Output A, the optional 'M' parameter selects channel 2*
>
> or
>
> **CALABOFFSET? [M]** *Return current offset of Output B relative to Output A*

Where:

> **n.n** Offset power level setting of Output B from Output A, from +0.8 to -0.8 dB, in 0.1 dB increments

Description:

The CALABOFFSET command applies a compensation factor "n" to signals from output Channel B so as to best match the calibration level applied to signals from output Channel A.

The calibration data stored by the CALTGTTABLE command is determined by the performance through Output A. Output power level is adjusted by the value of the CALABOFFSET when Output B is active.

The ADS-B Test Set must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALABOFFSET 0.5**{CR}{LF}

Command: **CALABOFFSET M -0.2**{CR}{LF}

Query: **CALABOFFSET? M**{CR}{LF}
Response: **-0.2**{CR}{LF}

Query Response Format:

n.n{CR}{LF}

> *Where **n.n** is the offset between Output A and Output B, from +0.8 to -0.8 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALBITLVL		✗	✗		✗	✗	✗		
CALBITLVL?									

Syntax:

> **CALBITLVL [M,]s**   *Set new A/D value for calibration of the output power level, from 0 to 4095, the optional 'M' parameter selects* channel 2.
>
> or
>
> **CALBITLVL? [M]**   *Return current A/D calibration value*

Where:

> **s**   reference A/D value to use for the adjustment of the 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 -10 dBm. The calibration process is invoked by the use of the *CAL? query.

The ADS-B Test Set must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

Command: **CALBITLVL 1665**{CR}{LF}

Command: **CALBITLVL M 3125**{CR}{LF}

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

Query Response Format:

s{CR}{LF}

> *Where* **s** *is the A/D value measured in the BIT Module necessary for Upconverter channel A output 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALPULSEPWR		✗	✗		✗	✗	✗		
CALPULSEPWR?									

Syntax:

> **CALPULSEPWR [M,]n.n**   *Set new offset for pulsed modes, the optional 'M' parameter selects* channel 2
> or
> **CALPULSEPWR?**   *Return current offset for pulsed modes of* channel 1
> or
> **CALPULSEPWR? M**   *Return current offset for pulsed modes of* channel 2

> Where:
> **n.n**   Offset from steady-state power level, from 0.00 to +0.8 dB in 0.1 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 channel signal level and compensates for the effects of the rise time limiting circuits found within the Reply Generator Module.

> The ADS-B Test Set must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

> Command: **CALPULSEPWR 0.4**{CR}{LF}

> Command: **CALPULSEPWR M 0.2**{CR}{LF}

> Query: **CALPULSEPWR?**{CR}{LF}
> Response: **0.4**{CR}{LF}

Query Response Format:

> **n.n** {CR}{LF}

> *Where* **n.n** *is the offset between steady-state and pulsed modes, from 0.00 to +0.8 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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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: **2,80,79,26**{CR}{LF}

Query: **CALSTS?**{CR}{LF}
Response: **0,81,82,28**{CR}{LF}

Query Response Format:

sts,rgc1,rgc2,t
Where:
sts *is* **0** *for successful calibration, or* **1** *for RGC1 failure, or* **2** *for RGC2 failure, or* **3** *for RGC1 & RGC2 failure.*
rgc1 *is the current calibration gain setting for RGC1*
rgc2 *is the current calibration gain setting for RGC2*
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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALTEMPLIMIT		✗	✗		✗	✗	✗		
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 ADS-B Test Set 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALTGTTABLE		✗	✗		✗	✗	✗		
CALTGTTABLE?									

Syntax:

CALTGTTABLE [M,]p,n.nnnn,n.nnnn,n.nnnn,... n.nnnn,n.nnnn
  Set to the Target absolute output power level for each attenuator value
  (384 entries). The optional 'M' parameter enters levels for channel 2.
  or
CALTGTTABLE? [M,]p *Returns the current absolute power table*

Where:

P   is the output, either **A** or **B**
n.nnnn   Measured power level in steps of 0.0625 dB.

Description:

The CALTGTTABLE command loads a table of absolute power levels for each Target attenuator setting, (384 entries). This table compensates for inaccuracies or non-linearity in the Target attenuator. The first value corresponds to an attenuator setting of 0 (RAWLVL T 0), and the last value corresponds to an attenuator setting of 511 (RAWLVL T 511). Four Target Tables are used by the ADS-B, two for each signal generator (channel A and Channel B) output.

Because the Target attenuator uses two 32 dB attenuators instead of a 32 dB and a 64 dB attenuator valid Target attenuator values range from 0 to 127, and then 256 to 511, instead of from the expected range of from 0 to 383.

The ADS-B Test Set must be in the STANDBY or CAL mode to run this command (see the MODE command).

Query Response Format:

n.nnnn,n.nnnn,n.nnnn,... n.nnnn,n.nnnn {CR}{LF}
  *Where **n** is the Target power level, from –100.0000 to +5.0000.*

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.

CALDATTEN - **Calibration Attenuators**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CALDATTEN		✗	✗		✗	✗	✗		
CALDATTEN?									

Syntax:

    CALDATTEN [M,]p,s.ss   *Sets calibration attenuator values for output* **p** *to* **s.s**, *the optional 'M' parameter selects generator* channel 2.

    or
CALDATTEN? [M]   *Return current calibration attenuator defaults*

    Where:
        p   is the output, either **A** or **B**
        s.ss   is the calibration attenuator value, from 0 to 47.75 dB in 0.25 dB steps

Description:

    The CALDATTEN command is used as an initial calibration factor to adjust the output level of the ADS-B Test Set to near nominal values. Once set other calibration values, such as CALTGTTABLE, are created. A CALDATTEN value is specified for channel A and Channel B of both signal generators.

    The ADS-B Test Set must be in the STANDBY or CAL mode to run this command (see the MODE command).

Examples:

    Command: **CALDATTEN A,7.50**{CR}{LF}

    Command: **CALDATTEN M,B,4.25**{CR}{LF}

    Query: **CALDATTEN?**{CR}{LF}
    Response: **A,7.0,B,0.75**{CR}{LF}

Query Response Format:

    A,s.ss,B,s.ss {CR}{LF}

        Where **s.ss** *is the Delta attenuator value (in the RGM), from 0.00 to 47.75 dB in 0.25 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.

CAPTREPLY – **Capture Replies**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
CAPTREPLY								✘	✘
CAPTREPLY?									

Syntax:

> **CAPTREPLY state**   *Sets Reply Capture State.*
>   or
> **CAPTREPLY?**   *Return current Reply Capture State*

Where:

state	Function
0	Disable reply captures
1	Clear the reply table and capture one reply (single shot)
2	Clear the reply table and capture all replies (armed)

Description:

The CAPTREPLY command sets the capture mode of the received signal detection state machine. When set to 1 the state will switch to 0 when the first valid received signal is captured. The received data table is viewed using the READREPLY query.

Refer to the READREPLY command for notational comments on the operation and limitations of the data detection and analysis circuits used in this process.

The CAPTREPLY command cannot execute while a BER test is running.

Examples:

Command: **CAPTREPLY 2**{CR}{LF}

Command: **CAPTREPLY 1**{CR}{LF}

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

Query Response Format:

d {CR}{LF}
    Where **d** *0, 1, or 2.*

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.
OPTION CONFLICT	CAPTREPLY attempted while BER test is running.

*CLS - Clear Status Command

Command	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 in hexadecimal. The register is cleared by a query except for the AMP Conflict entry. 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 Amplitude Conflict alert is created when the output power level setting cannot be achieved

Examples:

> Query: **CMDSTS?**{CR}{LF}
> Response: **0**{CR}{LF}
>
> Query: **CMDSTS?**{CR}{LF}
> Response: **20**{CR}{LF}

Query Response Format:

> **n**
>
> *Where* **n** *is in the range* **0** *to* **7ff**. *The values are encoded as follows:*

400	**AMP CONFLICT 2**	*The channel 2 power level setting and the channel 1 power level setting are not compatible or the channel 2 level could not be set within spec.*
100	**AMP CONFLICT**	*The channel 1 level could not be set within spec*
80	**OPTION CONFLICT**	*Attempt to set TYPE while a BET test is running.*
40	**WRITE PROTECT**	*Calibrate data command issued while Write Protect DIP switch was set.*
20	**TIME OUT**	*Command has timed out*
10	**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.*
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.

DELAY – Set Transmission Delay

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
DELAY	▼		▼	▼	▼	▼			✘
DELAY?									

Syntax:

> **DELAY [M,] d**   *Sets the transmission delay to d, the optional 'M' parameter selects channel 2*
>   or
> **DELAY? [M]**   *Returns the transmission delay*

> Where **d** is 40 to 65535 in 25 ns units

Description:

> The DELAY command sets the time delay between a trigger event and the start of a transmission. If the random position mask is set (see RANDOM command) the DELAY command has no effect.

Examples:

> Command: **DELAY 40**{CR}{LF}
>
> Command: **DELAY M, 654**{CR}{LF}
>
> Query: **DELAY?**{CR}{LF}
> Response: **40**{CR}{LF}
>
> Query: **DELAY? M**{CR}{LF}
> Response: **654**{CR}{LF}

Query Response Format:

> **d**{CR}{LF}

Default Value:

> **40**

Possible Error Conditions:

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

DELAYMM – Set Min and Max Random Transmission Delay

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
DELAYMM	▼		▼	▼	▼	▼			✘
DELAYMM?									

Syntax:

DELAYMM [M,] l,u   *Sets the minimum random transmission delay to l and the maximum random transmission delay to u, the optional 'M' parameter selects generator channel 2*

  or

DELAYMM? [M]   *Returns the maximum random transmission delay*

Where **l** and **u** are 40 to 65535 in 25 ns units and l must be less than or equal to u.

Description:

The DELAYMM command sets the minimum and maximum time delay between a trigger event and the start of a transmission when the RANDOM transmission delay function is applied. If the random position mask is cleared (see RANDOM command) the DELAYMM command has no effect.

Examples:

Command: **DELAYMM 40,120**{CR}{LF}

Command: **DELAYMM M,180,654**{CR}{LF}

Query: **DELAYMM?**{CR}{LF}
Response: **40,120**{CR}{LF}

Query: **DELAYMM? M**{CR}{LF}
Response: **180,654**{CR}{LF}

Query Response Format:

l,u{CR}{LF}

Default Value:

40,40

Possible Error Conditions:

PARAM CNT   The wrong number of parameters was supplied.
BAD PARAM   A supplied parameter is out of the acceptable range or u was less than l.

DIPSW – Get Current State of DIP Switches

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
DIPSW?									✘

Syntax:

    DIPSW?   *Return the current DIP Switch settings*

Description:

    Returns the current value of the DIP switches on the PCC Module of the ADS-B Test Set.

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
*ESE									
*ESE?									

Syntax:

    *ESE n   *Set the Events Status Enable register to* **n**

       or

    *ESE?   *Returns 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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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: **32**{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 ADS-B Test Set starts or stops operation.*
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, or AMP CONFLICT flags are set in CMDSTS.*
4	**QUERY ERROR**	*Query Error. Not used by the ADS-B Test Set.*
2	**REQ CONTROL**	*Request Control. Not used by the ADS-B Test Set.*
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.

FACTORYCAL – Restore Calibration Data from Factory FLASH Memory Area

Command	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 ADS-B Test Set 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	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
FLASH		✗	✗	✗	✗	✗			

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	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
FLASHCAL		✗	✗		✗	✗	✗		

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 ADS-B Test Set 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.

FREQOFF –Frequency Offset to Channel 2

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
FREQOFF								✗	✗
FREQOFF?									

Syntax:

   FREQOFF n.nn   *Set frequency offset to channel 2*
      or
   FREQOFF?   *Return current frequency offset*

Where:
   n.nn   Output frequency offset, in MHz, from -2.0 to 2.0 in 0.05 MHz steps

Description:

The REPLYFREQ command sets the output frequency for channel 1 signals. The FREQOFF command sets the output frequency for signals generated in channel 2 at an offset from the channel 1 setting. This is accomplished by altering the operating signal frequency within the second Reply Generator Module.

If this command is issued while the ADS-B TEST SET is in an operational mode, the ADS-B TEST SET will go off-line and stop generating transmissions while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. A START OPERATION event will then be generated and normal ADS-B TEST SET operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **FREQOFF −1.45**{CR}{LF}

Query: **FREQOFF?**{CR}{LF}
Response: **−1.45**{CR}{LF}

Query Response Format:

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

Default Value:

−0.50

Possible Error Conditions:

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

IDN – Identification Query

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
*IDN?									

Syntax:

*IDN?   *Return the Identification string for the ADS-B Test Set.*

Description:

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

If the Xilinx Load fails, the ADS-B Test Set returns 0 for all FPGA and BIT versions.

Example:

Query: ***IDN?**{CR}{LF}
Response: **FREESTATE ELECTRONICS INC,FS-1520,0,4.2-2-4.1-3**{CR}{LF}

Query Response Format:

FREESTATE ELECTRONICS INC,FS-1520,0,p.pp-c-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
   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.

INTERR – **Internal Error Events Register**

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 in hexadecimal 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: **1c503**{CR}{LF}

Query Response Format:

n{CR}{LF}

Where **n** *is the Internal Error Events register value, from* **0** *to* **2dffffff**. *The values are encoded as follows:*

20000000	**FACT XILINX BAD**	*An error was detected in the Factory Xilinx FPGA data area.*
8000000	**BER RGC2 FAIL**	*The RGC2 Bit Error Rate Test failed.*
4000000	**XILINX SRAM FAIL**	*The Xilinx SRAM failed self-test.*
1000000	**PAM2 ATTEN FAILED**	*The PAM attenuator of RGC2 failed self-test.*
200000	**DS2 ATTEN FAILED**	*The Delta attenuator of RGC2 failed self-test.*
80000	**TGT2 ATTEN FAILED**	*The Target attenuator of RGC2 failed self-test.*
8000	**USER PROG BAD**	*An error was detected in the downloadable User Program.*
4000	**USER CAL BAD**	*An error was detected in the User Calibration Constants.*
2000	**USER XILINX BAD**	*An error was detected in the User Xilinx FPGA data area.*
800	**BER RGC1 FAIL**	*The RGC1 Bit Error Rate Test failed.*
400	**FACTORY CAL BAD**	*An error was detected in the Factory Calibration Constants.*
200	**XILINX LOAD FAILED**	*The PCC was unable to download a Xilinx pattern.*
100	**PAM1 ATTEN FAILED**	*The PAM attenuator of RGC1 failed self-test.*
20	**DS1 ATTEN FAILED**	*The Delta attenuator of RGC1 failed self-test.*
8	**TGT1 ATTEN FAILED**	*The Target attenuator of RGC1 failed self-test.*

Default Value:

N/A

Possible Error Conditions:

    PARAM CNT   The wrong number of parameters was supplied.

INTTRIGPRF - Internal Trigger Pulse Repetition Frequency

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 8000 in 5 Hz steps

Description:

> The INTTRIGPRF command sets the internal trigger repetition rate.

Examples:

> Command: **INTTRIGPRF 500**{CR}{LF}
>
> Command: **INTTRIGPRF 225**{CR}{LF}
>
> Query: **INTTRIGPRF?**{CR}{LF}
> Response: **225**{CR}{LF}

Query Response Format:

> **n**
> *Where* **n** *is the trigger repetition rate in Hz, from 10 to 8000.*

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.

MANFLVL – Set RF Output Signal Levels Fine Adjustment

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
MANFLVL	▼								✗
MANFLVL?									

<u>Syntax:</u>

MANFLVL [M,] c *Sets the fine power level to c, the optional 'M' parameter selects channel 2*
        or
MANFLVL? [M]   *Returns the fine power level*

Where **c** is -1.0 to 1.0 in 0.1 dB steps

<u>Description:</u>

The MANFLVL command applies a fine adjustment to the output signal level of the ADS-B Test Set.

NOTE: The ADS-B Test Set may not meet output power level accuracy requirements if the Target power level fine adjustment is other than 0.0 dB.

<u>Examples:</u>

Command: **MANFLVL 0.5**{CR}{LF}

Command: **MANFLVL M,-0.3**{CR}{LF}

Query: **MANFLVL?**{CR}{LF}
Response: **0.5**{CR}{LF}

Query: **MANFLVL? M**{CR}{LF}
Response: **-0.3**{CR}{LF}

<u>Query Response Format:</u>

c.c{CR}{LF}

<u>Default Value:</u>

0.0

<u>Possible Error Conditions:</u>

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.

MANTLVL – **Set RF Output Signal Levels**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
MANTLVL	▼					▼			✘
MANTLVL?									

Syntax:

MANTLVL [M,]t   *Set the power level to t, the optional 'M' parameter selects channel 2*
    or
MANLVL? [M]   *Returns the power level*

Where t is 0.0 to -95.0 dBm in 0.5 dB steps

Description:

The MANTLVL command sets the output signal level from the ADS-B Test Set. The output signal level can be adjusted in fine increments using the MANFLVL command.

If this command is issued while the ADS-B TEST SET is in an operational mode, the ADS-B TEST SET will go off-line and stop generating transmissions while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. A START OPERATION event will then be generated and normal ADS-B TEST SET operation will resume. The Operation event flags are described in the OP register.

Examples:

Command: **MANTLVL T,-42.5**{CR}{LF}

Query: **MANTLVL?**{CR}{LF}
Response: -**42.5**{CR}{LF}

Query Response Format:

t.t{CR}{LF}

Default Value:

0.0

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.

MODE – **ADS-B Test Set Mode**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
MODE								✗	✗
MODE?									

<u>Syntax:</u>

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

<u>Where:</u>

n	**STANDBY**	- Disable transmissions, route outputs to dummy load and BIT Module
	PULSE	- Enter "pulse" mode
	CW	- Enter CW Output mode
	CAL	- Enter Calibration mode
	REF	- Enter Reference (1060 MHz) mode
	PLAYBACK	- Enter playback mode

<u>Description:</u>

The MODE command sets the current ADS-B Test Set 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 ADS-B Test Set uses the following default settings whenever it enters each of the following modes:

STANDBY
- Outputselect to BIT
- Disable transmission generation
- Reference output disabled
- Issue a "STOP OP"

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

PLAYBACK
- Output frequency (RGM freq. to 70.0 MHz, Ref freq to [replyfreq – 70.0])
- Outputselect to BIT
- Enable transmission generation
- Reference output disabled
- TRIG cleared from INT or EXT to OFF

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

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

REF
- Disable transmissions
- Reference LO frequency set to 1060 MHz.
- Outputselect to BIT (all rear panel outputs disabled)
- Reference output (at front of Reference Module) enabled
- Issue a "STOP OP"
- Attenuators reloaded with current information

If this command is issued while the ADS-B TEST SET is in an operational mode, the ADS-B TEST SET will go off-line and stop generating transmissions while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. A START OPERATION event will then be generated and normal ADS-B TEST SET operation will resume. The Operation event flags are described in the OP register.

Examples:

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

Command: **MODE PULSE**{CR}{LF}

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

Query Response Format:

n{CR}{LF}

where **n** *is* **STANDBY**, **REF**, **PULSE, PLAYBACK**, **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 mode attempted running a BER test.

OP – Return Operational Status

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
OP?									

Syntax:

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

Description:

The OP query returns the current operational state of the ADS-B Test Set in hexadecimal, 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* **3F**. *The values are encoded as follows:*

40	**CNT_ACTIVE**	*Set when the ADS-B Test Set is counting transmission triggers. This bit is not latched.*
20	**RG2_PRESENT**	*A second Reply Generator Module is present*
4	**STOP OP**	*Set when the ADS-B Test Set stops generating transmissions.*
2	**SUSPEND**	*Set when the ADS-B Test Set is suspended waiting for Northmark*
1	**START OP**	*Set when the ADS-B Test Set starts operation, i.e. commences transmitting.*

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

Default Value:

N/A

Possible Error Conditions:

    PARAM CNT   The wrong number of parameters was supplied.

*OPC – Operation Complete Command

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 RF output signals. The BIT selection routes RF signals within an Upconverter Module to the BIT Module instead of to the rear panel output interfaces.

    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.

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.

PLAYBACKTAB – **Playback Table**

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
PLAYBACKTAB		✘						✘	
PLAYBACKTAB?		✘						✘	

Syntax:

```
PLAYBACKTAB <from 1 to 38 (0x26) records>     Write playback table records
PLAYBACKTAB? n,c                              Read playback table records
```

Where:
  n   number of first record in hexadecimal from 0 to 0x176f.
  c   count of records to transfer in hexadecimal from 1 to 0x26.

Description:

The PLAYBACK commands are not available for Pulse mode. Refer to the RECA for Pulse mode log information.

The PLAYBACK command and PLAYBACK? query transmit ACSII records that match the record format described in the RECR command description. Since each record contains a record number there are no additional parameters needed for the PLAYBACK command. The PLAYBACK command will accept from 1 to 38 records. Multiple PLAYBACK commands can be used to load up to 6000 records into the playback memory.

The PLAYBACK table is used in the Playback mode using the TRIG COUNT command. This approach provides the user control over the type, data content, and power level of each transmission independently.

Default Value:

N/A

Possible Error Conditions:

PARAM CNT   The wrong number of parameters was supplied.

PLL – PLL Alarm Register

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 in hexadecimal 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: **18,18**{CR}{LF}

Query: **PLL?**{CR}{LF}
Response: **14,4**{CR}{LF}

Query Response Format:

l,s{CR}{LF}

Where **l** *and* **s** *are the PLL Alarm register value, from 0 to 3f. The values are encoded as follows:*

    20   **RGC2 PLL**   *The Reply Generator 2 PLL is out of lock.*
    10   **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.*
     2   **RGC PLL**   *The Reply Generator 1 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.

PREAMBLE – Set the Mode S Preamble Pulses

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
PREAMBLE	▼		▼	▼	▼	▼			✘
PREAMBLE?									

Syntax:

> **PREAMBLE [M,] p** *Sets the Mode S preamble to* **p***, the optional 'M' parameter selects channel 2*
> or
> **PREAMBLE? [M]** *Return the Mode S preamble setting*

Where:
> **p** Preamble, from 0 to f

Description:

The PREAMBLE command permits the user to directly control the content of the preamble portion of all Mode S, including ADS-B formatted, messages generated by the selected source. This capability is useful in configuring non-compliant messages for test purposes. The Mode S preamble is normally composed of four pulses; corresponding to a PREAMBLE value of **F**.   A PREAMBLE **E** command deletes the last pulse in the preamble.

NOTE: The PREAMBLE command setting is not in affect when the RANDOM 4 command is used to control the generation of preamble pulses.

Examples:

Command: **PREAMBLE F**{CR}{LF}

Command: **PREAMBLE M E**{CR}{LF}

Query: **PREAMBLE?**{CR}{LF}
Response: **f**{CR}{LF}

Query: **PREAMBLE? M**{CR}{LF}
Response: **e**{CR}{LF}

Query Response Format:

p{CR}{LF}
where **p** *is the preamble in hex.*

Default Value:

f

Possible Error Conditions:

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

PULSEPOS - Reply Pulse Position

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
PULSEPOS	▼		▼	▼	▼				✘
PULSEPOS?									

Syntax:

    PULSEPOS [M,]n   *Set reply pulse position, the optional 'M' parameter selects channel 2*
      or
    PULSEPOS?   *Return current reply pulse position for channel 1*
      or
    PULSEPOS? M   *Return current reply pulse position for channel 2*

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

Description:

The PULSEPOS command offsets the pulse position of all ATCRBS pulses and Mode-S preamble pulses from the nominal value. The timing of Mode-S 56 and 112-bit data pulses as they relate to the initial preamble pulse, P1, is unaffected.

Examples:

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

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

    Query: **PULSEPOS?**{CR}{LF}
    Response: **-200**{CR}{LF}

    Query: **PULSEPOS? M**{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 50 ns 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
PULSEWID	▼		▼	▼	▼				✘
PULSEWID?									

Syntax:

PULSEWID [M,]n   *Set reply pulse width, the optional 'M' parameter selects channel 2*
   or
PULSEWID?   *Return current reply pulse width for channel 1*
   or
PULSEWID? M   *Return current reply pulse width for channel 2*

Where:
   n   pulse width in nanoseconds, -250 to 750 in 50 ns steps

Description:

The PULSEWID command alters the pulse width of all ATCRBS and Mode-S preamble pulses from the nominal value. Mode-S 56 and 112-bit data pulses are not affected. This command alters the position of the trailing edge of the affected pulses (the leading edge is determined by the PULSEPOS command).

Examples:

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

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

Query: **PULSEWID?**{CR}{LF}
Response: **-200**{CR}{LF}

Query: **PULSEWID? M**{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 50 ns 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.

RANDOM – Set the Randomization Mask

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RANDOM	▼		▼	▼	▼	▼			✘
RANDOM?									

Syntax:

> **RANDOM [M,] r**   *Sets the randomization mask to r, the optional 'M' parameter selects channel 2*
>   or
> **RANDOM? [M]**   *Return the randomization mask setting*

Where:
>   **r**   Randomization Mask, from 0 to 7f

Description:

The RANDOM command controls the application of random trigger timing and data content to transmission messages. The Randomization Mask is defined as indicated below:

Bit	Function
0	Enable Random Delays. When set transmission timing varies randomly between the (inclusive) limits set by the DELAYMM command. When cleared transmission timing is as set by the DELAY command.
1	Enable Random Data. When set the data content of ATCRBS and Mode S messages vary randomly. The random function may be overridden in its application to the data content of Mode S DF, CA, AA, and PI (all but ME) fields. When the random function is disabled message content is as set by the TDATA command.
2	Enable Random Mode S Preamble. When set preamble pulses are randomly dropped from Mode S messages. The probability all preamble pulses are present is 0.5. When pulses are deleted, only one preamble pulse is deleted from a given message. A selected preamble pulse has a 0.125 probability of being deleted from any given message. When this random function is disabled the Mode S preamble is set by the PREAMBLE command.
3	Not Used
4	DF random override. When set the data content of the DF field is static.
5	PI random override. When set the data content of the PI field is static.
6	CA, AA random override. When set the data content of the CA and AA fields are static.

Examples:

Command: **RANDOM F**{CR}{LF}

Command: **RANDOM M E**{CR}{LF}

Query: **RANDOM?**{CR}{LF}
Response: **f**{CR}{LF}

Query: **RANDOM? M**{CR}{LF}
Response: **e**{CR}{LF}

Query Response Format:

    r{CR}{LF}

    where **r** *is the randomization mask in hex.*

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.

RAWFGAIN – **Directly set fine gain attenuator**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWFGAIN									✘
RAWFGAIN?									✘

Syntax:

    RAWFGAIN [M,]n   *Sets fine gain control to n, the optional 'M' parameter selects channel 2*
      or
    RAWFGAIN?   *Return current setting of the channel 1 attenuator*
      or
    RAWFGAIN? M   *Return current setting of the channel 2 attenuator*

    Where:
      n   raw fine gain setting, from 1 to 127

Description:

    The RAWFGAIN command directly sets the signal gain of the fine gain attenuator in each Reply Generator Module. Settings do not represent an absolute power level. This value is not modified by calibration constants.

Examples:

    Command: **RAWFGAIN 80**{CR}{LF}

    Command: **RAWFGAIN M,79**{CR}{LF}

    Query: **RAWFGAIN?**{CR}{LF}
    Response: **80**{CR}{LF}

    Query: **RAWFGAIN? M**{CR}{LF}
    Response: **79**{CR}{LF}

Query Response Format:

    n {CR}{LF}

    where **n** *is the value sent to the fine gain attenuator.*

Default Value:

    N/A – Determined automatically by temperature calibration, OUTPUTSELECT, CALABOFFSET, MODE, CALPULSEPWR, and MANFLVL command settings. Operational values of about 80 are typical and desired.

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 signal attenuators

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWLVL	✗	✗			✗	✗			✗
RAWLVL?	✗	✗			✗	✗			✗

Syntax:

> **`RAWLVL [M,]n,p`**   *Sets attenuator n to p, the optional 'M' parameter selects channel 2*
> or
> **`RAWLVL?`**   *Return current setting of all attenuators for channel 1*
> or
> **`RAWLVL? M`**   *Return current setting of all attenuators for channel 2*

Where:

n	**p**	**Function**	**Precision**
T	0 to 511	Target Attenuator	0.25 dB
S	0 to 63	Sum/Omni Attenuator	1 dB
D	0 to 255	Delta/Sum Attenuator	0.25 dB
A	0 to 7	Aux Delta/Sum Attenuator	1 dB

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.

For ADS-B purposes, the S attenuator is set to 0, the T Attenuator controls output signal level, the D attenuator is used to apply a calibration constant (see CALDATTEN), and the A attenuators are not used. Also, the Reply Generator physically located furthest to the left in the ADS-B chassis is part of signal generator channel 1.

Setting a bit in the raw level command turns on the corresponding attenuator.

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 M,D,225**{CR}{LF}

Query: **RAWLVL?**{CR}{LF}
Response: **T,422,S,0,D,24,A,0**{CR}{LF}

Query: **RAWLVL? M**{CR}{LF}
Response: **T,40,S,0,D,225,A,0**{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 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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWPAM	✗	✗			✗	✗			✗
RAWPAM?	✗	✗			✗	✗			✗

Syntax:

> **RAWPAM [M,]n** *Set the PAM either **ON** or **OFF**, the optional 'M' parameter selects channel 2*
> or
> **RAWPAM?** *Return current PAM setting for channel 1*
> or
> **RAWPAM? M** *Return current PAM setting for channel 2*

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

Description:

> The RAWPAM command controls the PAM circuit in the Reply Generator Module. When **ON,** RF energy is present at the PAM output. This command is only active in CAL or CW mode.

Examples:

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

> Command: **RAWPAM M OFF**{CR}{LF}

> Query: **RAWPAM?**{CR}{LF}
> Response: **ON**{CR}{LF}

> Query: **RAWPAM? M**{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** for Reply Generator one (primary) and **OFF** for Reply Generator two (secondary).

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWREFLVL	✗	✗				✗			✗
RAWREFLVL?	✗	✗				✗			✗

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 output signal attenuator in the Reference Module. 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: **5**{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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWRGCFREQ									✘
RAWRGCFREQ?									

Syntax:

RAWRGCFREQ [M,]nn.nn   *Set RGC output frequency, the optional 'M' parameter selects channel 2*
    or
RAWRGCFREQ?   *Return current RGC output frequency for channel 1*
    or
RAWRGCFREQ? M   *Return current RGC output frequency for channel 2*

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 frequency of signals generated within a Reply Generator Module. Note that the REPLYFREQ command resets the primary RGC frequency to 70 MHz and the secondary RGC frequency to an offset (from 70 MHz) as set by the FREQOFFSET command.

Examples:

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

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

Query: **RAWRGCFREQ?**{CR}{LF}
Response: **70.40**{CR}{LF}

Query: **RAWRGCFREQ? M**{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 (69.50 for secondary RGC)

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 Upconverter Attenuators**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RAWUCLVL	✗	✗			✗	✗			✗
RAWUCLVL?									

Syntax:

 RAWUCLVL [M,]n   *Sets the Upconverter attenuator to* **n***, the optional 'M' parameter selects channel 2.*

  or

 RAWUCLVL?   *Return current Upconverter attenuator settings*

Where:
 n   is the Upconverter attenuator value, from 0 to 31

Description:

 The RAWUCLVL command directly sets the attenuators within each Upconverter. 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.

Examples:

 Command: **RAWUCLVL 21**{CR}{LF}

 Command: **RAWUCLVL M,4**{CR}{LF}

 Query: **RAWUCLVL?**{CR}{LF}
 Response: **21**{CR}{LF}

Query Response Format:

 n {CR}{LF}
 Where **n** *is Upconverter attenuator value, from 0 to 31.*

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.

READREPLY – Read Reply

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
READREPLY								✗	✗

Syntax:

READREPLY [B]   *The optional B parameter selects a compact binary output format to increase system throughput. This parameter is required for GPIB use.*

When controlling the ADS-B Test Set through the GPIB interface, use the READREPLY B command. This limits the reply size to less than 7,700 binary characters, all placed upon a single line. Without any parameters the reply length can reach 51,300 characters on up to 2565 lines.

Description:

Replies are reported in the order received with a millisecond timestamp provided by the BIT Module. The timestamp algorithm requires successive detected input transmissions to be spaced less than 65 seconds. Executing a READREPLY command at least once a minute guarantees that all timestamps are accurate.

The READREPLY query transmits the detected reply table, generated within the BIT Module, and presents it to the user. The reply tables can be long and cryptic so two output formats are available. The reply table is emptied each time it is read. Reading the reply table does not interrupt the detection and capture of new replies. If the reply table overflows the data lost flag is set on the next READREPLY response. When the reply table overflows the unread data is discarded and is replaced by new detected reply information.

The read table contains 7695 bytes. Each 112 bit Mode S transmission detected consumes 17 bytes giving a maximum number of detected transmissions of 452 for each READREPLY command. Each 56 bit Mode S transmission detected consumes 10 bytes giving a maximum number of detected transmissions of 769 for each READREPLY command. Each ATCRBS transmission detected consumes 6 bytes giving a maximum number of detected transmissions of 1,282 for each READREPLY command. Each Mode 4 transmission detected consumes 3 bytes giving a maximum number of detected transmissions of 2,565 for each READREPLY command.

Only those data sequences that generally fit within the pulse timing and pulse width formats established for ATCRBS or Mode S signals are recorded by the ADS-B Test Set. Data that is determined to be extraneous and non-standard is discarded. The data reported through the READREPLY process provides a good indication of reply signal activity. However, the user is advised to respect the limitations of this process and to use it with caution when testing operationally critical equipment.

The detection of replies is controlled by the CAPTREPLY command.

The READREPLY query cannot execute while a BER test is running.

The READREPLY query will erase any pending reply created by a RECR? R command.

The 'B' parameter is required on the GPIB interface.

Examples:

Query:	**READREPLY**{CR}{LF}	
Response:	**ModeS (12947) 58000002 e0f316**{CR}{LF}	*Mode S DF=11, AA=2; 12,947 ms after last BIT Module restart*
	ATCRBS (12957) 0006{CR}{LF}	*ATCRBS 0006; 10 ms later*
	ATCRBS (12960) 0010 SPI{CR}{LF}	*ATCRBS 0010, SPI; 3 ms later*
	Mode4 (49458){CR}{LF}	*Mode 4; 36,498 ms later*
	ATCRBS (49478) 0012 X{CR}{LF}	*ATCRBS 0012, X; 20 ms later*
	ModeS (49517) 89000052 87654321 abcdef 614b83{CR}{LF}	*Mode S DF=17, AA=52, ME=87654321abcdef, PI=0; 39 ms later*
	ModeS (49532) 89000052 87654321 abcdef 614b83{CR}{LF}	*The same pattern repeated 15 ms later*

Query:	**READREPLY**{CR}{LF}	
Response:	**Lost Data**{CR}{LF}	*The Reply buffer overflowed since the last READREPLY command*
	ATCRBS (65385148) 0014 X SPI{CR}{LF}	*ATCRBS 0014, X, SPI*
	Mode4 (65385162){CR}{LF}	*Mode 4*
	ATCRBS (65385517) 0016 Emerg{CR}{LF}	*ATCRBS 0016 Emergency*
	ModeS (65386359) 58000007 1f3f29{CR}{LF}	*Mode S DF=11, AA=7*
	ATCRBS (65435148) 0020{CR}{LF}	*ATCRBS 0020*

Query:	**READREPLY**{CR}{LF}	
Response:	**ATCRBS (65397543) 1234 SPI**{CR}{LF}	*single shot ATCRBS 1234, SPI; 65,397,543 ms after last BIT Module restart*

Binary Mode Examples:

These examples match the examples above.

Query:	**READREPLY B**{CR}{LF}	
Response:	**44<space>**	*2 ASCII characters giving the binary length in hex followed by an ASCII space char (0x20)*
	00,	*Lost Flag*
	00, 00,	*Timestamp msw*
	0A, 93, 32, 02, 00, 00, 58, 16, F3, E0,	*Mode S DF=11, AA=2; 12,947 ms after last BIT Module restart*
	06, 9D, 32, 06, 00, 00,	*ATCRBS 0006; 10 ms later*
	06, A0, 32, 08, 20, 00,	*ATCRBS 0010, SPI; 3 ms later*
	03, 32, C1,	*Mode 4; 36,498 ms later*
	06, 46, C1, 0A, 10, 00,	*ATCRBS 0012, X; 20 ms later*
	11, 6D, C1, 52, 00, 00, 89, 21, 43,	*Mode S DF=17, AA=52,*
	65, 87, EF, CD, AB, 83, 4B, 61,	*ME=87654321abcdef, PI=0; 39 ms later*
	11, 7C, C1, 52, 00, 00, 89, 21, 43,	*The same pattern repeated 15 ms*
	65, 87, EF, CD, AB, 83, 4B, 61	*later*

Query:	**READREPLY B**{CR}{LF}	
Response:	**22<space>**	*2 ASCII characters giving the binary length in hex followed by an ASCII space char (0x20)*
	01,	*Lost Flag. The Reply buffer overflowed since the last READREPLY command*
	E5, 03,	*Timestamp msw*
	06, BC, B2, 0C, 30, 00,	*ATCRBS 0014, X, SPI*
	03, CA, B2,	*Mode 4*
	06, 2D, B4, 0E, E0, 07,	*ATCRBS 0016 Emergency*
	0A, 77, B7, 07, 00, 00, 58, 29, 3F, 1F,	*Mode S DF=11, AA=7*
	06, 0C, 76, 10, 00, 00	*ATCRBS 0020*
Query:	**READREPLY B**{CR}{LF}	
Response:	**09<space>**	*2 ASCII characters giving the binary length in hex followed by an ASCII space char (0x20)*
	00,	*Lost Flag*
	E5, 03,	*Timestamp msw*
		06, 0C, 76, 10, 00, 00 *ATCRBS 0020*
	1234 2	*ATCRBS def 0: code = 1234, SPI*
	40 0{CR}{LF}	*1 occurrence of ATCRBS def 0*
Query:	**READREPLY**{CR}{LF}	
Response:	**09<space>**	*2 ASCII characters giving the binary length in hex followed by an ASCII space char (0x20)*
	00,	*Lost Flag*
	E5, 03,	*Timestamp msw*
	06, 27, E3, 9C, 22, 00	*ATCRBS 1234, SPI; 65,397,543 ms after last BIT Module restart*

Query Response Binary Format:

> **[ASCII hexadecimal byte count of binary bytes followed by one space (0x20)]**
> **[Binary 8 bit char 0:1 Data Lost Flag]**
> **[Binary 16 bit word timestamp top 16 bits, lsb first]**
> **{ list of detected transmissions record fields, in the order received**
> **either Mode4: [Binary char 0x03][Binary 16 bit word timestamp bottom 16 bits, lsb first]**
> **or ATCRBS: [Binary char 0x06] [Binary 16 bit word timestamp bottom 16 bits, lsb first] [Binary 24 bit word ATCRBS code, lsb first]**
> **or ModeS 56 bit: [Binary char 0x0a][Binary 16 bit word timestamp bottom 16 bits, lsb first] [Binary 32 bit word ModeS code, lsb first] [Binary 24 bit word ModeS code, lsb first]**
> **or ModeS 112 bit: [Binary char 0x11][Binary 16 bit word timestamp bottom 16 bits, lsb first] [Binary 32 bit word ModeS code, lsb first] [Binary 32 bit word ModeS code, lsb first] [Binary 24 bit word ModeS code, lsb first] [Binary 24 bit word ModeS code, lsb first]**
> **}**

The response starts with an ASCII hexadecimal integer which provides the binary size in bytes followed by a space. The next character is the Data Lost Flag which indicates if the BIT Module table overflowed since the last REPLYDATA query. The following two characters are the most significant 16 bit of the 32 bit timestamp for the first record. The next character is the type of a record which is followed by two characters which provide the list significant 16 bits of the 32 bit timestamp. Note that if this field is smaller than it was in the last record the most significant 16 bits of the timestamp should be incremented. The following characters vary depending upon the record type.

When an ATCRBS transmission was detected the 24 bit data field contains the ATCRBS code in bits [11:0], the X pulse in bit [12], the SPI pulse in bit [13], and the emergency response pulses in bits [18:13].

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.
	The B parameter was missing when using the GBIB interface.
INTERNAL	The data received from the BIT Module was corrupted.
OPTION CONFLICT	READREPLY attempted while BER test is running

RECA – **Read Number of Transmit Log Records Available**

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RECA?									

Syntax:

    RECA?   *Return number of transmit log records available*

Description:

The RECA? query returns the number of transmit log records available to be read in hexadecimal. The maximum storage capacity of the ADS-B Test Set is 0x17ff (6143) records. If the transmit log record memory overflows it is flushed, resulting in the loss of 0x1800 (6144) log records.

The RECA? query always returns 0 in Playback mode.

Examples:

    Query: **RECA?**{CR}{LF}
    Response: **1e3**{CR}{LF}

Query Response Format:

    h{CR}{LF}
    Where **h** *is the number of transmit log records available to be read, in hex.*

Default Value:

    n/a

Possible Error Conditions:

    PARAM CNT   The wrong number of parameters was supplied.

RECR – **Read transmit log records**

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RECR?						✗		✗	

Syntax:

> **RECR? [B,][R,]h**   *Read transmit log records*

Where:

B	Optional parameter to select binary mode.
R	Optional parameter to enable read ahead.
h	Number of records to be read, in hex. (1-80 in binary mode, 1-26 in ASCII mode)

Description:

The RECR? query reads the transmit log. When records are read they are removed from the log. The maximum storage capacity of the ADS-B Test Set is 0x1fff (8191) records. If the transmit log record memory overflows it is flushed, resulting in the loss of 0x2000 (8192) log records.

The optional 'B' parameter selects Binary output mode. This cuts the required communication channel bandwidth in half, increasing the number of records per second that can be transmitted.

The optional 'R' parameter instructs the ADS-B Test Set to prepare another RECR? reply at the conclusion of the current query. This allows the ADB-S Test Set to get a head start on the next RECR? query, reducing command latency and thereby increasing the number of records per second that can be transmitted. Replies generated using Read ahead use the Binary mode flag and the number of record parameter of the previous RECR? query.

NOTE: The Read ahead reply will be erased by a READREPLY command.

If there are fewer records available than requested in the query and ADS-B Test Set will only send the number of records available.

Examples:

Query:	**RECR? 2**{CR}{LF}	
Response:	**A,02,**	ASCII, 2 records
	0,0,	1st Record, number 0, Time from previous trigger 0 μs
	59c0,	Channel 1: ATCRBS, -50 dBm
	28,40f,	1 μsec delay, Code: 2017 (0x40f)
	9a50,	Channel 2: Pulse, -45.5 dBm
	50,7d0,	2 μsec delay, 50 μsec pulse width
	1,a0,	2nd Record, number 1, time from previous trigger 160 μs
	79cf,	Channel 1: Mode S 112 bit, -50 dBm, Preamble = F
	fa0,	100 μsec delay
	88123456123456789abcde654321,	Transmitted data
	030000000000000,	Data bit 3 is dropped
	3a5f,	Channel 2: Mode S 56 bit, -45.4 dBm, Preamble = F
	190,88123456fedcba{CR}{LF}	10 μsec delay, transmitted data

Query Response Format:

> **<A or B>,<2 digit hex count>[<size>]<First record> <Last record>[**{CR}{LF}**]**

Where **A** indicates ASCII formatted records and **B** indicates Binary formatted records. All values are hexadecimal in ASCII mode.

The 2 digit hex count is always sent in ASCII. Note that the comma after the 2 digit hex count is not transmitted in Binary mode.

The size is only transmitted in Binary mode. It is a 16 bit number indicating the total number of 16 bit words in the entire response.

Record Format

<Record Number><Record Time><Chan 1 Transmission><Chan 2 Transmission>

In ASCII mode Record Number and Record Time separated by commas. In Binary mode the Record Number is a 16 bit binary value and the Record Time is a 32 bit value where only the low order 24 bits are used.

The Record Number increments for each record and can be reset by the RECRES command.

The Record Time indicated the number of microseconds after the previous record.

Channel Transmission

<Type>[<position><type dependent data>]

The type is a 16 bit value. It contains the following fields:

Bits	Value	Function
15:13	0	Off
	1	Mode S 56 bit
	2	ATCRBS
	3	Mode S 112 bit
	4	Pulse
12:4		Output power level in 0.5 dB steps from -95.0 (0x142) to 0.0 (0x0)
3:0		Mode S Preamble Pulses

If the type is not OFF the Position and Type dependent data will be sent.

The position is a 16 bit value that specifies the delay from the trigger to the start of transmission in 25 ns steps.

Type dependent data:

ATCRBS   One 16 bit value which contains the ATCRBS code. In ASCII this is sent as a three digit hex value.

Mode S 56   Four 16 bit values which contain the Mode S code sent. The most significant 8 bits of the last 16 bit value are not used. In ASCII this is sent as a single 56 bit hex value.

Mode S 112   Seven 16 bit values which contain the Mode S code sent followed by eight 8 bit values that contain the dropped bit numbers. In ASCII this is sent as a 112 bit hex value followed by a 64 bit hex value. The dropped bit values are 0 for none and from 1 to 112 to indicate a dropped bit. Note that inverted bits are indicated in the Mode S code.

Pulse   One 16 bit value which contains the pulse width in 25 ns steps.

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 or there are no transmit log records available.

RECRES – Record Log Reset

Command	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
RECRES						✘			

Syntax:

    RECRES   *Reset transmit log record counters, flush log*

Description:

The RECRES command empties the transmit log and resets the record number to zero. If the TRIG is set to COUNT it will be changed to OFF.

Examples:

    Command: **RERES**{CR}{LF}

Default Value:

    n/a

Possible Error Conditions:

    PARAM CNT   A parameter was supplied.

REFFREQ – Set Reference Frequency

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
REFFREQ	✗	✗	✗	✗		✗			✗
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: **1031.0**{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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
REFLVL	✘	✘				✘			✘
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 1 dB steps.

Description:

The REFLVL command sets the level of the Reference 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: **5**{CR}{LF}

Query Response Format:

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

Default Value:

–4

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
REFOE	✗	✗				✗			✗
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 Output Frequency of the ADS-B Test

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 output channel 1. The FREQOFF adjusts the frequency of channel 2 to an offset from the REPLYFREQ entry. The primary (channel 1) Reply Generator signal is forced to 70 MHz, and the Reference Module signal is set to the appropriate frequency to generate the ADS-B Test Set 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 can return 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 ADS-B TEST SET is in an operational mode, the ADS-B TEST SET will go off-line and stop generating transmissions while it updates its internal hardware with the new values. A STOP OPERATION event will be activated. A START OPERATION event will then be generated and normal ADS-B TEST SET 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: **1081.0**{CR}{LF}

Query Response Format:

    nnnn.n{CR}{LF}
    Where **nnnn.n** *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.

REPSEL – RF Signal Source Select

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
REPSEL								✗	✗
REPSEL?									

Syntax:

REPSEL s   *Set RF Signal Source*
   or
REPSEL?   *Return RF Signal Source*

Where:

s is **EXT** (into J30 on the rear panel of the ADS-B Test Set), **1,**or **2**

Description:

The REPSEL command selects the RF interface for signal detection and analysis within the BIT Module of the ADS-B Test Set. Internal BIT processes automatically control the REPSEL setting. Users who wish to monitor signals from external transmitter equipment must use the EXT selection. If this selection is changed, through the implementation of a BIT or calibration function, it will be restored once the interrupting process terminates.

The REPSEL command cannot execute while a BER test is running.

Examples:

Command: **REPSEL EXT**{CR}{LF}

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

Query Response Format:

s{CR}{LF}
Where **s** *is* **EXT**, **1**, *or* **2**

Default Value:

EXT

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   REPSEL attempted while BER test is running.

RST – Reset

Command	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
*RST									

Syntax:

*RST   *Reset the ADS-B Test Set*

Description:

The *RST command causes the ADS-B Test Set 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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 ADS-B Test Set was powered on or reset (via the *RST command or a watchdog timeout). This value is 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 ADS-B Test Set has been operational.*

Default Value:

    N/A

Possible Error Conditions:

    PARAM CNT   The wrong number of parameters was supplied.

SQENABLE – **Squitter Enable**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
SQENABLE	▼		▼	▼	▼	▼			✘
SQENABLE?									

Syntax:

SQENABLE [M,]p,e   *Set squitter enable*
   or
SQENABLE? [M]   *Return squitter enables*

Where:
p   = squitter select (**1** to **7)**
e   = **ON** or **OFF**

Description:

The SQENABLE command enables the transmission of squitter signals from each generator channel. Up to seven different squitter signals may be generated by each channel. Squitter data is used when the channel type is set to SQUITTER and the SQENABLE for at least one squitter type is on. The SRATE command sets the rate each squitter is transmitted.

Examples:

Command: **SQENABLE 2,ON**{CR}{LF}

Command: **SQENABLE M,7,OFF**{CR}{LF}

Query: **SQENABLE?**{CR}{LF}
Response: **1,ON,2,ON,3,OFF,4,OFF,5,ON,6,ON,7,OFF**

Query Response Format:

1,<ON or OFF>,2,<ON or OFF>,3,<ON or OFF>,4,<ON or OFF>,5,<ON or OFF>,6,<ON or OFF>,7,<ON or OFF>{CR}{LF}

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.

SQUITTER – Squitter Transmit Data

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
SQUITTER	▼		▼	▼	▼	▼			✘
SQUITTER?									

Syntax:

    SQUITTER [M,]p,sl,sl,ss,ss   *Set transmit data Mode S 112 bit*
      or
    SQUITTER? [M]   *Return transmit data settings*

    Where:
    p   = **1ODD, 1EVEN, 2ODD, 2EVEN, 3, 4, 5, 6,** or **7**
    sl   32 bit hexadecimal code
    ss   24 bit hexadecimal code

Description:

The SQUITTER command sets the transmit data for all Squitter transmissions. Squitter 1 and Squitter 2 have separate odd and even patterns, which are broadcast on alternate transmissions, and are useful for implementing airborne and ground position transmissions. Squitter 3 to 7 use a single pattern. Squitter transmissions are enabled when the channel TYPE is set to SQUITTER and the SQENABLE for a given pattern is ON. The SRATE command sets the rate each squitter is transmitted.

Note that the PCC will calculate and apply the proper CRC for the data provided. The data used for this command should be before the CRC is calculated.

Examples:

    Command: **SQUITTER M,2EVEN,8801305E,12345678,654321,000000**{CR}{LF}

    Query: **SQUITTER?**{CR}{LF}
    Response: **1ODD,8801305E,543bc54f,ad4580,eb54dc**
                     1EVEN,8801305E,543bc54f,eb54dc,ad4580,
                     2ODD,8801305E,ad454580,0B0DE0,123456,
                     2EVEN,8801305E,8765432A,C23456,000000,
                     3,8801305E,12345678,654321,FEDCBA,
                     4,8801305E,87654321,FEDCBA,654321,
                     5,8801305E,acbbcade,eb54dc,ad4580,
                     6,8801305E,ad454580,ad4580,eb54dc,
                     7,8801305E,8765432A,C23456,0B0DE0{CR}{LF}

Query Response Format:

    1ODD,sl,sl,ss,ss,1EVEN,sl,sl,ss,ss,2ODD,sl,sl,ss,ss,2EVEN,sl,sl,ss,ss,
    3,sl,sl,ss,ss,4,sl,sl,ss,ss,5,sl,sl,ss,ss,6,sl,sl,ss,ss,7,sl,sl,ss,ss{CR}
    {LF}

Possible Error Conditions:

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

SRATE – **Squitter Transmit Rate**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
SRATE	▼		▼	▼	▼	▼			✖
SRATE?									

Syntax:

>**SRATE [M,]p,l,h**   *Set squitter transmit rate*
>   or
>**SRATE? [M]**   *Return squitter transmit rates*

Where:
>**p**   = squitter select (**1** to **7)**
>**l**   **=** minimum spacing in ms (**100** to **6000**)
>**h**   **=** maximum spacing in ms (**100** to **6000**)

Description:

The SRATE command sets the rate each squitter is transmitted. Squitter data is used when the channel type is set to SQUITTER and the SQENABLE is on. The minimum spacing must not be greater than the maximum spacing or the command will fail.

Examples:

Command: **SRATE 2,400,600**{CR}{LF}

Command: **SRATE M,1,1300,1500** {CR}{LF}

Query: **SRATE?**{CR}{LF}
Response: **1,400,600,2,400,600,3,400,600,4,400,600,5,2400,2600,6,400,600,
7,2400,2600**

Query Response Format:

1,min,max,2,min,max,3,min,max,4,min,max,5,min,max,6,min,max,7,min,max{CR}
{LF}

Default Value:

400,600

Possible Error Conditions:

PARAM CNT	The wrong number of parameters was supplied.
BAD PARAM	A supplied parameter is out of the acceptable range or the minimum spacing is greater than the maximum spacing.

SRE - Service Request Enable

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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 a mask bit to a one enables service requests for that condition. Setting a mask bit to zero disables that service requests. The service request mask is set to zero on power-up or when a *Device Clear* command is received.

NOTE: The ADS-B Test Set 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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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: **9**{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.

TDATA – **Transmit Data**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
TDATA	▼		▼	▼	▼	▼			✘
TDATA?									

Syntax:

TDATA [M,]ATCRBS,o4   *Sets the ATCRBS transmit data*
TDATA [M,]S56,h8,h6   *Sets the 56 bit Mode S transmit data*
TDATA [M,]S112,h8,h8,h6,h6   *Sets the 112 bit Mode S transmit data*
TDATA [M,]PULSE,d   *Sets the transmit pulse width*
   or
TDATA? [M,]   *Returns the current transmit data setting*

Where:
  o4   Octal value, 4 digit max
  h8   Hexadecimal value, 8 digit max
  h6   Hexadecimal value, 6 digit max
  d   Decimal pulse width from 1 to 65535, in units of 25 nSec.

Description:

The TDATA command controls all pulsed output waveforms for transmit types ATCRBS, S56, S112, and Pulse. Transmit type Squitter uses the SQUITTER command to control transmit data content.

The ATCRBS selection encodes only the transmission of the Code pattern pulses. Transmission of the "X" and "SPI" bits has not been instituted. Bit designation and pulse transmission timing is the same as in specified in ICAO Annex 10. For instance, an ATCRBS setting of 1010 would generate an A1 pulse and a C1 pulse at the first two programmable pulse positions in an ATCRBS transmission.

Note that the PCC will calculate and apply the proper CRC for the data provided. The data used for this command should be before the CRC is calculated.

Examples:

Command: **TDATA ATCRBS,4321**{CR}{LF}

Command: **TDATA S56,1234ABCD,FEDCBA**{CR}{LF}

Command: **TDATA S112,12345678,1234ABCD,FEDCBA,0**{CR}{LF}

Command: **TDATA PULSE,40**{CR}{LF}   This specifies a 1 uSec. pulse.

Query: **TDATA?**{CR}{LF}
Response: **ATCRBS,4321,S56,1234ABCD,FEDCBA,S112,12345678,1234ABCD,FEDCBA, 000000,PULSE,40**{CR}{LF}

Query Response Format:

`ATCRBS,o4,S56,h8,h6`,**`S112,h8,h8,h6,h6,PULSE,d`**

Where **`o4, h8, h6,`** and **`d`** are as defined above for the command.

Default Value:

`ATCRBS,0,S56,0,0`,**`S112,0,0,0,0,PULSE,40`**

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	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
TRIG	▼		▼	▼	▼				✘
TRIG?									

Syntax:

> **TRIG n [t]**   *Sets the reply generation trigger source*
>   or
> **TRIG?**   *Returns the current trigger source setting*

Where:
> **n**   Trigger mode, as follows
> > "**OFF**"   - Trigger disabled
> > "**SLAVE**" - Use pulse triggers from the TRIG IN interface (slave unit timing)
> > "**INT**"   - Use internally generated triggers
> > "**EXT**"   - Use external triggers from the TRIG IN interface (master unit timing)
> > "**COUNT**" - Use internally generated triggers to generate the number of triggers specified by 't'.
> **t**   Trigger count from 1 to 6,000. Only applicable for n = COUNT.

Description:

The TRIG command determines the trigger mode and source.

To synchronize transmissions from multiple ADS-B instruments one unit is selected as a master. The TRIG selection of the master unit is set to INT, EXT, or COUNT. All slave units should use the SLAVE trigger mode with a trigger signal cabled into the TRIG IN interface from the master chassis SYNC OUT interface.

The record log is reset (or cleared) when a TRIG COUNT t command is received. The CNT_ACTIVE bit of the OP? query is set while the ADS-B Test Set is sending counted triggers.

When either channel has a squitter enabled, the active triggers are generated by the squitter timing logic.

TRIG COUNT and TRIG SLAVE are used in playback mode. It is up to the user to specify a count that matches the size of the playback table.

Examples:

Command: **TRIG SLAVE** {CR}{LF}

Command: **TRIG COUNT 1000** {CR}{LF}

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

Query Response Format:

N [t]

Where **n** is **OFF, SLAVE**, **INT**, **EXT,** or **COUNT** and **t**   is the trigger count.

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.
OPTION CONFLICT	TRIG INT or TRIG EXT attempted while MODE = PLAYBACK.

TRIGPW - Trigger Pulse Width

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	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.

> **Error! Reference source not found.**

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

Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
*TST?		✗	✗	✗	✗	✗			✗

Syntax:

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

Description:

The *TST query forces the ADS-B Test Set 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 1×10^{-3}.

The ADS-B Test Set 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.

TYPE - **Transmit Type**

Command or Query	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
TYPE	▼		▼	▼	▼	▼			✘
TYPE?									

Syntax:

TYPE [M,]t   *Set transmit type*
   or
TYPE? [M]   *Return transmit type*

Where:

T = OFF, ATCRBS, **S56, S112, PULSE,** or **SQUITTER**

Description:

The TYPE command sets the transmission type. Setting either channel to SQUITTER will disable the TRIG command settings and generate triggers as configured by the SRATE and SQENABLE commands using data configured by the SQUITTER command. If one channel is configured as a SQUITTER and the other is not configured as a SQUITTER the non SQUITTER channel will be triggered by the SQUITTER channel. Both channels can generate SQUITTER signals independent of each other.

Examples:

Command: **TYPE,ATCRBS**{CR}{LF}

Command: **TYPE M, SQUITTER**{CR}{LF}

Query: **TYPE?**{CR}{LF}
Response: **ATCRBS** {CR}{LF}

Query: **TYPE? M**{CR}{LF}
Response: **SQUITTER** {CR}{LF}

Query Response Format:

OFF, ATCRBS, **S56, S112, PULSE,** or **SQUITTER** {CR}{LF}

Possible Error Conditions:

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

WAI – Wait to Continue Command

Command	Standby Mode	Pulse Mode	CW Mode	Cal Mode	Ref Mode	Playback Mode	Cal. Write Protect	BERT Running	Xilinx Load Fail
*WAI									

Syntax:

*WAI   *Wait to Continue*

Description:

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

Currently, the *WAI command has no effect unless the ADS-B Test Set 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

*STB:

7	6	5	4	3	2	1	0
INT ERROR	RQS/MSS	ESB	MAV	ALARM	---	PLL ERROR	RECAL SUGGESTED

PLL:

7	6	5	4	3	2	1	0
---	---	RGC2 PLL	70BIT PLL	1100BIT PLL	---	RGC PLL	REF PLL

ALARM:

7	6	5	4	3	2	1	0
---	---	---	TRIG 2 ALERT	TRIG 1 ALERT	CAL FAILED	BIT TEMP ALARM	BIT PWR ALARM

*ESR:

7	6	5	4	3	2	1	0
PON	USER REQ	CMD ERROR	EXEC ERROR	DEV ERROR	QUERY ERROR	REQ CONTROL	OP COMPLETE

OP:

6	5	4	3	2	1	0
CNT ACTIVE	RGC2 PRESENT	---	---	STOP OP	SUSPEND	START OP

CMDSTS:

10	9	8	7	6	5	4	3	2	1	0
AMP CONFLICT 2	---	AMP CONFLICT	OPTION CONFLICT	WRITE PROTECT	TIME OUT	NOT POSSIBLE	WRONG MODE	BAD PARAM	PARAM CNT	NO COMMAND

INT ERR:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
USER PROG ROM BAD	USER CAL BAD	USER XILINX BAD	---	BER RGC1 FAIL	FACTORY CAL BAD	XILINX LOAD FAIL	PAM1 ATTEN FAILED	---	---	DS1 ATTEN FAILED	---	TGT1 ATTEN FAILED	---	---	---
---	---	FACTORY XILINX BAD	---	BER RGC2 FAIL	XILINX SRAM FAIL	---	PAM2 ATTEN FAILED	---	---	DS2 ATTEN FAILED	---	TGT2 ATTEN FAILED	---	---	---
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16