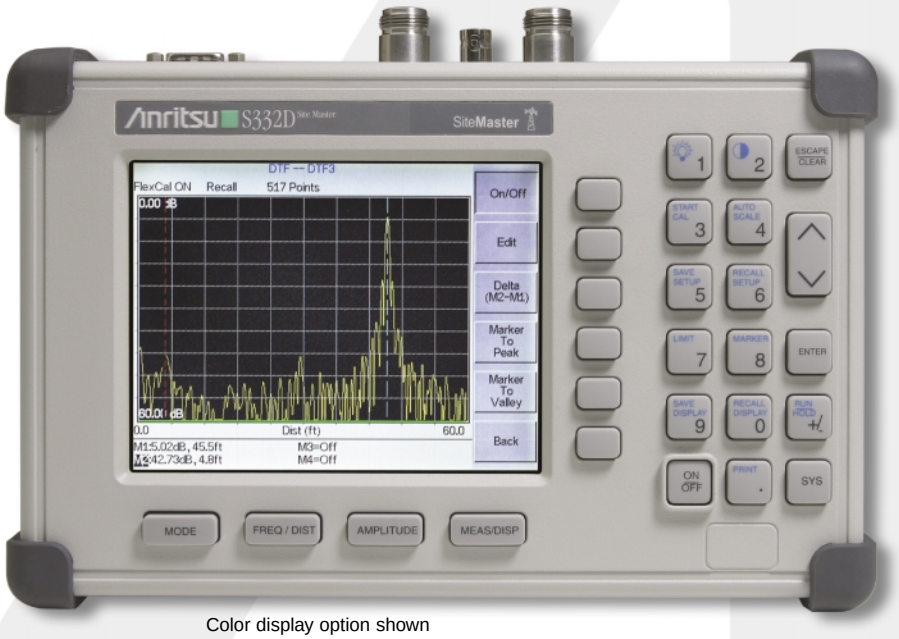
Anritsu

Site Master™

S331D/S332D

Cable and Antenna Analyzer

Site Master is the preferred cable and antenna analyzer of wireless providers, contractors and installers.



Color display option shown

Programming Manual

SiteMaster | SpectrumMaster | CellMaster

WARRANTY

The Anritsu product(s) listed on the title page is (are) warranted against defects in materials and workmanship for one year from the date of shipment.
Anritsu's obligation covers repairing or replacing products which prove to be defective during the warranty period. Buyers shall prepay transportation charges for equipment returned to Anritsu for warranty repairs. Obligation is limited to the original purchaser. Anritsu is not liable for consequential damages.

LIMITATION OF WARRANTY

The foregoing warranty does not apply to Anritsu connectors that have failed due to normal wear. Also, the warranty does not apply to defects resulting from improper or inadequate maintenance by the Buyer, unauthorized modification or misuse, or operation outside the environmental specifications of the product. No other warranty is expressed or implied, and the remedies provided herein are the Buyer's sole and exclusive remedies.

TRADEMARK ACKNOWLEDGEMENTS

Site Master is a trademark of Anritsu Company.

NOTICE

Anritsu Company has prepared this manual for use by Anritsu Company personnel and customers as a guide for the proper installation, operation, and maintenance of Anritsu Company equipment and computer programs. The drawings, specifications, and information contained herein are the property of Anritsu Company, and any unauthorized use or disclosure of these drawings, specifications, and information is prohibited; they shall not be reproduced, copied, or used in whole or in part as the basis for manufacture or sale of the equipment or software programs without the prior written consent of Anritsu Company.

UPDATES

Updates to this manual, if any, may be downloaded from the Anritsu internet site at: http://www.us.anritsu.com.

January 2008 10580-00100

Revision:C

Table of Contents

Programming Overview

Warning: The Anritsu Site Master Serial Port Commands are not backward compatible with earlier Site Master Models.

This programming menu is written exclusively for Anritsu Site Master model S331D, S332D, S311D, and S312D. It is intended for firmware 5.00 and above. For information on firmware upgrade, please contact your local Anritsu service center.

General Description

The Site Master must first be set into "remote" mode for communication with a computer. Remote mode differs from normal repetitive sweep and single-sweep modes. During remote mode, the Site Master suspends normal operations and attends to the serial port. The front panel display indicates when the Site Master is in remote mode.

Once in remote mode, you send a series of control bytes and associated data to the Site Master. These control byte sequences command the Site Master to perform various functions and activities. The serial port supports virtually all features accessible from the keypad. The only exception is the printer, which requires connection to the same 9 pin connector on the Site Master rear panel.

To complete the communication session, send the control byte to exit remote mode. Site Master resumes normal operations. You may also exit the remote mode by using the ESCAPE/CLEAR key.

Cabling

Serial communications take place via the 9 pin connector on the back of the Site Master. The Site Master is a DTE-type serial device and therefore requires a "null modem" cable for communication with a computer, which is also a DTE device. We provide a suitable cable with your Site Master. (Anritsu part number 800-441)

Serial Communication Parameters

When turned on, the Site Master communicates at a default baud rate of 9600. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used. The Set Baud Rate serial command Control Byte #197 (C5h) can be used to change the baud rate to other common baud rates. It can be reset by turning the Cell Master off.

Communications Error Checking

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. The expected number of response bytes for each control byte (listed in the control byte description section of this manual) works well for responses coming from the Site Master. For data streams going to the Site Master, the "watch dog timer" protects against interrupted transmissions by aborting a control byte sequence if the inter-byte time limit is exceeded.

Parameter Validation

The Site Master validates input parameters for each control byte sequence. If the input parameters are out of range or invalid, the Site Master notifies the computer by sending Parameter Error Byte #224 (E0h). The Site Master discards the received data and waits for the next control byte.

Entering Remote Mode

Send the Enter Remote Mode Byte #69 (45h) to the Site Master to enter remote mode at the end of a sweep. Send the Enter Remote Mode Immediately byte #70 (46h) to enter remote mode in the middle of a sweep.

The Site Master's serial port buffer is one byte wide. No internal buffer exists, so waiting for the unit's response is essential. If the Site Master is not in remote, sending a second byte overwrites the original byte commanding it to go into remote. If you send control byte #69, you must wait until the end of the sweep. If you send control byte #70, the unit will enter remote mode as soon as it receives the byte. Note that this means that data stored for the current sweep may be incomplete.

Once you receive the response string from Site Master, you are in remote mode.

Exiting Remote Mode

Send the Exit Remote control byte #255 (FFh) to the Site Master. Site Master sends a response byte of 255 (FFh) then exits remote mode. Remote mode can also be exited by pressing the ESCAPE/CLEAR key.

Lifetime of Changes to Site Master Operating Parameters

System parameters changed during remote mode remain changed for normal operation. They are not automatically written to the non-volatile EEPROM. Turning off power erases the changed settings.

If you want the changes saved, you must save the change to one of the setup memories. Use either the run-time setup (location 0, which holds the power-on defaults) or one of the nine saved setups. See control byte #18 (12h) for details.

Write Cycle Limitation of EEPROM

The EEPROM, used to store calibrations, setups and traces has a guaranteed lifetime of at least 100,000 write cycles and an unlimited number of read cycles. The write cycle limitation is for a specific location. For example, you can store setup #1 100,000 times and setup #2 100,000 times, etc.

It is for this reason we do not automatically store the changed system parameters to EEPROM. Instead, we provide a means of changing the operating parameters independent of this limitation.

Be aware of the EEPROM write cycle limitation when programming the Site Master. Keep the number of write cycles to a minimum.

Documentation Conventions

Through this manual the following conventions will be observed:

Numeric Representation:

Hexadecimal numbers are represented with the suffix h. For example, the decimal number 255 is represented in hexadecimal as FFh.
Binary numbers are represented with the suffix b. For example, the decimal number 2 is represented in binary as 10b.
Decimal numbers are represented with the prefix # when referring to a control byte (command byte) and without a prefix or suffix in all other cases.

Bit Positions:

When enumerating bits in a byte, bit 0 will always be the least significant bit (LSB).

Control Byte Descriptions

***Setup System* – Control Byte #1 (01h)**

Description: Sets system status flags and switches. The current value of the flags can be obtained by executing command #29, Query System Setup, and parsing the values from the appropriate bytes. The Site Master acts on the entire byte. So, the state of each of the bits must be defined every time the command is issued. See control byte #29 (1Dh) response bytes 170 (VNA modes) and 275 and 276 (Spectrum Analyzer mode) for current Site Master configuration.

Bytes to Follow: 2 bytes

1) Status Byte 1
   - bit 0: Fixed CW Mode On/Off (1b = On, 0b = Off)
   - bit 1: Not Used
   - bit 2: LCD Back Light On/Off (1b = On, 0b = Off)
   - bit 3: Measurement Unit Metric/English (0b = English, 1b = Metric)[1]
   - bits 4-7: Not Used
2) Status Byte 2
   - bit 0: RBW Coupling (to span) (1b = Auto 0b = Manual)
   - bit 1: VBW Coupling (to RBW) (1b = Auto 0b = Manual)
   - bit 2: Not Used
   - bits 3-4: Logarithmic Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
   - bits 5-6: Detection Algorithm (00b = Positive Peak 01b = RMS Average
     10b = Negative Peak 11b = Sampling Mode)
   - bit 7: Attenuation Coupling (to ref level) (1b = Auto 0b = Manual)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

***Set Site Master VNA Frequency* – Control Byte #2 (02h)**

Description: Sets the Site Master frequency range. Start and stop frequencies are given in terms of 1 Hz steps. (e.g. 1000.3 MHz would be sent as 1000300000 = 1,000,300,000 Hz.)

Valid range is 25 MHz – 4000 MHz.
Low end is extended to 2 MHz with option 2; and high end is extended to 6000 MHz with option 16.

See control byte #29 (1Dh) response bytes 28 to 35 for current Site Master start and stop frequencies.

This command handles frequency up to 4 GHz. If option 16 is present, then higher frequency can be entered using the command Set Site Master VNA Extended Frequency whose control byte is #244 (F4h).

Bytes to Follow: 8 bytes

1) Start Frequency (Highest byte)
2) Start Frequency
3) Start Frequency
4) Start Frequency (Lowest byte)
5) Stop Frequency (Highest byte)
6) Stop Frequency
7) Stop Frequency
8) Stop Frequency (Lowest byte)

[1] Set the Metric/English flag to the proper value before sending distance information.

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid frequency range
   238 (EEh) Time-out Error

***Select Measurement Mode* – Control Byte #3 (03h)**

Description: Sets the measurement mode of the Site Master. The response byte will not be sent until the mode change is complete.

See control byte #29 (1Dh) response byte 3 for the current Site Master measurement mode.

Bytes to Follow: 1 byte

1) Measurement Mode
   - 00h: RL Frequency
   - 01h: SWR Frequency
   - 02h: Cable Loss Frequency
   - 10h: RL Distance
   - 11h: SWR Distance
   - 30h: Spectrum Analyzer Mode
   - 31h: Transmission Mode
   - 39h: Channel Scanner Mode
   - 3Bh: Interference Analyzer Mode
   - 3Ch: CW Signal Generator Mode
   - 40h: Power Monitor Mode (Option 29 Only)
   - 41h: Power Monitor Mode (Option 5)
   - 42h: High Accuracy Power Meter Mode
   - 60h: T1 Tester Mode (Option 50 Only)
   - 70h: E1 Tester Mode (Option 50 Only)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid measurement mode
   238 (EEh) Time-out Error:

***Set Cell Master VNA Scale* – Control Byte #4 (04h)**

Description: Sets the top and bottom value of current measurement mode.

Return Loss:
Unit is dB/1000.
Maximum value sent is 60000 which represents 60.00 dB,
Minimum value sent is 0 which represent 0.00 dB,

SWR:
Unit is 1/1000 (of ratio)
Maximum value sent is 65530 which represents 65.50
Minimum value sent is 1000 which represents 1.00

Cable Loss:
Unit is dB/1000.
Maximum value sent is 30000 which represents 30.00 dB,

Minimum value sent is 0 which represent 0.00 dB,

See control byte #29 (1Dh) response bytes 36 to 43 for current Cell Master scaling.

Bytes to Follow: 8 bytes

1) Scale Start (Highest byte)
2) Scale Start
3) Scale Start
4) Scale Start (Lowest byte)
5) Scale Stop (Highest byte)
6) Scale Stop
7) Scale Stop
8) Scale Stop (Lowest byte)

Cell Master Returns: 1 byte

255 (FFh): Operation Complete Byte
224 (E0h): Parameter Error - Invalid scale range
238 (EEh): Time-out Error

Set Site Master VNA Marker – Control Byte #5 (05h)

Description: Sets an individual marker position and status in the current measurement mode.

The Site Master sets the position of a marker by its relative position on the graph. The lowest position is 0 at the start frequency (or distance). The highest position is the data point number at the stop frequency (or distance). For example, for a resolution of 130, the first frequency is at position 0. The last frequency is at 129.

To calculate the data point from a frequency (or distance) do the following:
point = (resolution – 1) * (marker freq – start freq) / (stop freq – start freq)

See control byte #29 (1Dh) response bytes 44 to 55 for current frequency markers.
See control byte #29 (1Dh) response bytes 138 to 149 for current distance markers.
See control byte #29 (1Dh) response byte 162 for current marker on/off status.

Bytes to Follow: 5 bytes

1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
2) Marker Line On/Off (01h = On, 00h = Off)
3) Marker Delta On/Off (01h = On, 00h = Off) [2]
4) Marker Value (Higher byte)
5) Marker Value (Lower byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid marker, marker status, or marker position
   238 (EEh) Time-out Error

---

[2] This byte is not applicable for markers 5 and 6. It will be ignored by the Site Master.

Set Site Master VNA Single Limit – Control Byte #6 (06h)

Description: Sets the position and On/Off Status of the Single Limit Line for the VNA modes. See control byte #103 to set the single limit for the spectrum analyzer mode.

The single limit is a single, horizontal line. It can be set to On/Off in any Site Master mode. If Limit Beep is set to ON, the Site Master will give an error beep when sweep data appears above the limit line in SWR or Return Loss mode, or when sweep data appears below the limit line in Cable Loss mode.

The single limit and multiple limit types are mutually exclusive. That is, setting the single limit ON automatically turns multiple limit lines OFF. See control byte #112 (70h) for information about multiple limits.

See control byte #29 (1Dh) response bytes 56-59, and byte 164 for current Site Master configuration.

Bytes to Follow: 6 bytes

1) Limit Line On/Off (01h = On, 00h = Off)
2) Beep at Limit On/Off (01h = On, 00h = Off)
3) Limit Value (Highest byte)
4) Limit Value
5) Limit Value
6) Limit Value (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid limit status, limit beep status, or limit value
   238 (EEh) Time-out Error

Notes:

Return Loss & Cable Loss:

Limit should be sent as (dB * 1000)
Maximum value sent is 60000 which represents 60.00 dB
Minimum value sent is 0 which represents 0.0 dB

SWR:

Limit is in **thousandths** (of ratio), so it should be sent as (ratio * 1000)
Maximum value sent is 65530 which represents 65.53
Minimum value sent is 1000 which represents 1.00

Set DTF Parameter – Control Byte #7 (07h)

Description: Sets Distance to Fault parameters.

Be aware using this control byte. The distance to fault parameters are all inter-related. Consequently, the control byte must change all of those parameters at the same time to properly set them.

Please refer to the Site Master User's Guide for a detailed explanation of the factors influencing proper selection of DTF parameters.

Give Start & Stop Distances in hundred-thousandths of meter or foot (12.34 m would be sent as 1234000)

Relative Propagation Velocity is in hundred-thousandths (a Relative Propagation Velocity of 0.850 will be sent as 85000)

Cable Loss is in hundred-thousandths of dB/m or dB/ft (-0.345 dB/m would be sent as 34500)

See control byte #29 (1Dh) response bytes 130-137 (Distance), 150-157 (Propagation Velocity & Cable Loss) for current Site Master configuration.

Bytes to Follow: 16 bytes

1) Start Distance (Highest byte)
2) Start Distance
3) Start Distance
4) Start Distance (Lowest byte)
5) Stop Distance (Highest byte)
6) Stop Distance
7) Stop Distance
8) Stop Distance (Lowest byte)
9) Relative Propagation Velocity (Highest byte)
10) Relative Propagation Velocity
11) Relative Propagation Velocity
12) Relative Propagation Velocity (Lowest byte)
13) Cable Loss (Highest byte)
14) Cable Loss
15) Cable Loss
16) Cable Loss (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Parameter(s) out of range
   238 (EEh) Time-out Error
   254 (FEh): Internal Error

Set Time/Date – Control Byte #8 (08h)

Description: Sets the current time and date.

This Time/Date is stamped into all stored sweeps (for users' reference).

The Site Master stores bytes as ASCII text. Recommended time form is "hh:mm:ss" (hour:minute:sec). Recommended date format is "mm/dd/yyyy" (month/day/year).

The current time setting can be found by using control byte #33 to recall trace 0 and examining response bytes 31-38.

The current date setting can be found by using control byte #33 to recall trace 0 and examining response bytes 21-30.

Bytes to Follow: 7 bytes

1) Hour
2) Minute
3) Month
4) Day
5) Year (Highest byte)
6) ear (Lowest byte)
7) Daylight Saving (01h = On, 00h = Off)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

Set Trace Name (Reference Number) – Control Byte #9 (09h)

Description: Stores a Reference Number with the sweep trace.

The reference number is also known as the trace name. It is any combination of 16 letters, numbers and the characters "-", ",", "." and "+". This command stores a trace name with the sweep trace.

The current reference number is found by recalling trace 0 and examining response bytes 39 to 54.

Bytes to Follow: 16 bytes (ASCII text string)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

Serial Port Echo On/Off – Control Byte #10 (0Ah)

Description: Sets the serial port echo mode On/Off.

Serial Port Echo Mode uses the **single sweep** mode (see control byte #11 (0Bh)). At the end of each sweep cycle, the Site Master sends a Sweep Complete Byte #192 (C0h) to the serial port.

This mode activates once the Site Master exits from the remote mode. Serial Port Echo status can't be saved to or recalled from saved setups. Cycling power resets the Serial port echo status to Off.

The Serial Port Echo Mode allows run-time handshaking between the Site Master and computer by doing the following:

1) Enter remote mode. Set Serial Port Echo Mode On. Exit remote mode.
2) The Site Master sweeps once and then sends the Sweep Complete Byte.
3) After you receive it. Enter remote mode. Recall sweep 0 (last sweep trace in RAM).
4) Exit remote mode. Send Sweep Triggering Byte #48 (30h) and wait for the next sweep cycle.
5) Repeat steps 2-4

Bytes to Follow: 1 byte

1) Serial Port Echo Status
   00h : Off
   01h : On

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid serial port echo status
   238 (EEh) Time-out Error

Site Master VNA Single Sweep Mode On/Off – Control Byte #11 (0Bh)

Description: Enables or disables the Single Sweep Mode during Site Master VNA modes of operation.
For Single Sweep Mode during the Spectrum Analyzer mode of operation see control byte #108 (6Ch)

Single Sweep Mode activates once the Site Master exits from the remote mode.

When the Site Master returns to local mode, the Site Master stops sweeping, waits for either the Run/Hold Key of the Site Master keypad or triggering byte #48 (30h).

Site Master also checks for the Enter Remote byte #69 (45h) at the end of each sweep. If present in the buffer, Site Master returns to remote mode.

Bytes to Follow: 1 byte

1) Single Sweep Mode Status
   00h : Off
   01h : On

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid single sweep mode status
   224 (E0h) Incompatible Measurement Mode (i.e. Spectrum Analyzer)
   238 (EEh) Time-out Error

Watch-Dog Timer On/Off – Control Byte #12 (0Ch)

Description: Enables or disables the Watch-dog timer. Default is Disabled.

The Site Master incorporates a watch-dog timer for higher reliability in serial communication. In selected control bytes (see control byte summary), the Site Master checks for the time interval between each byte received from the computer. If the time interval exceeds the set time limit (0.5 sec), the Site Master notifies the computer by sending Time-out Byte #238 (EEh). The Site Master discards the data it just received and then waits for the next control byte sequence.

Bytes to Follow: 1 byte
1) Watch-dog timer On/Off
   00h = Off
   01h = On

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid watch-dog timer status

---

Sequence Site Master Calibration – Control Byte #13 (0Dh)

Description: Initiates a calibration step.

The Site Master must be calibrated to give accurate measurements.

The command sequence must be sent in correct order. i.e. Open -> Short -> Load. You can also abort the calibration by command – "Abort" before the command - "Load" is sent. Once command - "Load" is sent, calibration is completed, and the old calibration data is lost.

This command is designed to be executed step by step: open, short, load. Issuing any other command during this command sequence will cause undesired results.

Bytes to Follow: 1 byte
1) Calibration Step to trigger
   01h = Open
   02h = Short
   03h = Load
   04h = Not Used
   05h = Abort

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Error : Invalid Cal operation or Cal Incomplete
   238 (EEh) Time-out Error

2) 240 (F0h): Calibration Step Complete Byte[3]

***Set Site Master VNA Data Points* – Control Byte #14 (0Eh)**

Description: Set number of measurement data points for Site Master VNA modes.

Bytes to Follow: 1 byte
1) Number of Data Points
00h = 130 Points
01h = 259 Points
02h = 517 Points

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid number of data points
238 (EEh) Time-out Error

***Set Site Master Calibration Mode* – Control Byte #15 (0Fh)**

Description: Set the Site Master calibration mode to OSL Cal (standard) or FlexCal.

Bytes to Follow: 1 byte
1) Calibration Mode
00h = OSL Calibration (standard)
01h = FlexCal Calibration

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid calibration mode
238 (EEh) Time-out Error

***Store Sweep Trace* – Control Byte #16 (10h)**

Description: Saves current trace to the next available memory location. Trace name can be set using control byte #9, "Set Trace Name (Reference Number)" before executing this command.

Bytes to Follow: 0 bytes

Site Master Returns: 5 bytes
1-4) Time/Date Stamp (In long integer format)
5) Operation result: 255 (FFh) Operation Complete Byte
224 (E0h) Out of memory (Memory full)
238 (EEh) Time-out Error

---

[3] This byte is returned only after the instrument is finished with its sweep. Not right away.

OBSOLETE: Recall Sweep Trace – Control Byte #17 (11h)

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #33 (21h).

Description: Queries the Site Master for sweep trace data.

NOTE: Before you can recall a sweep stored in non-volatile memory (trace numbers 1-200) you must build a trace table in the Site Master's RAM. Use Control Byte #24 to build the trace table. Since the trace table exists in RAM, Control Byte #24 must be executed every time the Site Master's power is cycled.

Bytes to Follow: 1 byte

0 = Last sweep trace before entering remote mode (sweep trace in RAM)
1- 200 = Specific saved sweep number (stored sweeps in Flash memory)

Site Master Returns:

1-2) # of following bytes (total length - 2)
3-4) Not Used
5-11) Model Number (7 bytes in ASCII)
12-15) Software Version (4 bytes ASCII)
16) Measurement Mode[4]
17-20) Time/Date (in Long Integer[5])
21-30) Date in String Format (mm/dd/yyyy)
31-38) Time in String Format (hh:mm:ss)
39-54) Reference number stamp (16 bytes in ASCII)
55-56) # data points (130, 259, 517 or 400)

For all "Site Master Modes" :

57) Start Frequency[6] (Highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (Lowest byte)
61) Stop Frequency (Highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (Lowest byte)
65) Minimum Frequency Step Size (Highest byte)
66) Minimum Frequency Step Size
67) Minimum Frequency Step Size
68) Minimum Frequency Step Size (Lowest byte)
69) Scale Top[7] (Highest byte)
70) Scale Top
71) Scale Top
72) Scale Top (Lowest byte)
73) Scale Bottom (Highest byte)
74) Scale Bottom
75) Scale Bottom
76) Scale Bottom (Lowest byte)
77) Frequency Marker 1[8] (Highest byte)
78) Frequency Marker 1 (Lowest byte)

[4] Refer to Control Byte #3 "Select Measurement Mode" for detailed value.
[5] Time/Date long integer representation is in seconds since January 1, 1970
[6] Frequency units are Hz
[7] See Control Byte #4 "Set Site Master Scale" for data format
[8] marker point = (# of data points – 1) * (marker freq – start freq) / (stop freq – start freq) where # of data points can be found in bytes 55-56, start freq is in bytes 57-60, and stop freq is in bytes 61-64.

79) Frequency Marker 2 (Highest byte)
80) Frequency Marker 2 (Lowest byte)
81) Frequency Marker 3 (Highest byte)
82) Frequency Marker 3 (Lowest byte)
83) Frequency Marker 4 (Highest byte)
84) Frequency Marker 4 (Lowest byte)
85) Frequency Marker 5 (Highest byte)
86) Frequency Marker 5 (Lowest byte)
87) Frequency Marker 6 (Highest byte)
88) Frequency Marker 6 (Lowest byte)
89) Single Limit[9] (Highest byte)
90) Single Limit
91) Single Limit
92) Single Limit (Lowest byte)
93) Multiple Limit Segment # (1)
94) Multiple Limit Segment Status
95) Multiple Limit Start X[10] (Highest byte)
96) Multiple Limit Start X
97) Multiple Limit Start X
98) Multiple Limit Start X (Lowest byte)
99) Multiple Limit Start Y (Highest byte)
100) Multiple Limit Start Y (Lowest byte)
101) Multiple Limit End X (Highest byte)
102) Multiple Limit End X
103) Multiple Limit End X
104) Multiple Limit End X (Lowest byte)
105) Multiple Limit End Y (Highest byte)
106) Multiple Limit End Y (Lowest byte)
107–162) Repeat bytes 93-106 for segments 2-5
163) Start Distance[11] (Highest byte)
164) Start Distance
165) Start Distance
166) Start Distance (Lowest byte)
167) Stop Distance (Highest byte)
168) Stop Distance
169) Stop Distance
170) Stop Distance (Lowest byte)
171) Distance Marker 1[12] (Highest byte)
172) Distance Marker 1 (Lowest byte)
173) Distance Marker 2 (Highest byte)
174) Distance Marker 2 (Lowest byte)
175) Distance Marker 3 (Highest byte)
176) Distance Marker 3 (Lowest byte)
177) Distance Marker 4 (Highest byte)
178) Distance Marker 4 (Lowest byte)
179) Distance Marker 5 (Highest byte)
180) Distance Marker 5 (Lowest byte)
181) Distance Marker 6 (Highest byte)
182) Distance Marker 6 (Lowest byte)
183) Relative Propagation Velocity[13] (Highest byte)

[9] See Control Byte #6 “Set Site Master Single Limit” for data format.
[10] See Control Byte #112 “Set Site Master Segmented Limit Lines” for data format.
[11] Distance data uses units 1/100,000m (or feet)
[12] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 55-56, start dist is in bytes 163-166, and stop dist is in bytes 167-170.

184) Relative Propagation Velocity
185) Relative Propagation Velocity
186) Relative Propagation Velocity (Lowest byte)
187) Cable Loss[14] (Highest byte)
188) Cable Loss
189) Cable Loss
190) Cable Loss (Lowest byte)
191) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
192) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bits 4-7 : Not Used
193) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bit 2-3 : Not Used
bit 4 : InstaCal On/Off[15]
bit 5 : Cal On/Off
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of Measurement (1b = Metric, 0b = English)
194) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used
195-228) Not Used
229-1268) Sweep Data (130 points * 8 bytes/point = 1040 bytes)
229-2300) Sweep Data (259 points * 8 bytes/point = 2072 bytes)
229-4364) Sweep Data (517 points * 8 bytes/point = 4136 bytes)
8 bytes for each data point
1. gamma[16] MSB
2. gamma
3. gamma
4. gamma LSB
5. phase[17] MSB
6. phase
7. phase

---

[13] Relative Propagation Velocity uses units 1/100,000
[14] Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[15] Bits (4,5) are as follows: (0,0) = Cal Off, (0,1) = OSL Cal (1,1) = InstaCal On, (1,0) = Impossible.
[16] Gamma data uses 1/1000 units.
[17] Phase data uses 1/10 degree unit.

8. phase LSB

Note: return loss = - 20* (log(gamma) / log(10))
VSWR = (1+gamma)/(1-gamma)
phase compares the reflected to the incident (reference)

For Spectrum Analyzer Mode:

57) Start Frequency[18] (Highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (Lowest byte)
61) Stop Frequency (Highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (Lowest byte)
65) Center Frequency (Highest byte)
66) Center Frequency
67) Center Frequency
68) Center Frequency (Lowest byte)
69) Frequency Span (Highest byte)
70) Frequency Span
71) Frequency Span
72) Frequency Span (Lowest byte)
73) Minimum Frequency Step Size (Highest byte)
74) Minimum Frequency Step Size
75) Minimum Frequency Step Size
76) Minimum Frequency Step Size (Lowest byte)
77) Ref Level[19] (Highest byte)
78) Ref Level
79) Ref Level
80) Ref Level (Lowest byte)
81) Scale per div[20] (Highest byte)
82) Scale per div
83) Scale per div
84) Scale per div (Lowest byte)
85) Frequency Marker 1[21] (Highest byte)
86) Frequency Marker 1 (Lowest byte)
87) Frequency Marker 2 (Highest byte)
88) Frequency Marker 2 (Lowest byte)
89) Frequency Marker 3 (Highest byte)
90) Frequency Marker 3 (Lowest byte)
91) Frequency Marker 4 (Highest byte)
92) Frequency Marker 4 (Lowest byte)
93) Frequency Marker 5 (Highest byte)
94) Frequency Marker 5 (Lowest byte)
95) Frequency Marker 6 (Highest byte)
96) Frequency Marker 6 (Lowest byte)
97) Single Limit[22] (Highest byte)
98) Single Limit
99) Single Limit

[18] Frequency in Hz
[19] Value sent as (Value in dBm * 1000) + 270,000
[20] Value sent as (Value * 1000)
[21] Value sent as data point on display. Freq = (Point * Span / (Total Data Points – 1)) + Start Freq
[22] Value sent as (value in dBm * 1000) + 270,000

100) Single Limit (Lowest byte)
101) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
102) Multiple Upper Limit 1 Start X (Frequency in Hz)
103) Multiple Upper Limit 1 Start X (Frequency in Hz)
104) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
105) Multiple Upper Limit 1 Start Y (Power Level[23]) (Highest byte)
106) Multiple Upper Limit 1 Start Y (Power Level)
107) Multiple Upper Limit 1 Start Y (Power Level)
108) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
109) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
110) Multiple Upper Limit 1 End X (Frequency in Hz)
111) Multiple Upper Limit 1 End X (Frequency in Hz)
112) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
113) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
114) Multiple Upper Limit 1 End Y (Power Level)
115) Multiple Upper Limit 1 End Y (Power Level)
116) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
117-260) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 101-116 for format)
261) RBW Setting (Frequency in Hz) (Highest byte)
262) RBW Setting (Frequency in Hz)
263) RBW Setting (Frequency in Hz)
264) RBW Setting (Frequency in Hz) (Lowest byte)
265) VBW Setting (Frequency in Hz) (Highest byte)
266) VBW Setting (Frequency in Hz)
267) VBW Setting (Frequency in Hz)
268) VBW Setting (Frequency in Hz) (Lowest byte)
269) OCC BW Method (0b if % of power, 1b = dB down)
270) OCC BW % Value[24] (Highest byte)
271) OCC BW % Value
272) OCC BW % Value
273) OCC BW % Value (Lowest byte)
274) OCC BW dBc [25](Highest byte)
275) OCC BW dBc
276) OCC BW dBc
277) OCC BW dBc (Lowest byte)
278) Attenuation[26] (Highest byte)
279) Attenuation
280) Attenuation
281) Attenuation (Lowest byte)
282-297)Antenna Name(16 bytes in ASCII)
298) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
299) Status Byte 2: (0b = Off , 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off

[23] Value sent as (value in dBm * 1000) + 270,000
[24] % value is 0-99
[25] dBc value 0 – 120 dBc
[26] Value sent as (value in dB * 1000)

bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bits 4-7: Not Used

298) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection Alg (00b = pos. peak 01b = average 10b = neg. peak)
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bit 5 : Channel Power On/Off
bit 6 : Adjacent Channel Power On/Off
bit 7 : Not Used

299) Status Byte 4[27]
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Not Used
bit 2 : Single Limit On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[28]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

300) Status Byte 5
(0b = Off/Beep if data is below line, 1b = On/Beep if data is above line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW[29]

303) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

304) Status Byte 7
bits 0-6: Number of sweeps to average (1-25, 1 implies no averaging)
bit 7: Not Used

305) Reference Level Offset [30](Highest byte)
306) Reference Level Offset
307) Reference Level Offset
308) Reference Level Offset (Lowest byte)
309-338) Not Used
339-1938) Sweep Data (400 points * 4 bytes/point= 1600 bytes)
4 bytes for each data point

[27] For bits 2 and 0, 00=no limit, 10=single limit, 01=multiple limit, 11=multiple limit.
[28] Upper limits always trigger an error beep if data is ABOVE the limit segment, for example, this bit is always 1b.
[29] LOWER limits always trigger an error beep if data is BELOW the limit segment, for example, this bit is always 0b.
[30] Value sent as (value in dBm * 1000) + 270,000

1. dBm[31] MSB
2. dBm
3. dBm
4. dBm LSB

For T1 Tester / E1 Tester Mode:

57) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
58) Framing Mode
(T1 Mode: 01h: ESF, 02h: D4SF)
(E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
59) Line Coding (01h: B8ZS, 02h: AMI, 03h: HDB3)
60) Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
61) Clock Source (00h: External, 01h: Internal)
62) Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
63) Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
64) Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)
65) CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
66) Display Type (00h: Histogram, 01h: Raw Data)
67) Impedance (Valid for E1 Only) (01h: 75 Ω, 02h: 120 Ω)
68) Pattern (Higher byte)
69) Pattern (Lower byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
70) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
71) Insert Bit Error Value (1-1000) (Highest byte)
72) Insert Bit Error Value
73) Insert Bit Error Value
74) Insert Bit Error Value (Lowest byte)
75) Insert BPV Error Value (1-1000) (Highest byte)
76) Insert BPV Error Value
77) Insert BPV Error Value
78) Insert BPV Error Value (Lowest byte)
79) Insert Frame Error Value (1-1000) (Highest byte)
80) Insert Frame Error Value
81) Insert Frame Error Value
82) Insert Frame Error Value (Lowest byte)
83) Measurement Duration (Highest byte)
84) Measurement Duration
85) Measurement Duration
86) Measurement Duration (Lowest byte) (00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days)
87) Histogram Resolution (Highest byte)
88) Histogram Resolution
89) Histogram Resolution
90) Histogram Resolution (Lowest byte) (00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min)
91) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
92) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
93) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
94) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
95 – 98) BPV Error Count
99 – 102) CRC Error Count
103 – 106) Frame Error Count
107 – 110) LOF Error Count

[31] Value sent as (value in dBm * 1000) + 270,000

111 – 114) E Bit Error Count (E1 Only)
115 – 118) Errored Seconds
119 – 122) Bit Count
123 – 126) Bit Errors
127) User Defined Pattern (convert to binary for pattern) (Highest byte)
128) User Defined Pattern
129) User Defined Pattern
130) User Defined Pattern (Lowest byte)
131 – 138) Measurement Start Time String (ASCII string: "HH:MM:SS")
139 – 150) Reserved
151 – 158) Measurement Stop Time String (ASCII string: "HH:MM:SS")
159 – 170) Reserved
171 – 181) Elapsed Time String (ASCII string: "DD,HH:MM:SS")
182 – 189) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
190 – 689) 100 data points with 5 bytes for each data point.
1st byte has information about Carrier Loss, Frame Loss, BPV and CRC
Following 4 bytes corresponds to the Bit Error Count
Break down of the 1st byte :

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not Used	Not Used	Not Used	Carrier Loss	Frame Loss	BPV Error	CRC / E-Bit Error	Any Error

690 – 800) Not Used

*Site Master Returns (*For invalid sweeps/empty stored sweep locations)*:* 11 bytes
1-2) Number of following bytes (9 bytes for invalid sweep recall)
3-4) Model # (unsigned integer, 14h for Site Master S33xD)
5-11) Extended Model # (7 bytes in ASCII)

Site Master Returns (Invalid sweep location): 1 byte
1) 224 (E0) Parameter Error: Invalid sweep location

***Save System Setup* – Control Byte #18 (12h)**

Description: Saves current system setup parameters to a specific setup store location.

The Site Master saves all parameters described in Query System Status - Control Byte #29 (1Dh), (except Serial Port Echo Status) to the specified store location. Store location 0 is the run-time setup of the Site Master. It holds the power-on defaults of the Site Master.

Bytes to Follow: 1 byte
1) Location to save system setup parameters:
0 – 10 for SWR Mode, Return Loss Mode, Cable Loss Mode and DTF Mode
0 – 5 for Spectrum Analyzer Mode (S332D only)
0 – 5 for Power Meter Mode (with Option 29 only)
0 – 5 for T1/E1 Modes (with Option 50 only)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid store location
238 (EEh) Time-out Error

***Recall System Setup* – Control Byte #19 (13h)**

Description: Recalls system setup parameters from a specific store location. Storage locations depend on the measurement mode of the current setup. When the current mode is Spectrum Analyzer, Spectrum Analyzer setups (1-5) can be recalled. When the current mode is one of the Site Master VNA modes (SWR, RL, CL, DTF), one of the 10 VNA mode setups can be recalled. When the current mode is T1/E1, one of the T1/E1 setups can be recalled (1-5).

The Site Master recalls all parameters described in Query System Status - Control Byte #29 (1Dh), (except Serial Port Echo Status) from the specified store location. The recalled setup does **not** automatically become the power-on runtime setup when exiting remote. Therefore, a call to #29 will not display the parameters in that setup.

You may want to save the recalled setup as the run-time setup by saving it to setup location 0 (which holds the power-on runtime setup). See control byte #18 (12h) for details.

Bytes to Follow: 1 byte

1) Location from which to recall system setup parameters:
   - 0 = Run time setup for all measurement modes
   - 1 – 10 = Saved setups for Site Master VNA modes SWR, RL, CL, DTF
   - 1 – 5 = Saved setups for Spectrum Analyzer mode (S332D only)
   - 1 – 5 = Saved setups for Power Meter mode (with Option 29 only)
   - 1 – 5 = Saved setups for T1/E1 modes (with Option 50 only)
   - 254 = Default setup, current mode
   - 255 = Default setup, all modes

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid store location or no saved setup
   227 (E3h) Frequency Mismatch Error
   238 (EEh) Time-out Error

***OBSOLETE: Query System Status* – Control Byte #20 (14h)**

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #29 (1Dh).

Description: Queries the Site Master for current system settings.

The current state of the Site Master represents the state after the last successful remote control operation.
For example, change the start frequency to another valid frequency while in remote mode, then execute control byte #20. The new start frequency will be returned in bytes 4-7, even though no sweep has been performed with that frequency.

Bytes to Follow: 0 bytes

Site Master Returns: 434 bytes

1) Measurement Mode[32]
2) Site Master Mode Data Points (Higher byte)
3) Site Master Mode Data Points (Lower byte)
4) Start Frequency (Frequency in Hz) (Highest byte)
5) Start Frequency
6) Start Frequency
7) Start Frequency (Lowest byte)
8) Stop Frequency (Frequency in Hz)[34] (Highest byte)
9) Stop Frequency

[32] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.

10) Stop Frequency
11) Stop Frequency (Lowest byte)
12) Scale Start (Highest byte)[33]
13) Scale Start
14) Scale Start
15) Scale Start (Lowest byte)
16) Scale Stop (Highest byte)
17) Scale Stop
18) Scale Stop
19) Scale Stop (Lowest byte)
20) Frequency Marker 1 (Higher byte)[34]
21) Frequency Marker 1(Lower byte)
22) Frequency Marker 2 (Higher byte)
23) Frequency Marker 2 (Lower byte)
24) Frequency Marker 3 (Higher byte)
25) Frequency Marker 3 (Lower byte)
26) Frequency Marker 4 (Higher byte)
27) Frequency Marker 4 (Lower byte)
28) Frequency Marker 5 (Higher byte)
29) Frequency Marker 5 (Lower byte)
30) Frequency Marker 6 (Higher byte)
31) Frequency Marker 6 (Lower byte)
32) Site Master Single Limit (Highest byte)[35]
33) Site Master Single Limit
34) Site Master Single Limit
35) Site Master Single Limit (Lowest byte)
36) Multiple Limit Segment # (1)
37) Multiple Limit Segment Status (0h = Off, 01h = On)
38) Multiple Limit Segment Start X (Highest byte)[36]
39) Multiple Limit Segment Start X
40) Multiple Limit Segment Start X
41) Multiple Limit Segment Start X (Lowest byte)
42) Multiple Limit Segment Start Y (Higherbyte)
43) Multiple Limit Segment Start Y (Lower byte)
44) Multiple Limit Segment End X (Highest byte)
45) Multiple Limit Segment End X
46) Multiple Limit Segment End X
47) Multiple Limit Segment End X (Lowest byte)
48) Multiple Limit Segment End Y (Higher byte)
49) Multiple Limit Segment End Y (Lower byte)
50-105) Repeat bytes 36 – 49 for segments 2 - 5
106) Start Distance (Highest byte)[37]
107) Start Distance
108) Start Distance
109) Start Distance (Lowest byte)
110) Stop Distance (Highest byte)
111) Stop Distance
112) Stop Distance
113) Stop Distance (Lowest byte)

[33] See “Set Site Master Scale” Control Byte #4 for data format.
[34] Marker Point = (# data points – 1) * (marker freq – start freq) / (stop freq – start freq)
Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.
[35] See Control Byte #6, “Set Site Master Single Limit” for data format.
[36] See Control Byte #112, “Set Site Master Segmented Limit Lines” for data format.
[37] Distance data uses units 1/100,000 m or 1/100,000 ft

114) Distance Marker 1 (Higher byte)[38]
115) Distance Marker 1 (Lower byte)
116) Distance Marker 2 (Higher byte)
117) Distance Marker 2 (Lower byte)
118) Distance Marker 3 (Higher byte)
119) Distance Marker 3 (Lower byte)
120) Distance Marker 4 (Higher byte)
121) Distance Marker 4 (Lower byte)
122) Distance Marker 5 (Higher byte)
123) Distance Marker 5 (Lower byte)
124) Distance Marker 6 (Higher byte)
125) Distance Marker 6 (Lower byte)
126) Relative Propagation Velocity (Highest byte)[39]
127) Relative Propagation Velocity
128) Relative Propagation Velocity
129) Relative Propagation Velocity (Lowest byte)
130) Cable Loss (Highest byte)[40]
131) Cable Loss
132) Cable Loss
133) Cable Loss (Lowest byte)
134) Spectrum Analyzer Mode Data Points (Higher byte)
135) Spectrum Analyzer Mode Data Points (Lower byte)
136) Spectrum Analyzer Start Frequency[41] (Highest byte)
137) Spectrum Analyzer Start Frequency
138) Spectrum Analyzer Start Frequency
139) Spectrum Analyzer Start Frequency (Lowest byte)
140) Spectrum Analyzer Stop Frequency (Highest byte)
141) Spectrum Analyzer Stop Frequency
142) Spectrum Analyzer Stop Frequency
143) Spectrum Analyzer Stop Frequency (Lowest byte)
144) Spectrum Analyzer Center Frequency (Highest byte)
145) Spectrum Analyzer Center Frequency
146) Spectrum Analyzer Center Frequency
147) Spectrum Analyzer Center Frequency (Lowest byte)
148) Spectrum Analyzer Frequency Span (Highest byte)
149) Spectrum Analyzer Frequency Span
150) Spectrum Analyzer Frequency Span
151) Spectrum Analyzer Frequency Span (Lowest byte)
152) Spectrum Analyzer Minimum Frequency Step Size (Highest byte)
153) Spectrum Analyzer Minimum Frequency Step Size
154) Spectrum Analyzer Minimum Frequency Step Size
155) Spectrum Analyzer Minimum Frequency Step Size (Lowest byte)
156) Ref Level (Highest byte)[42]
157) Ref Level
158) Ref Level
159) Ref Level (Lowest byte)
160) Scale per div (Highest byte)[43]
161) Scale per div

[38] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.
[39] Relative Propagation Velocity uses units 1/100,000.
[40] Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[41] Frequency unit is Hz.
[42] Value sent as (value in dBm * 1000) + 270,000)
[43] Value sent as (value * 1000)

162) Scale per div
163) Scale per div (Lowest byte)
164) Spectrum Analyzer Frequency Marker 1 (Higher byte)[44]
165) Spectrum Analyzer Frequency Marker 1 (Lower byte)
166) Spectrum Analyzer Frequency Marker 2 (Higher byte)
167) Spectrum Analyzer Frequency Marker 2 (Lower byte)
168) Spectrum Analyzer Frequency Marker 3 (Higher byte)
169) Spectrum Analyzer Frequency Marker 3 (Lower byte)
170) Spectrum Analyzer Frequency Marker 4 (Higher byte)
171) Spectrum Analyzer Frequency Marker 4 (Lower byte)
172) Spectrum Analyzer Frequency Marker 5 (Higher byte)
173) Spectrum Analyzer Frequency Marker 5 (Lower byte)
174) Spectrum Analyzer Frequency Marker 6 (Higher byte)
175) Spectrum Analyzer Frequency Marker 6 (Lower byte)
176) Spectrum Analyzer Single Limit (Highest byte)[45]
177) Spectrum Analyzer Single Limit
178) Spectrum Analyzer Single Limit
179) Spectrum Analyzer Single Limit (Lowest byte)
180) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
181) Multiple Upper Limit 1 Start X (Frequency in Hz)
182) Multiple Upper Limit 1 Start X (Frequency in Hz)
183) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
184) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [46]
185) Multiple Upper Limit 1 Start Y (Power Level)
186) Multiple Upper Limit 1 Start Y (Power Level)
187) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
188) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
189) Multiple Upper Limit 1 End X (Frequency in Hz)
190) Multiple Upper Limit 1 End X (Frequency in Hz)
191) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
192) Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [47]
193) Multiple Upper Limit 1 End Y (Power Level)
194) Multiple Upper Limit 1 End Y (Power Level)
195) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
196-339) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 180-195 for format)
340) RBW Setting (Highest byte)[48]
341) RBW Setting
342) RBW Setting
343) RBW Setting (Lowest byte)
344) VBW Setting (Highest byte)[49]
345) VBW Setting
346) VBW Setting
347) VBW Setting (Lowest byte)
348) OCC BW Method[50]
349) OCC BW % Value (Highest byte)[51]

---

[44] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[45] Value sent as (value in dBm * 1000) + 270000
[46] Value sent as (value in dBm * 1000) + 270000
[47] Value sent as (value in dBm * 1000) + 270000
[48] 0000h = 10kHz, 0001h = 30kHz, 0002h = 100kHz, 0003h = 1MHz
[49] 0000h = 100Hz, 0001h = 300Hz, 0002h = 1kHz, 0003h = 3kHz,
0004h = 10kHz, 0005h = 30kHz, 0006h = 100kHz, 0007h = 300kHz
[50] 00h = % of power, 01h = dB down
[51] 0 – 99%

350) OCC BW % Value
351) OCC BW % Value
352) OCC BW % Value (Lowest byte)
353) OCC BW dBc (Highest byte)[52]
354) OCC BW dBc
355) OCC BW dBc
356) OCC BW dBc (Lowest byte)
357) Attenuation (Highest byte)[53]
358) Attenuation
359) Attenuation
360) Attenuation (Lowest byte)
361) Antenna Index (0-14)
362-377) Antenna Name (16 bytes in ASCII)
378) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Marker 1 On/Off
bit 1 : Site Master Marker 2 On/Off
bit 2 : Site Master Marker 3 On/Off
bit 3 : Site Master Marker 4 On/Off
bit 4 : Site Master Marker 5 On/Off
bit 5 : Site Master Marker 6 On/Off
bits 6- 7 : Not Used
379) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Site Master Marker 2 Delta On/Off
bit 2 : Site Master Marker 3 Delta On/Off
bit 3 : Site Master Marker 4 Delta On/Off
bits 4-7: Not Used
380) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
381) Status Byte 4: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bits 4-7: Not Used
382) Status Byte 5: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)
bit 1 : Site Master Limit Beep ON/OFF
bit 2 : FREQ-SWR Multiple Limit Segment 1 Status On/Off
bit 3 : FREQ-SWR Multiple Limit Segment 2 Status On/Off
bit 4 : FREQ-SWR Multiple Limit Segment 3 Status On/Off
bit 5 : FREQ-SWR Multiple Limit Segment 4 Status On/Off
bit 6 : FREQ-SWR Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used
383) Status Byte 6: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : FREQ-RL Multiple Limit Segment 1 Status On/Off

[52] 0 – 120 dBc
[53] 00h = 0dB, 01h = 10dB, 02h = 20dB, 03h = 30dB, 04h = 40dB, 05h = 50dB

bit 3 : FREQ-RL Multiple Limit Segment 2 Status On/Off
bit 4 : FREQ-RL Multiple Limit Segment 3 Status On/Off
bit 5 : FREQ-RL Multiple Limit Segment 4 Status On/Off
bit 6 : FREQ-RL Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

384) Status Byte 7: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : FREQ-CL Multiple Limit Segment 1 Status On/Off
bit 3 : FREQ-CL Multiple Limit Segment 2 Status On/Off
bit 4 : FREQ-CL Multiple Limit Segment 3 Status On/Off
bit 5 : FREQ-CL Multiple Limit Segment 4 Status On/Off
bit 6 : FREQ-CL Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

385) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : DIST-SWR Multiple Limit Segment 1 Status On/Off
bit 3 : DIST-SWR Multiple Limit Segment 2 Status On/Off
bit 4 : DIST-SWR Multiple Limit Segment 3 Status On/Off
bit 5 : DIST-SWR Multiple Limit Segment 4 Status On/Off
bit 6 : DIST-SWR Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

386) Status Byte 9: (Ob = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : DIST-RL Multiple Limit Segment 1 Status On/Off
bit 3 : DIST-RL Multiple Limit Segment 2 Status On/Off
bit 4 : DIST-RL Multiple Limit Segment 3 Status On/Off
bit 5 : DIST-RL Multiple Limit Segment 4 Status On/Off
bit 6 : DIST-RL Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

387) Status Byte 10: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[54]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

388) Status Byte 11 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [55]

389) Status Byte 12 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW

[54] Beep level is always 1b for upper segmented limit line
[55] Beep level is always 0b for lower segmented limit line

bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

390) Status Byte 13:
(LSB) bits 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

391) Status Byte 14: (0b = Off, 1b = On)
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Site Master Cal On/Off
bit 2 : LCD Back Light On/Off
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bit 4 : InstaCal On/Off
bits 5 -7 : Not Used

392) Status Byte 15: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Not Used
bit 2 : SPA Cal Status On/Off
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bits 5-6 : Detection alg (00b = pos. peak 01b = average 10b = neg. peak, 11b= sampling mode)
bit 7 : Not Used

393) Status Byte 16: (0b = Off, 1b = On)
(LSB) bit 0: Serial Port Echo Status On/Off
bit 1: Return Sweep Time On/Off
bit 2: RBW Coupling (1b = auto, 0b = manual)
bit 3: VBW Coupling (1b = auto, 0b = manual)
bit 4: Attenuation Coupling (1b = auto, 0b = manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Not Used

394) Printer Type[56]

395) Current Language
(0 = English, 1 = French, 2 = German, 3 = Spanish, 4 = Chinese, 5 = Japanese)

396) LCD Contrast Value (0-255)

397) RTC battery [57](Higher byte)

398) RTC battery (Lower byte)

399) PC board revision [58](Higher byte)

400) PC board revision (Lower byte)

401) Reference Level Offset[59] (Highest byte)

402) Reference: Level Offset

403) Reference Level Offset

404) Reference Level Offset (Lowest byte)

[56] See Control Byte #30 for supported printers.
[57] Value sent as Volts * 10. For example, 2.7V = 27.
[58] This value is for internal use only.
[59] Value sent as (value in dBm * 1000) + 270,000

405-434) Not Used

***Trigger Self-Test* – Control Byte #21 (15h)**

Description: Triggers a self test on the Site Master.

Bytes to Follow: 0 bytes

Site Master Returns: 12 bytes

1) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Phase Lock Loop
   bit 1 : Integrator
   bit 2 : Battery
   bit 3 : Temperature
   bit 4 : EEPROM read/write
   bit 5 : RTC Battery
   bits 6- 7 : Not Used
2) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Spectrum Analyzer Lock
   bits 1–7 : Not Used
3) Battery Voltage (Higher byte)
4) Battery Voltage (Lower byte)
5) Temperature (Higher byte)
6) Temperature (Lower byte)
7) Lock Fail Counter (Higher byte)
8) Lock Fail Counter (Lower byte)
9) Integrator Fail Counter (Higher byte)
10) Integrator Fail Counter (Lower byte)
11) Spectrum Analyzer Lock Fail Counter (Higher byte)
12) Spectrum Analyzer Lock Fail Counter (Lower byte)

Notes:
Battery Voltage in 1/10th of a Volt (e.g. 124 = 12.4 Volts)
Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) or degree Fahrenheit (e.g. 934 = 93.4 ^{o}F), depending on the current measurement unit (Metric or English) selected

---

***Read Fail Counter* – Control Byte #22 (16h)**

Description: Reads the Fail Counter. Values are integer numbers of failures.

Bytes to Follow: 0 bytes

Site Master Returns: 8 bytes

1) Value of SM Lock Fail Counter (Higher byte)
2) Value of SM Lock Fail Counter (Lower byte)
3) Value of Integration Fail Counter (Higher byte)
4) Value of Integration Fail Counter (Lower byte)
5) Value of SA Lock Fail Counter (Higher byte)
6) Value of SA Lock Fail Counter (Lower byte)
7) Value of SA Fatal Error Counter (Higher byte)
8) Value of SA Fatal Error Counter (Lower byte)

***Clear Fail Counters* – Control Byte #23 (17h)**

Description: Resets the Lock Fail Counters, Integrator Fail Counter and spectrum analyzer Fatal Error Counter.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte

***Query Trace Names* – Control Byte #24 (18h)**

Description: Returns a list of all saved traces.

Bytes to Follow: 0 bytes

Site Master Returns: 3 + (41 x number of save traces) bytes
1-2) # of saved traces

For each trace:
- 1-2) Trace Index
- 3) Measurement Mode (refer to Control Byte #3)
- 4-21) Date/Time in string format ("MM/DD/YYYYHH:MM:SS")
- 22-25) Date/Time as Unsigned Long Integer (Seconds Since January 1, 1970)
- 26-41) Trace Name (16 bytes)

255 (FFh) Operation Complete Byte

***Delete Sweep Trace* – Control Byte #25 (19h)**

Description: Delete single trace or all stored sweep traces in Site Master.

Bytes to Follow: 1 byte
1) 0 - Delete all traces
X - Delete single trace #X

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte

***OBSOLETE: Upload SPA Sweep Trace* – Control Byte #26 (1Ah)**

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #36 (24h).

Description: Uploads a spectrum analyzer sweep trace to Site Master.

For data formats, refer to the footnotes listed beside the return bytes.

Bytes to Follow: 1921 bytes
- 1-2) # of following bytes (1919)
- 3) Measurement Mode[60]
- 4-7) Time/Date (long integer format[61])
- 8-17) Date in String Format (mm/dd/yyyy)

[60] See Control Byte #3 "Select Measurement Mode" for measurement modes.
[61] Time/Date long integer representation is in seconds since January 1, 1997.

18-25) Time in String Format (hh:mm:ss)
26-41) Reference Number/Trace Name (16 bytes in ASCII)
42-43) # data points (400)
44) Start Frequency (in Hz) (Highest byte)
45) Start Frequency (in Hz)
46) Start Frequency (in Hz)
47) Start Frequency (in Hz) (Lowest byte)
48) Stop Frequency (in Hz) (Highest byte)
49) Stop Frequency (in Hz)
50) Stop Frequency (in Hz)
51) Stop Frequency (in Hz) (Lowest byte)
52) Center Frequency (in Hz) (Highest byte)
53) Center Frequency (in Hz)
54) Center Frequency (in Hz)
55) Center Frequency (in Hz) (Lowest byte)
56) Frequency Span (in Hz) (Highest byte)
57) Frequency Span (in Hz)
58) Frequency Span (in Hz)
59) Frequency Span (in Hz) (Lowest byte)
60) Ref Level[62] (Highest byte)
61) Ref Level
62) Ref Level
63) Ref Level (Lowest byte)
64) Scale per div[63] (Highest byte)
65) Scale per div
66) Scale per div
67) Scale per div (Lowest byte)
68) Marker 1[64] (Higher byte)
69) Marker 1 (Lower byte)
70) Marker 2 (Higher byte)
71) Marker 2 (Lower byte)
72) Marker 3 (Higher byte)
73) Marker 3 (Lower byte)
74) Marker 4 (Higher byte)
75) Marker 4 (Lower byte)
76) Marker 5 (Higher byte)
77) Marker 5 (Lower byte)
78) Marker 6 (Higher byte)
79) Marker 6 (Lower byte)
80) Single Limit[65] (Highest byte)
81) Single Limit
82) Single Limit
83) Single Limit (Lowest byte)
84) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
85) Multiple Upper Limit 1 Start X (Frequency in Hz)
86) Multiple Upper Limit 1 Start X (Frequency in Hz)
87) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
88) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte)
89) Multiple Upper Limit 1 Start Y (Power Level)
90) Multiple Upper Limit 1 Start Y (Power Level)

[62] Value sent as (value in dBm * 1000) + 270,000
[63] Value sent as (value * 1000)
[64] Marker values are sent as # of data point on display.
See Control Byte #102, "Set Spectrum Analyzer Marker" for calculation of data point.
[65] All amplitude values are sent as (value in dBm * 1000) + 270,000

91) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
92) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
93) Multiple Upper Limit 1 End X (Frequency in Hz)
94) Multiple Upper Limit 1 End X (Frequency in Hz)
95) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
96) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
97) Multiple Upper Limit 1 End Y (Power Level)
98) Multiple Upper Limit 1 End Y (Power Level)
99) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
100-243) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 84-99 for format)
244) RBW Setting[66] (Highest byte)
245) RBW Setting
246) RBW Setting
247) RBW Setting (Lowest byte)
248) VBW Setting[67] (Highest byte)
249) VBW Setting
250) VBW Setting
251) VBW Setting (Lowest byte)
252) OCC BW Method (00h = % of power, 01h = dB down)
253) OCC BW % Value (0-99) (Highest byte)
254) OCC BW % Value (0-99)
255) OCC BW % Value (0-99)
256) OCC BW % Value (0-99) (Lowest byte)
257) OCC BW dBc (0-120) (Highest byte)
258) OCC BW dBc (0-120)
259) OCC BW dBc (0-120)
260) OCC BW dBc (0-120) (Lowest byte)
261) Attenuation[68] (Highest byte)
262) Attenuation
263) Attenuation
264) Attenuation (Lowest byte)
265-280) Antenna Name (16 bytes in ASCII)
281) Status Byte 1: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7: Not Used
282) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bits 4-7: Not Used
283) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = average 10b= neg. peak)
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power Ratio On/Off

[66] Valid frequencies (in Hz) are 10,000 30,000 100,000 1,000,000
[67] Valid frequencies (in Hz) are 100, 300, 1,000 3,000 10,000 30,000 100,000 300,000
[68] Value sent as (value * 1000)

bit 7: Not Used

284) Status Byte 4
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit On/Off
bit 2 : Single Limit Beep Level (0b = beep when data is below line 1b = above)
bit 3 : Not Used
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

285) Status Byte 5
(0b = Off/Beep if data is BELOW line, 1b =On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW

286) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

287) Status Byte 7
(LSB) bits 0-6: Number of Sweeps to Average (1-25, 1 implies no averaging)
bit 7 : Not Used

288) Reference Level Offset[69] (Highest byte)
289) Reference Level Offset
290) Reference Level Offset
291) Reference Level Offset (Lowest byte)
292-321) Not Used
322-1921) Sweep Data (400 points * 4 bytes/point = 1600 bytes)
4 bytes for each data point
1. dBm[70] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Not enough bytes transferred
225 (E1h) Memory Error: Not enough memory to store data
238 (EEh) Time-out Error

---

[69] Value sent as (Value in dBm * 1000) + 270,000
[70] Value sent as (Value in dBm * 1000) + 270,000

***Query Sweep Memory* – Control Byte #27 (1Bh)**

Description: Queries Site Master for percentage of memory that is available for trace storage.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) % of memory currently available (0 to 100)

***OBSOLETE: Upload Site Master Sweep Trace* – Control Byte #28 (1Ch)**

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #36 (24h).

Description: Uploads a Site Master Mode sweep trace to the Site Master.

Bytes to Follow: 1255, 2287, or 4351 Bytes (depending on resolution)

1-2) # of following bytes
3) Measurement Mode[71]
4-7) Time/Date (in Long Integer)
8-17) Date in String Format (mm/dd/yyyy)
18-25) Time in String Format (hh:mm:ss)
26-41) Reference number stamp (16 ASCII bytes)
42-43) # of data points
44) Start Frequency (Highest byte)
45) Start Frequency
46) Start Frequency
47) Start Frequency (Lowest byte)
48) Stop Frequency (Highest byte)[74]
49) Stop Frequency
50) Stop Frequency
51) Stop Frequency (Lowest byte)
52) Minimum Frequency Step Size (Highest byte)
53) Minimum Frequency Step Size
54) Minimum Frequency Step Size
55) Minimum Frequency Step Size (Lowest byte)
56) Scale Top (Highest byte)[72]
57) Scale Top
58) Scale Top
59) Scale Top (Lowest byte)
60) Scale Bottom (Highest byte)
61) Scale Bottom
62) Scale Bottom
63) Scale Bottom (Lowest byte)
64) Frequency Marker 1 (Higher byte)[73]
65) Frequency Marker 1 (Lower byte)
66) Frequency Marker 2 (Higher byte)
67) Frequency Marker 2 (Lower byte)
68) Frequency Marker 3 (Higher byte)
69) Frequency Marker 3 (Lower byte)
70) Frequency Marker 4 (Higher byte)
71) Frequency Marker 4 (Lower byte)

---

[71] See Control Byte #3 "Set Measurement Mode" for available measurement modes.
[72] See Control Byte #4, "Set Site Master Scale" for data format.
[73] Marker point = (Number of data points – 1) * (marker freq – start freq) / (stop freq – start freq)

72) Frequency Marker 5 (Higher byte)
73) Frequency Marker 5 (Lower byte)
74) Frequency Marker 6 (Higher byte)
75) Frequency Marker 6 (Lower byte)
76) Single Limit Line Value (Highest byte)[74]
77) Single Limit Line Value
78) Single Limit Line Value
79) Single Limit Line Value (Lowest byte)
80) Multiple Limit Segment # (1)
81) Multiple Limit Segment Status (00h = Off, 01h = On)
82) Multiple Limit Start X (Highest byte)[75]
83) Multiple Limit Start X
84) Multiple Limit Start X
85) Multiple Limit Start X (Lowest byte)
86) Multiple Limit Start Y (Higher byte)
87) Multiple Limit Start Y (Lower byte)
88) Multiple Limit End X (Highest byte)
89) Multiple Limit End X
90) Multiple Limit End X
91) Multiple Limit End X (Lowest byte)
92) Multiple Limit End Y (Higher byte)
93) Multiple Limit End Y (Lower byte)
94-149) Repeat bytes 80-93 for segments 2-5
150) Start Distance (Highest byte)[76]
151) Start Distance
152) Start Distance
153) Start Distance (Lowest byte)
154) Stop Distance (Highest byte)
155) Stop Distance
156) Stop Distance
157) Stop Distance (Lowest byte)
158) Distance Marker 1 (Higher byte)[77]
159) Distance Marker 1 (Lower byte)
160) Distance Marker 2 (Higher byte)
161) Distance Marker 2 (Lower byte)
162) Distance Marker 3 (Higher byte)
163) Distance Marker 3 (Lower byte)
164) Distance Marker 4 (Higher byte)
165) Distance Marker 4 (Lower byte)
166) Distance Marker 5 (Higher byte)
167) Distance Marker 5 (Lower byte)
168) Distance Marker 6 (Higher byte)
169) Distance Marker 6 (Lower byte)
170) Relative Propagation Velocity (Highest byte)[78]
171) Relative Propagation Velocity
172) Relative Propagation Velocity
173) Relative Propagation Velocity (Lowest byte)
174) Cable Loss (Highest byte)[79]
175) Cable Loss

[74] See Control Byte #6, “Set Site Master Single Limit” for data format
[75] See Control Byte #112, “Set Site Master Segmented Limit Lines” for data format.
[76] Distance data uses units 1/100,000m or 1/100,000 ft
[77] Marker point = (# of data points – 1) * (marker dist – start dist) / (stop dist – start dist)
[78] Relative Propogation Velocity uses units 1/100,000
[79] Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft

176) Cable Loss
177) Cable Loss (Lowest byte)
178) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
179) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 2 Delta On/Off
bit 1 : Marker 3 Delta On/Off
bit 2 : Marker 4 Delta On/Off
bits 3-7: Not Used
180) Status Byte 3: (0b = Off , 1b = On)[80]
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bits 2-3: Not Used
bit 4 : InstaCal On/Off
bit 5 : Cal On/Off
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of measurement (1b = Metric, 0b = English)
181) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used
182-215) Not Used
216-1255) Sweep Data (130 points * 8 bytes/point= 1040 bytes)
216-2287) (259 points * 8 bytes/point= 2072 bytes)
216-4351) (517 points * 8 bytes/point= 4136 bytes)
8 bytes for each data point
1. Gamma[81] MSB
2. Gamma
3. Gamma
4. Gamma LSB
5. Phase[82] MSB
6. Phase
7. Phase
8. Phase LSB

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Not enough bytes transferred
225 (E1h) Memory Error: Not enough memory to store data
238 (EEh) Time-out Error

[80] Bits (4,5) are as follows: (0,0)=Cal Off, (0,1)=OSL Cal, (1,0) = Impossible, (1,1) = InstaCal
[81] Gamma data uses 1/1000 units.
[82] Phase data uses 1/10 degree unit.

Notes:
return loss = - 20* (log(Gamma) / log(10))
VSWR = (1+Gamma)/(1-Gamma)
Phase compares the reflected to the incident (reference)

Query System Status – Control Byte #29 (1Dh)

This command is new to the S33xD. Use it instead of Control Byte #20 to access the new features.

Description: Queries the Site Master for current system settings. Unlike Control Byte #20, this command returns only data that is valid for the active mode, plus system settings, such as the defined printer.

The current state of the Site Master represents the state after the last successful remote control operation. For example, change the start frequency to another valid frequency while in remote mode, then execute control byte #29. The new start frequency will be returned in the defined bytes, even though no sweep has been performed with that frequency.

Bytes to Follow: 0 bytes

Site Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[83]
4) Printer Type[84]
5) Current Language
   (00h = English, 01h = French, 02h = German, 03h = Spanish, 04h = Chinese, 05h = Japanese)
6) LCD Contrast Value (0-255)
7) Date Format
   (00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD)
8) RTC battery [85] (Higher byte)
9) RTC battery (Lower byte)
10) PC Board Revision [86] (Higher byte)
11) PC Board Revision (Lower byte)

12-13) Digital Mother Board ID. Beginning with motherboard 64968, the hardware includes a 9-bit digital ID port. The digital ID will be used together with the PC Board Revision (mother board ID voltage) to identify the board and "dash" number. For boards prior to 64968, bytes 12 and 13 will be 0

14-25) Not Used

For Site Master VNA Modes:

26) Site Master VNA Mode Data Points (Higher byte)
27) Site Master VNA Mode Data Points (Lower byte)
28) VNA Start Frequency[87] (Highest byte)
29) VNA Start Frequency
30) VNA Start Frequency
31) VNA Start Frequency (Lowest byte)
32) VNA Stop Frequency[88] (Highest byte)
33) VNA Stop Frequency
34) VNA Stop Frequency

---

[83] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[84] See Control Byte #30 for supported printers.
[85] Value sent as Volts * 10. For example, 2.7 V = 27.
[86] This value is for internal use only.
[87] Frequency is scaled by the frequency scale factor specified in bytes 218-219.
[88] Frequency is scaled by the frequency scale factor specified in bytes 218-219.

35) VNA Stop Frequency (Lowest byte)
36) VNA Scale Start (Highest byte)[89]
37) VNA Scale Start
38) VNA Scale Start
39) VNA Scale Start (Lowest byte)
40) VNA Scale Stop (Highest byte)
41) VNA Scale Stop
42) VNA Scale Stop
43) VNA Scale Stop (Lowest byte)
44) VNA Frequency Marker 1 (Higher byte)[90]
45) VNA Frequency Marker 1(Lower byte)
46) VNA Frequency Marker 2 (Higher byte)
47) VNA Frequency Marker 2 (Lower byte)
48) VNA Frequency Marker 3 (Higher byte)
49) VNA Frequency Marker 3 (Lower byte)
50) VNA Frequency Marker 4 (Higher byte)
51) VNA Frequency Marker 4 (Lower byte)
52) VNA Frequency Marker 5 (Higher byte)
53) VNA Frequency Marker 5 (Lower byte)
54) VNA Frequency Marker 6 (Higher byte)
55) VNA Frequency Marker 6 (Lower byte)
56) Site Master VNA Single Limit (Highest byte)[91]
57) Site Master VNA Single Limit
58) Site Master VNA Single Limit
59) Site Master VNA Single Limit (Lowest byte)
60) VNA Multiple Limit Segment # (1)
61) VNA Multiple Limit Segment Status (0h = Off, 01h = On)
62) VNA Multiple Limit Segment Start X (Highest byte)[92]
63) VNA Multiple Limit Segment Start X
64) VNA Multiple Limit Segment Start X
65) VNA Multiple Limit Segment Start X (Lowest byte)
66) VNA Multiple Limit Segment Start Y (Higher byte)
67) VNA Multiple Limit Segment Start Y (Lowest byte)
68) VNA Multiple Limit Segment End X (Highest byte)[93]
69) VNA Multiple Limit Segment End X
70) VNA Multiple Limit Segment End X
71) VNA Multiple Limit Segment End X (Lowest byte)
72) VNA Multiple Limit Segment End Y (Higher byte)
73) VNA Multiple Limit Segment End Y (Lowest byte)
74-129) Repeat bytes 60 – 73 for segments 2 - 5
130. Start Distance (Highest byte)[94]
131. Start Distance
132. Start Distance
133. Start Distance (Lowest byte)
134. Stop Distance (Highest byte)
135. Stop Distance
136. Stop Distance

[89] See "Set Site Master VNA Scale" Control Byte #4 for data format.
[90] Marker Point = (# data points – 1) * (marker freq – start freq) / (stop freq – start freq)
Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.
[91] See Control Byte #6, "Set Site Master VNA Single Limit" for data format.
[92] See Control Byte #112, "Set Site Master VNA Segmented Limit Lines" for data format. Frequency is scaled by the frequency scale factor specified in bytes 218-219.
[93] Frequency is scaled by the frequency scale factor specified in bytes 218-219.
[94] Distance data uses units 1/100,000m or 1/100,000 ft

137. Stop Distance (Lowest byte)
138. Distance Marker 1 (Higher byte)[95]
139. Distance Marker 1 (Lower byte)
140. Distance Marker 2 (Higher byte)
141. Distance Marker 2 (Lower byte)
142. Distance Marker 3 (Higher byte)
143. Distance Marker 3 (Lower byte)
144. Distance Marker 4 (Higher byte)
145. Distance Marker 4 (Lower byte)
146. Distance Marker 5 (Higher byte)
147. Distance Marker 5 (Lower byte)
148. Distance Marker 6 (Higher byte)
149. Distance Marker 6 (Lower byte)
150. Relative Propagation Velocity (Highest byte)[96]
151. Relative Propagation Velocity
152. Relative Propagation Velocity
153. Relative Propagation Velocity (Lowest byte)
154. Cable Loss (Highest byte)[97]
155. Cable Loss
156. Cable Loss
157. Cable Loss (Lowest byte)
158. Average Cable Loss[98] (Highest byte)
159. Average Cable Loss
160. Average Cable Loss
161. Average Cable Loss (Lowest byte)
162. Status Byte 1: (0b = Off , 1b = On)
    (LSB) bit 0 : Site Master Marker 1 On/Off
    bit 1 : Site Master Marker 2 On/Off
    bit 2 : Site Master Marker 3 On/Off
    bit 3 : Site Master Marker 4 On/Off
    bit 4 : Site Master Marker 5 On/Off
    bit 5 : Site Master Marker 6 On/Off
    bits 6- 7 : Not Used
163. Status Byte 2: (0b = Off, 1b = On)
    (LSB) bit 0 : Not Used
    bit 1 : Site Master Marker 2 Delta On/Off
    bit 2 : Site Master Marker 3 Delta On/Off
    bit 3 : Site Master Marker 4 Delta On/Off
    bits 4-7: Not Used
164. Status Byte 3: (0b = Off , 1b = On)
    (LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)
    bit 1 : Site Master Limit Beep On/Off
    bit 2 : FREQ-SWR Multiple Limit Segment 1 Status On/Off
    bit 3 : FREQ-SWR Multiple Limit Segment 2 Status On/Off
    bit 4 : FREQ-SWR Multiple Limit Segment 3 Status On/Off
    bit 5 : FREQ-SWR Multiple Limit Segment 4 Status On/Off
    bit 6 : FREQ-SWR Multiple Limit Segment 5 Status On/Off
    bit 7 : Site Master Single Limit Status On/Off
165. Status Byte 4: (0b = Off, 1b = On)
    (LSB) bits 0-1: Not Used

[95] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.
[96] Relative Propagation Velocity uses units 1/100,000.
[97] Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[98] Average Cable Loss is dB * 1000.

bit 2: FREQ-RL Multiple Limit Segment 1 Status On/Off
bit 3: FREQ-RL Multiple Limit Segment 2 Status On/Off
bit 4: FREQ-RL Multiple Limit Segment 3 Status On/Off
bit 5: FREQ-RL Multiple Limit Segment 4 Status On/Off
bit 6: FREQ-RL Multiple Limit Segment 5 Status On/Off
bit 7: Not Used

166. Status Byte 5: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2: FREQ-CL Multiple Limit Segment 1 Status On/Off
bit 3: FREQ-CL Multiple Limit Segment 2 Status On/Off
bit 4: FREQ-CL Multiple Limit Segment 3 Status On/Off
bit 5: FREQ-CL Multiple Limit Segment 4 Status On/Off
bit 6: FREQ-CL Multiple Limit Segment 5 Status On/Off
bit 7: Not Used

167. Status Byte 6: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : DIST-SWR Multiple Limit Segment 1 Status On/Off
bit 3 : DIST-SWR Multiple Limit Segment 2 Status On/Off
bit 4 : DIST-SWR Multiple Limit Segment 3 Status On/Off
bit 5 : DIST-SWR Multiple Limit Segment 4 Status On/Off
bit 6: DIST-SWR Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

168. Status Byte 7: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2: DIST-RL Multiple Limit Segment 1 Status On/Off
bit 3: DIST-RL Multiple Limit Segment 2 Status On/Off
bit 4: DIST-RL Multiple Limit Segment 3 Status On/Off
bit 5: DIST-RL Multiple Limit Segment 4 Status On/Off
bit 6: DIST-RL Multiple Limit Segment 5 Status On/Off
bit 7: Not Used

169. Status Byte 8:
(LSB) bits 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bit 2: Serial Port Echo Status On/Off
bits 3 – 7 : Not Used

170. Status Byte 9: (0b = Off, 1b = On)
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Site Master VNA Cal On/Off
bit 2 : LCD Back Light On/Off
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bit 4 : InstaCal On/Off
bits 5-6: Not Used
bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)

171. VNA Signal Standard[99] (Higher byte)
172. VNA Signal Standard (Lower byte)
173-196. VNA Signal Standard Name, 24 bytes of ASCII
197-217. VNA Cable Name, 21 bytes of ASCII
218. Frequency Scale Factor[100] (Higher byte)

[99] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[100] Frequency Scale Factor is in number of Hz.

219. Frequency Scale Factor (Lower byte)
220-300) Not Used

For Spectrum Analyzer Mode/Transmission Mode (Option 21):

26) Spectrum Analyzer Mode Data Points (Higher byte)
27) Spectrum Analyzer Mode Data Points (Lower byte)
28) Spectrum Analyzer Start Frequency[101] (Highest byte)
29) Spectrum Analyzer Start Frequency
30) Spectrum Analyzer Start Frequency
31) Spectrum Analyzer Start Frequency (Lowest byte)
32) Spectrum Analyzer Stop Frequency[102] (Highest byte)
33) Spectrum Analyzer Stop Frequency
34) Spectrum Analyzer Stop Frequency
35) Spectrum Analyzer Stop Frequency (Lowest byte)
36) Spectrum Analyzer Center Frequency[103] (Highest byte)
37) Spectrum Analyzer Center Frequency
38) Spectrum Analyzer Center Frequency
39) Spectrum Analyzer Center Frequency (Lowest byte)
40) Spectrum Analyzer Frequency Span[104] (Highest byte)
41) Spectrum Analyzer Frequency Span
42) Spectrum Analyzer Frequency Span
43) Spectrum Analyzer Frequency Span (Lowest byte)
44) Spectrum Analyzer Minimum Frequency Step Size (Highest byte)
45) Spectrum Analyzer Minimum Frequency Step Size
46) Spectrum Analyzer Minimum Frequency Step Size
47) Spectrum Analyzer Minimum Frequency Step Size (Lowest byte)
48) Ref Level (Highest byte)[105]
49) Ref Level
50) Ref Level
51) Ref Level (Lowest byte)
52) Scale per div (Highest byte)[106]
53) Scale per div
54) Scale per div
55) Scale per div (Lowest byte)
56) Spectrum Analyzer Frequency Marker 1 (Higher byte)[107]
57) Spectrum Analyzer Frequency Marker 1 (Lower byte)
58) Spectrum Analyzer Frequency Marker 2 (Higher byte)
59) Spectrum Analyzer Frequency Marker 2 (Lower byte)
60) Spectrum Analyzer Frequency Marker 3 (Higher byte)
61) Spectrum Analyzer Frequency Marker 3 (Lower byte)
62) Spectrum Analyzer Frequency Marker 4 (Higher byte)
63) Spectrum Analyzer Frequency Marker 4 (Lower byte)
64) Spectrum Analyzer Frequency Marker 5 (Higher byte)
65) Spectrum Analyzer Frequency Marker 5 (Lower byte)
66) Spectrum Analyzer Frequency Marker 6 (Higher byte)
67) Spectrum Analyzer Frequency Marker 6 (Lower byte)
68) Spectrum Analyzer Single Limit (Highest byte)[108]

---

[101] Scaled by Frequency Scale Factor (bytes 321-322)
[102] Scaled by Frequency Scale Factor (bytes 321-322)
[103] Scaled by Frequency Scale Factor (bytes 321-322)
[104] Scaled by Frequency Scale Factor (bytes 321-322)
[105] Value sent as (value in dBm * 1000) + 270,000)
[106] Value sent as (value * 1000)
[107] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

69) Spectrum Analyzer Single Limit
70) Spectrum Analyzer Single Limit
71) Spectrum Analyzer Single Limit (Lowest byte)
72) SPA Multiple Upper Limit 1 Start X[109] (Highest byte)
73) SPA Multiple Upper Limit 1 Start X
74) SPA Multiple Upper Limit 1 Start X
75) SPA Multiple Upper Limit 1 Start X (Lowest byte)
76) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [110]
77) SPA Multiple Upper Limit 1 Start Y (Power Level)
78) SPA Multiple Upper Limit 1 Start Y (Power Level)
79) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
80) SPA Multiple Upper Limit 1 End X[111] (Highest byte)
81) SPA Multiple Upper Limit 1 End X
82) SPA Multiple Upper Limit 1 End X
83) SPA Multiple Upper Limit 1 End X (Lowest byte)
84) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [112]
85) SPA Multiple Upper Limit 1 End Y (Power Level)
86) SPA Multiple Upper Limit 1 End Y (Power Level)
87) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
88-231) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 72-87 for format)
232) RBW Setting (Highest byte)[113]
233) RBW Setting
234) RBW Setting
235) RBW Setting (Lowest byte)
236) VBW Setting (Highest byte)[114]
237) VBW Setting
238) VBW Setting
239) VBW Setting (Lowest byte)
240) OCC BW Method[115]
241) OCC BW % Value (Highest byte)[116]
242) OCC BW % Value
243) OCC BW % Value
244) OCC BW % Value (Lowest byte)
245) OCC BW dBc (Highest byte)[117]
246) OCC BW dBc
247) OCC BW dBc
248) OCC BW dBc (Lowest byte)
249) Attenuation (Highest byte)
250) Attenuation
251) Attenuation
252) Attenuation (Lowest byte)
253) Antenna Index(0-14)
254-269) Antenna Name (16 bytes in ASCII)
270) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off

---

[108] Value sent as (value in dBm * 1000) + 270000
[109] Scaled by Frequency Scale Factor (bytes 321-322)
[110] Value sent as (value in dBm * 1000) + 270000
[111] Scaled by Frequency Scale Factor (bytes 321-322)
[112] Value sent as (value in dBm * 1000) + 270000
[113] RBW frequency sent in Hz.
[114] VBW frequency sent in Hz.
[115] 00h = % of power, 01h = dB down
[116] 0 – 99%
[117] 0 – 120 dBc

bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used

271) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Transmission Mode Cal Status On/Off (Option 21)
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off

272) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[118]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

273) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [119]

274) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

275) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : SPA Cal Status On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)

[118] Beep level is always 1b for upper segmented limit line
[119] Beep level is always 0b for lower segmented limit line

bit 7 : Units Type (0b = Log 1b = Linear)

276) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Serial Port Echo Status On/Off
bit 1: Return Sweep Time On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

277) Reference Level Offset[120] (Highest byte)
278) Reference Level Offset
279) Reference Level Offset
280) Reference Level Offset (Lowest byte)
281) External Reference Frequency [121]
282) Signal Standard[122] (Higher byte)
283) Signal Standard (Lower byte)
284) Channel Selection[123] (Higher byte)
285) Channel Selection (Lower byte)
286) Trigger Type[124]
287) Interference Analysis Frequency[125] (Highest byte)
288) Interference Analysis Frequency
289) Interference Analysis Frequency
290) Interference Analysis Frequency (Lowest byte)
291) Trigger Position (0 – 100%)
292) Min Sweep Time (in µs) (Highest byte)
293) Min Sweep Time (in µs)
294) Min Sweep Time (in µs)
295) Min Sweep Time (in µs) (Lowest byte)
296) Video Trigger Level[126] (Highest byte)
297) Video Trigger Level
298) Video Trigger Level
299) Video Trigger Level (Lowest byte)
300) Status Byte 8
(LSB) bit 0: Input Power Status (1b = Input Power Too High, 0b = Input Power Ok)
bit 1: Reserved
bits 2-7: Not Used
301) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
302) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bits 4-7: Not Used
303) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
304) Impedance Loss[127] (Higher byte)

---

[120] Value sent as (value in dBm * 1000) + 270,000
[121] 1 byte in MHz (i.e. 20 = 20MHz)
[122] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[123] "No Channel" is sent as FFFEh
[124] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[125] Scaled by Frequency Scale Factor (bytes 321-322)
[126] Value sent as (value in dBm * 1000) + 270,000
[127] Value sent as (value in dB * 1000), valid values are 0 to 20 dB

305) Impedance Loss (Lower byte)
306) AM/FM Demod Type[128]
307) AM/FM Demod Status (01h = On, 00h = Off)
308) AM/FM Demod Volume (0 to 100)
309) AM/FM Demod Frequency[129] (Highest byte)
310) AM/FM Demod Frequency
311) AM/FM Demod Frequency
312) AM/FM Demod Frequency (Lowest byte)
313) AM/FM Demod Time (in ms) (Highest byte)
314) AM/FM Demod Time (in ms)
315) AM/FM Demod Time (in ms)
316) AM/FM Demod Time (in ms) (Lowest byte)
317) SSB BFO Offset[130] (Highest byte)
318) SSB BFO Offset
319) SSB BFO Offset
320) SSB BFO Offset (Lowest byte)
321) Frequency Scale Factor[131] (Higher byte)
322) Frequency Scale Factor (Lower byte)
323) Frequency Range Minimum[132] (Highest byte)
324) Frequency Range Minimum
325) Frequency Range Minimum
326) Frequency Range Minimum (Lowest byte)
327) Frequency Range Maximum[133] (Highest byte)
328) Frequency Range Maximum
329) Frequency Range Maximum
330) Frequency Range Maximum (Lowest byte)
331) Marker Type[134]
332-355) Signal Standard Name, 24bytes of ASCII
356-400) Not Used

For Power Meter Mode (Both option 5 and narrow band):

26) Power Meter Start Freq[135] (Highest byte)
27) Power Meter Start Freq
28) Power Meter Start Freq
29) Power Meter Start Freq (Lowest byte)
30) Power Meter Stop Freq[136] (Highest byte)
31) Power Meter Stop Freq
32) Power Meter Stop Freq
33) Power Meter Stop Freq (Lowest byte)
34) Power Meter Center Freq[137] (Highest byte)
35) Power Meter Center Freq
36) Power Meter Center Freq
37) Power Meter Center Freq (Lowest byte)
38) Power Meter Span[138] (Highest byte)

[128] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[129] Scaled by Frequency Scale Factor (bytes 321-322)
[130] Value sent as ((value in Hz) – 10,000)
[131] In number of Hz
[132] Scaled by Frequency Scale Factor (bytes 321-322)
[133] Scaled by Frequency Scale Factor (bytes 321-322)
[134] 00h = Regular Marker, 01h = Noise Marker
[135] Scaled by Frequency Scale Factor (bytes 59-60)
[136] Scaled by Frequency Scale Factor (bytes 59-60)
[137] Scaled by Frequency Scale Factor (bytes 59-60)

39) Power Meter Span
40) Power Meter Span
41) Power Meter Span (Lowest byte)
42) Signal Standard[139] (Higher byte)
43) Signal Standard (Lower byte)
44) Channel Selection[140] (Higher byte)
45) Channel Selection (Lower byte)
46) Power Meter Offset (Highest byte)
47) Power Meter Offset
48) Power Meter Offset
49) Power Meter Offset (Lowest byte)
50) Power Meter Relative (Highest byte)[141]
51) Power Meter Relative
52) Power Meter Relative
53) Power Meter Relative (Lowest byte)
54) Power Meter Status (00h = Off, 01h = On)
55) Power Meter Unit (00h = Watts, 01h = dBm)
56) Power Meter Relative Status (00h = Off, 01h = On)
57) Power Meter Offset Status (00h = Off, 01h = On)
58) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
59) Frequency Scale Factor[142] (Higher byte)
60) Frequency Scale Factor (Lower byte)
61) Frequency Range Minimum[143] (Highest byte)
62) Frequency Range Minimum
63) Frequency Range Minimum
64) Frequency Range Minimum (Lowest byte)
65) Frequency Range Maximum[144] (Highest byte)
66) Frequency Range Maximum
67) Frequency Range Maximum
68) Frequency Range Maximum (Lowest byte)
69) Zero Status (00h = Off, 01h = On)
70) Zero Value[145] (Highest byte)
71) Zero Value
72) Zero Value
73) Zero Value (Lowest byte)
74-97) Signal Standard Name, 24 bytes of ASCII
98-120) Not Used

For T1 Mode (Option 50):
26) T1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
27) T1 Framing Mode (01h: ESF, 02h: D4SF)
28) T1 Line Coding (01h: B8ZS, 02h: AMI)
29) T1 Clock Source (00h: External, 01h: Internal)
30) T1 Tx Level (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
31) T1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
32) T1 Loop Code (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
33) T1 CRC Method (00h: ANSI CRC, 01h: Japanese CRC)

---

[138] Scaled by Frequency Scale Factor (bytes 59-60)
[139] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[140] "No Channel" is sent as FFFEh
[141] Value as ((value in dBm * 1000) + 100)
[142] In number of Hz
[143] Scaled by Frequency Scale Factor
[144] Scaled by Frequency Scale Factor
[145] Value sent as ((value in dBm * 1000) + 100)

34) T1 Loop Type (00h: In Band, 01h: Data Link)
35) T1 Pattern (Higher byte)
36) T1 Pattern (Lower byte) 01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
37) T1 Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
38) T1 Display Type (00h: Histogram, 01h: Raw Data)
39) T1 Impedance
40 - 55) First User Defined Loop Code Down (16 bytes)
56 - 71) Second User Defined Loop Code Down (16 bytes)
72 - 87) First User Defined Loop Code Up (16 bytes)
88 - 103) Second User Defined Loop Code Up (16 bytes)
104 - 135) User Defined Pattern (32 bytes)
136) T1 1st User Defined Loop Up (Higher byte)
137) T1 1st User Defined Loop Up (Lower byte)
138) T1 2nd User Defined Loop Up (Higher byte)
139) T1 2nd User Defined Loop Up (Lower byte)
140) T1 1st User Defined Loop Down (Higher byte)
141) T1 1st User Defined Loop Down (Lower byte)
142) T1 2nd User Defined Loop Down (Higher byte)
143) T1 2nd User Defined Loop Down (Lower byte)
144) T1 User Defined Pattern (Highest byte)
145) T1 User Defined Pattern
146) T1 User Defined Pattern
147) T1 User Defined Pattern (Lowest byte)
148) T1 Bit Error Insert Value (1-1000) (Higher byte)
149) T1 Bit Error Insert Value (Lower byte)
150) T1 Frame Error Insert Value (1-1000) (Higher byte)
151) T1 Frame Error Insert Value (Lower byte)
152) T1 BPV Error Insert Value (1-1000) (Higher byte)
153) T1 BPV Error Insert Value (Lower byte)
154) T1 Graph Resolution[146]
155) T1 Measurement Duration[147]
156) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
157) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
158 – 240) Not Used

For E1 Mode (Option 50):
26) E1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
27) E1 Framing Mode (03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
28) E1 Line Coding (02h: AMI, 03h: HDB3)
29) E1 Clock Source (00h: External, 01h: Internal)
30) E1 Tx Level
31) E1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
32) E1 Loop Code
33) E1 CRC Method
34) E1 Loop Type
35) E1 Pattern (Highest byte)
36) E1 Pattern (Lowest byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)

[146] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[147] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

37) E1 Pattern Invert (00h: Non-Inverted, 01h: Inverted)
38) E1 Display Type (00h: Histogram, 01h: Raw Data)
39) E1 Impedance (01h: 75 Ω, 02h: 120 Ω)
40 - 55) First User Defined Loop Code Down (16 bytes)
56 - 71) Second User Defined Loop Code Down (16 bytes)
72 - 87) First User Defined Loop Code Up (16 bytes)
88 - 103) Second User Defined Loop Code Up (16 bytes)
104 - 135) User Defined Pattern (32 bytes)
136) E1 1st User Defined Loop Up (Highest byte)
137) E1 1st User Defined Loop Up (Lowest byte)
138) E1 2nd User Defined Loop Up (Highest byte)
139) E1 2nd User Defined Loop Up (Lowest byte)
140) E1 1st User Defined Loop Down (Highest byte)
141) E1 1st User Defined Loop Down (Lowest byte)
142) E1 2nd User Defined Loop Down (Highest byte)
143) E1 2nd User Defined Loop Down (Lowest byte)
144) E1 User Defined Pattern (Highest byte)
145) E1 User Defined Pattern
146) E1 User Defined Pattern
147) E1 User Defined Pattern (Lowest byte)
148) E1 Bit Error Insert Value (1-1000) (Higher byte)
149) E1 Bit Error Insert Value (Lower byte)
150) E1 Frame Error Insert Value (1-1000) (Higher byte)
151) E1 Frame Error Insert Value (Lower byte)
152) E1 BPV Error Insert Value (1-1000) (Higher byte)
153) E1 BPV Error Insert Value (Lower byte)
154) E1 Graph Resolution[148]
155) E1 Measurement Duration[149]
156) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
157-240) Not Used

***Select Printer Type* – Control Byte #30 (1Eh)**

Description: Select Printer Type.

Bytes to Follow: 1 byte

1) Printer ID
   - 0 – Epson Stylus Models
   - 1 – Epson LQ Models
   - 2 – Citizen PN Models
   - 3 – NEC Superscript Models
   - 4 – NEC Silentwriter Models
   - 5 – Seiko DPU 411, 414 Models
   - 6 – Canon BJC 50
   - 7 – Canon BJC 80
   - 8 – Canon BJC 250
   - 9 – Canon BJC 4400
   - 10 – HP DJ 300 Series
   - 11 – HP DJ 400 Series
   - 12 – HP DJ 500 Series

[148] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

[149] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

13 – HP DJ 600 Series
14 – HP DJ 800 Series
15 – HP DJ 1120
16 – HP LJ 6L, 6P, 4000
17 – Epson Esc/P Compatible
18 – Epson Esc/P2 Compatible
19 – Epson Esc/P Raster Compatible
20 – HP PCL3 Compatible

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte

Select DTF Windowing – Control Byte #31 (1Fh)

Description: Select DTF Windowing Methods.

DTF windowing allows you to make a trade off between side lobe height and resolution.

Bytes to Follow: 1 byte
1) Windowing Method
   00h = Rectangular (finest resolution, highest side lobes)
   01h = Nominal Side Lobe (balance between resolution and side lobes)
   02h = Low Side Lobe
   03h = Minimum Side Lobe

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid DTF Windowing Method
   238 (EEh) Time-out Error

Set Site Master VNA Trace Math – Control Byte #32 (20h)

Description: Setup trace math operation and trace for VNA modes.

Bytes to Follow: 2 bytes
1) Trace Math Operation
   00h = Off
   01h = Addition
   02h = Subtraction
2) Trace on which to Perform Math Operation (1 to 200)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Trace Math Operation
   238 (EEh) Time-out Error

***Recall Sweep Trace* – Control Byte #33 (21h)**

This command is new to the S33xD. Use it, instead of Control Byte #17, to access the new features.

Description: Queries the Site Master for sweep trace data.

NOTE: Before you can recall a sweep stored in non-volatile memory (trace numbers 1-200) you must build a trace table in the Site Master's RAM. Use Control Byte #24 to build the trace table. Since the trace table exists in RAM, Control Byte #24 must be executed every time the Site Master's power is cycled.

Bytes to Follow: 1 byte

0 = Last sweep trace before entering remote mode (sweep trace in RAM)
1- 200 = Specific saved sweep number (stored sweeps in Flash memory)

Site Master Returns:

1-2) # of following bytes (total length - 2)
3) Current Instrument Date Format[150]
4) Not Used
5-11) Model Number (7 bytes in ASCII)
12-15) Software Version (4 bytes ASCII)
16) Measurement Mode[151]
17-20) Time/Date (in Long Integer[152])
21-30) Date in String Format (mm/dd/yyyy)
31-38) Time in String Format (hh:mm:ss)
39-54) Reference number stamp (16 bytes in ASCII)
55-56) # data points (130, 259 or 517 or 401 or 100)

For all "Site Master VNA Modes" :

57) Start Frequency[153] (Highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (Lowest byte)
61) Stop Frequency[154] (Highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (Lowest byte)
65) Minimum Frequency Step Size (Highest byte)
66) Minimum Frequency Step Size
67) Minimum Frequency Step Size
68) Minimum Frequency Step Size (Lowest byte)
69) Scale Top[155] (Highest byte)
70) Scale Top
71) Scale Top
72) Scale Top (Lowest byte)
73) Scale Bottom (Highest byte)
74) Scale Bottom
75) Scale Bottom
76) Scale Bottom (Lowest byte)
77) Frequency Marker 1[156] (Higher byte)

[150] 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD
[151] Refer to Control Byte #3 "Select Measurement Mode" for detailed value.
[152] Time/Date long integer representation is in seconds since January 1, 1970
[153] Frequency is scaled by the frequency scale factor specified in bytes 268-269.
[154] Frequency is scaled by the frequency scale factor specified in bytes 268-269.
[155] See Control Byte #4 "Set Site Master Scale" for data format

78) Frequency Marker 1 (Lower byte)
79) Frequency Marker 2 (Higher byte)
80) Frequency Marker 2 (Lower byte)
81) Frequency Marker 3 (Higher byte)
82) Frequency Marker 3 (Lower byte)
83) Frequency Marker 4 (Higher byte)
84) Frequency Marker 4 (Lower byte)
85) Frequency Marker 5 (Higher byte)
86) Frequency Marker 5 (Lower byte)
87) Frequency Marker 6 (Higher byte)
88) Frequency Marker 6 (Lower byte)
89) Single Limit[157] (Highest byte)
90) Single Limit
91) Single Limit
92) Single Limit (Lowest byte)
93) Multiple Limit Segment # (1)
94) Multiple Limit Segment Status
95) Multiple Limit Start X[158] (Highest byte)
96) Multiple Limit Start X
97) Multiple Limit Start X
98) Multiple Limit Start X (Lowest byte)
99) Multiple Limit Start Y (Higher byte)
100) Multiple Limit Start Y (Lower byte)
101) Multiple Limit End X[159] (Highest byte)
102) Multiple Limit End X
103) Multiple Limit End X
104) Multiple Limit End X (Lowest byte)
105) Multiple Limit End Y (Higher byte)
106) Multiple Limit End Y (Lower byte)
107–162) Repeat bytes 93-106 for segments 2-5
163) Start Distance[160] (Highest byte)
164) Start Distance
165) Start Distance
166) Start Distance (Lowest byte)
167) Stop Distance (Highest byte)
168) Stop Distance
169) Stop Distance
170) Stop Distance (Lowest byte)
171) Distance Marker 1[161] (Higher byte)
172) Distance Marker 1 (Lower byte)
173) Distance Marker 2 (Higher byte)
174) Distance Marker 2 (Lower byte)
175) Distance Marker 3 (Higher byte)
176) Distance Marker 3 (Lower byte)
177) Distance Marker 4 (Higher byte)
178) Distance Marker 4 (Lower byte)

---

[156] marker point = (# of data points – 1) * (marker freq – start freq) / (stop freq – start freq) where # of data points can be found in bytes 55-56, start freq is in bytes 57-60, and stop freq is in bytes 61-64.
[157] See Control Byte #6 “Set Site Master VNA Single Limit” for data format.
[158] See Control Byte #112 “Set Site Master VNA Segmented Limit Lines” for data format. Frequency is scaled by the frequency scale factor specified in bytes 268-269.
[159] Frequency is scaled by the frequency scale factor specified in bytes 268-269.
[160] Distance data uses units 1/100,000m (or feet)
[161] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 55-56, start dist is in bytes 163-166, and stop dist is in bytes 167-170.

179) Distance Marker 5 (Higher byte)
180) Distance Marker 5 (Lower byte)
181) Distance Marker 6 (Higher byte)
182) Distance Marker 6 (Lower byte)
183) Relative Propagation Velocity[162] (Highest byte)
184) Relative Propagation Velocity
185) Relative Propagation Velocity
186) Relative Propagation Velocity (Lowest byte)
187) Cable Loss[163] (Highest byte)
188) Cable Loss
189) Cable Loss
190) Cable Loss (Lowest byte)
191) Average Cable Loss[164] (Highest byte)
192) Average Cable Loss
193) Average Cable Loss
194) Average Cable Loss (Lowest byte)
195) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
196) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 2 Delta On/Off
bit 1 : Marker 3 Delta On/Off
bit 2 : Marker 4 Delta On/Off
bits 3-7 : Not Used
197) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bit 2: Trace Math On/Off
bits 3-5 : Not Used
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of Measurement (1b = Metric, 0b = English)
198) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used
199) Status Byte 5 (Cal Status):
00h : Calibration Off
01h : Standard Calibration On
02h : InstaCal Calibration On
03h : Standard FlexCal On
04h : InstaCal FlexCal On
200) VNA Signal Standard[165] (Higher byte)

[162] Relative Propagation Velocity uses units 1/100,000
[163] Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[164] Average Cable Loss is dB * 1000.

201) VNA Signal Standard (Lower byte)
202-205) GPS Position – Latitude (long integer)[166]
206-209) GPS Position – Longitude (long integer)
210-211) GPS Position – Altitude (short integer)
212) Signal Standard Link Type[167]
213-236) Signal Standard Name, 24 bytes in ASCII
237-257) Cable Name, 21 bytes in ASCII
258-267) UTC Time, 10 bytes in ASCII
268) Frequency Scale Factor[168] (Higher Byte)
269) Frequency Scale Factor (Lower Byte)
270-324) Not Used
325-1364) Sweep Data (130 points * 8 bytes/point = 1040 bytes)
325-2396) Sweep Data (259 points * 8 bytes/point = 2072 bytes)
325-4460) Sweep Data (517 points * 8 bytes/point = 4136 bytes)
8 bytes for each data point
1. gamma[169] (Highest byte)
2. gamma
3. gamma
4. gamma (Lowest byte)
5. phase[170] (Highest byte)
6. phase
7. phase
8. phase (Lowest byte)

Notes:
return loss = - 20* (log(gamma) / log(10))
VSWR = (1+gamma)/(1-gamma)
phase compares the reflected to the incident (reference)

For Spectrum Analyzer Mode/Transmission Mode (Option 21 Only):
57) Start Frequency[171] (Highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (Lowest byte)
61) Stop Frequency[172] (Highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (Lowest byte)
65) Center Frequency[173] (Highest byte)
66) Center Frequency
67) Center Frequency
68) Center Frequency (Lowest byte)
69) Frequency Span[174] (Highest byte)

---

[165] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[166] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[167] 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link
[168] Frequency Scale Factor is in number of Hz.
[169] Gamma data uses 1/10,000 units.
[170] Phase data uses 1/10 degree unit.
[171] Scaled by Frequency Scale Factor (bytes 335-336)
[172] Scaled by Frequency Scale Factor (bytes 335-336)
[173] Scaled by Frequency Scale Factor (bytes 335-336)
[174] Scaled by Frequency Scale Factor (bytes 335-336)

70) Frequency Span
71) Frequency Span
72) Frequency Span (Lowest byte)
73) Minimum Frequency Step Size (Highest byte)
74) Minimum Frequency Step Size
75) Minimum Frequency Step Size
76) Minimum Frequency Step Size (Lowest byte)
77) Ref Level[175] (Highest byte)
78) Ref Level
79) Ref Level
80) Ref Level (Lowest byte)
81) Scale per div[176] (Highest byte)
82) Scale per div
83) Scale per div
84) Scale per div (Lowest byte)
85) Frequency Marker 1[177] (Higher byte)
86) Frequency Marker 1 (Lower byte)
87) Frequency Marker 2 (Higher byte)
88) Frequency Marker 2 (Lower byte)
89) Frequency Marker 3 (Higher byte)
90) Frequency Marker 3 (Lower byte)
91) Frequency Marker 4 (Higher byte)
92) Frequency Marker 4 (Lower byte)
93) Frequency Marker 5 (Higher byte)
94) Frequency Marker 5 (Lower byte)
95) Frequency Marker 6 (Higher byte)
96) Frequency Marker 6 (Lower byte)
97) Single Limit[178] (Highest byte)
98) Single Limit
99) Single Limit
100) Single Limit (Lowest byte)
101) Multiple Upper Limit 1 Start X[179] (Highest byte)
102) Multiple Upper Limit 1 Start X
103) Multiple Upper Limit 1 Start X
104) Multiple Upper Limit 1 Start X (Lowest byte)
105) Multiple Upper Limit 1 Start Y (Power Level[180]) (Highest byte)
106) Multiple Upper Limit 1 Start Y (Power Level)
107) Multiple Upper Limit 1 Start Y (Power Level)
108) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
109) Multiple Upper Limit 1 End X[181] (Highest byte)
110) Multiple Upper Limit 1 End X
111) Multiple Upper Limit 1 End X
112) Multiple Upper Limit 1 End X (Lowest byte)
113) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
114) Multiple Upper Limit 1 End Y (Power Level)
115) Multiple Upper Limit 1 End Y (Power Level)
116) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
117-260) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 101-116 for format)

[175] Value sent as (Value in dBm * 1000) + 270,000
[176] Value sent as (Value * 1000)
[177] Value sent as data point on display. Freq = (Point * Span / (Total Data Points – 1)) + Start Freq
[178] Value sent as (Value in dBm * 1000) + 270,000
[179] Scaled by Frequency Scale Factor (bytes 335-336)
[180] Value sent as (value in dBm * 1000) + 270,000
[181] Scaled by Frequency Scale Factor (bytes 335-336)

261) RBW Setting (Frequency in Hz) (Highest byte)
262) RBW Setting (Frequency in Hz)
263) RBW Setting (Frequency in Hz)
264) RBW Setting (Frequency in Hz) (Lowest byte)
265) VBW Setting (Frequency in Hz) (Highest byte)
266) VBW Setting (Frequency in Hz)
267) VBW Setting (Frequency in Hz)
268) VBW Setting (Frequency in Hz) (Lowest byte)
269) OCC BW Method (0b = % of power, 1b = dB down)
270) OCC BW % Value[182]
271) OCC BW dBc [183]
272) Attenuation[184] (Highest byte)
273) Attenuation
274) Attenuation
275) Attenuation (Lowest byte)
276-291) Antenna Name(16 bytes in ASCII)
292) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7: Not Used
293) Status Byte 2: (0b = Off , 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off
294) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = RMS average 10b = neg. peak 11b = sampling mode)
bits 3-4 : Amplitude Units (Log) - (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV) (Linear) – (00b = Watts 01b = Volts)
bit 5 : Channel Power On/Off
bit 6 : Adjacent Channel Power On/Off
bit 7 : Units Type (0b = Log 1b = Linear)
295) Status Byte 4[185]
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Not Used
bit 2 : Single Limit On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[186]

[182] % value is 0-99
[183] dBc value 0 – 120 dBc
[184] Value sent as (value in dB * 1000)
[185] For bits 2, 1 and 0 (“X” is “don’t care): 0X0=no limit, 1X0=single limit, 0X1=multiple limit, 1X1=multiple limit.
[186] Upper limits always trigger an error beep if data is ABOVE the limit segment, for example, this bit is always 1b.

bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

296) Status Byte 5
(0b = Off/Beep if data is below line, 1b = On/Beep if data is above line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW[187]

297) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

298) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used

299) Reference Level Offset [188](Highest byte)
300) Reference Level Offset
301) Reference Level Offset
302) Reference Level Offset (Lowest byte)
303) External Reference Frequency [189]
304) Signal Standard[190] (Higher byte)
305) Signal Standard (Lower byte)
306) Channel Selection[191] (Higher byte)
307) Channel Selection (Lower byte)
308) Interference Analysis Cellular Standard[192]
309) Interference Analysis Estimated Bandwidth (Highest byte)
310) Interference Analysis Estimated Bandwidth
311) Interference Analysis Estimated Bandwidth
312) Interference Analysis Estimated Bandwidth (Lowest byte)
313) Interference Analysis Frequency[193] (Highest byte)
314) Interference Analysis Frequency
315) Interference Analysis Frequency
316) Interference Analysis Frequency (Lowest byte)
317-320) Reserved
321) Trigger Type[194]
322) Trigger Position (0 – 100%)

[187] Lower limits always trigger an error beep if data is BELOW the limit segment, for example, this bit is always 0b.
[188] Value sent as (value in dBm * 1000) + 270,000
[189] 1 byte in MHz (i.e. 20 = 20MHz)
[190] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[191] "No Channel" is sent as FFFEh
[192] 4 Standards – 00h = 1250kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[193] Scaled by Frequency Scale Factor (bytes 335-336)
[194] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

323) Min Sweep Time (in µs) (Highest byte)
324) Min Sweep Time (in µs)
325) Min Sweep Time (in µs)
326) Min Sweep Time (in µs) (Lowest byte)
327) Video Trigger Level[195] (Highest byte)
328) Video Trigger Level
329) Video Trigger Level
330) Video Trigger Level (Lowest byte)
331) Status Byte 8 (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: Transmission Calibration On/Off (Option 21 Only)
bit 5: Bias Tee On/Off (Option 10 Only)
bit 6: Occupied BW Measurement On/Off
bit 7: Not Used
332) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
333) Impedance Loss[196] (Higher byte)
334) Impedance Loss (Lower byte)
335) Frequency Scale Factor[197] (Higher byte)
336) Frequency Scale Factor (Lower byte)
337) Frequency Range Minimum[198] (Highest byte)
338) Frequency Range Minimum
339) Frequency Range Minimum
340) Frequency Range Minimum (Lowest byte)
341) Frequency Range Maximum[199] (Highest byte)
342) Frequency Range Maximum
343) Frequency Range Maximum
344) Frequency Range Maximum (Lowest byte)
345) Linked Trace Number (1-200)
346) Status Byte 9 (0b = Off, 1b = On)
(LSB) bit 0: C/I Measurement On/Off
bits 1-3: C/I Carrier Trace/Signal Type[200]
bits 4-7: Not Used
347) C/I Calculated Power[201] (Carrier or Interference – NB FHSS[202]) (Highest byte)
348) C/I Calculated Power (Carrier or Interference – NB FHSS)
349) C/I Calculated Power (Carrier or Interference – NB FHSS)
350) C/I Calculated Power (Carrier or Interference – NB FHSS) (Lowest byte)
351) C/I Calculated Power [203] (Interference – WB FHSS[204]) (Highest byte)
352) C/I Calculated Power (Interference – WB FHSS)
353) C/I Calculated Power (Interference – WB FHSS)
354) C/I Calculated Power (Interference – WB FHSS) (Lowest byte)
355) C/I Calculated Power [205] (Interference – Broadband[206]) (Highest byte)

---

[195] Value sent as (value in dBm * 1000) + 270,000
[196] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[197] In number of Hz
[198] Scaled by Frequency Scale Factor
[199] Scaled by Frequency Scale Factor
[200] 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference
[201] Value sent as (value in dBm * 1000) + 270,000
[202] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes represent the calculated Carrier power.
[203] Value sent as (value in dBm * 1000) + 270,000
[204] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – WB FHSS trace. Otherwise, these bytes should be ignored.

356) C/I Calculated Power (Interference – Broadband)
357) C/I Calculated Power (Interference – Broadband)
358) C/I Calculated Power (Interference – Broadband) (Lowest byte)
359) Occupied Bandwidth Power (Highest byte)[207]
360) Occupied Bandwidth Power
361) Occupied Bandwidth Power
362) Occupied Bandwidth Power (Lowest byte)
363) Marker Type[208]
364-367) GPS Position – Latitude (long integer)[209]
368-371) GPS Position – Longitude (long integer)
372-373) GPS Position – Altitude (short integer)
374) Signal Standard Link Type[210]
375-398) Signal Standard Name, 24 bytes in ASCII
399) Measure Offset Status (0h = Off, 1h = On)
400-431) Not Used
432-2035) Sweep Data (401 points * 4 bytes/point= 1604 bytes)
4 bytes for each data point
1. dBm[211] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

For Power Meter Mode (both option 5 and narrow band):
57) Power Monitor Mode (00h = Off, 01h = On)
58) Power Meter Unit (00h = dBm, 01h = Watts)
59) Start Frequency[212] (Highest byte)
60) Start Frequency
61) Start Frequency
62) Start Frequency (Lowest byte)
63) Stop Frequency[213] (Highest byte)
64) Stop Frequency
65) Stop Frequency
66) Stop Frequency (Lowest byte)
67) Center Frequency[214] (Highest byte)
68) Center Frequency
69) Center Frequency
70) Center Frequency (Lowest byte)
71) Frequency Span[215] (Highest byte)
72) Frequency Span
73) Frequency Span
74) Frequency Span (Lowest byte)

---

[205] Value sent as (value in dBm * 1000) + 270,000
[206] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – Broadband trace. Otherwise, these bytes should be ignored.
[207] If Method is % of power then the value is db Down * 1000. If the method is db down, then the value is %
[208] 00h = Regular Marker, 01h = Noise Marker
[209] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[210] 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link
[211] Value sent as (value in dBm * 1000) + 270,000
[212] Scaled by Frequency Scale Factor (bytes 96-97)
[213] Scaled by Frequency Scale Factor (bytes 96-97)
[214] Scaled by Frequency Scale Factor (bytes 96-97)
[215] Scaled by Frequency Scale Factor (bytes 96-97)

75) Power Offset Status (00h = Off, 01h = On)
76) Power Offset[216] (Highest byte)
77) Power Offset
78) Power Offset
79) Power Offset (Lowest byte)
80) Power Relative Status (00h = Off, 01h = On
81) Power Relative Value[217] (Highest byte)
82) Power Relative Value
83) Power Relative Value
84) Power Relative Value (Lowest byte)
85) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
86) Power Zero Status (00h = Off, 01h = On)
87) External Reference Status (00h = Off, 01h = On)
88) External Reference Frequency (in Hz) (Highest byte)
89) External Reference Frequency (in Hz)
90) External Reference Frequency (in Hz)
91) External Reference Frequency (in Hz) (Lowest byte)
92) Signal Standard[218] (Highest byte)
93) Signal Standard (Lowest byte)
94) Channel Selection[219] (Highest byte)
95) Channel Selection (Lowest byte)
96) Frequency Scale Factor[220] (Higher byte)
97) Frequency Scale Factor (Lower byte)
98) Frequency Range Minimum[221] (Highest byte)
99) Frequency Range Minimum
100) Frequency Range Minimum
101) Frequency Range Minimum (Lowest byte)
102) Frequency Range Maximum[222] (Highest byte)
103) Frequency Range Maximum
104) Frequency Range Maximum
105) Frequency Range Maximum (Lowest byte)
106 – 150) Not Used
151) Power Meter Reading[223] (Highest byte)
152) Power Meter Reading
153) Power Meter Reading
154) Power Meter Reading (Lowest byte)
155) Measure Offset Status (0h = Off, 1h = On)

For T1 Tester / E1 Tester Mode (Option 50):
57) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
58) Framing Mode[224]
59) Line Coding (01h: B8ZS, 02h: AMI, 03h: HDB3)
60) Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
61) Clock Source (00h: External, 01h: Internal)
62) Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)

[216] Value sent as (value in dB * 1000), valid values are 0 to 60 dB
[217] Value sent as (value in dBm * 1000)
[218] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[219] "No Channel" is sent as FFFEh
[220] In number of Hz
[221] Scaled by Frequency Scale Factor
[222] Scaled by Frequency Scale Factor
[223] Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.
[224] T1 Mode: 01h: ESF, 02h: D4SF
E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC

63) Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
64) Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)
65) CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
66) Display Type (00h: Histogram, 01h: Raw Data)
67) Impedance (Valid for E1 Only) (01h: 75 Ω, 02h: 120 Ω)
68) Pattern[225]
69) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
70) Insert Bit Error Value (1-1000) (Higher byte)
71) Insert Bit Error Value (Lower byte)
72) Insert BPV Error Value (1-1000) (Higher byte)
73) Insert BPV Error Value (Lower byte)
74) Insert Frame Error Value (1-1000) (Higher byte)
75) Insert Frame Error Value (Lower byte)
76) Measurement Duration[226]
77) Histogram Resolution[227]
78) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
79) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
80) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
81) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
82) BPV Error Count (Highest byte)
83) BPV Error Count
84) BPV Error Count
85) BPV Error Count (Lowest byte)
86) CRC Error Count (Highest byte)
87) CRC Error Count
88) CRC Error Count
89) CRC Error Count (Lowest byte)
90) Frame Error Count (Highest byte)
91) Frame Error Count
92) Frame Error Count
93) Frame Error Count (Lowest byte)
94) LOF Error Count (Highest byte)
95) LOF Error Count
96) LOF Error Count
97) LOF Error Count (Lowest byte)
98) E Bit Error Count (E1 Only) (Highest byte)
99) E Bit Error Count (E1 Only)
100) E Bit Error Count (E1 Only)
101) E Bit Error Count (E1 Only) (Lowest byte)
102) Errored Seconds (Highest byte)
103) Errored Seconds
104) Errored Seconds
105) Errored Seconds (Lowest byte)
106) Bit Count (Highest byte)
107) Bit Count
108) Bit Count
109) Bit Count (Lowest byte)
110) Bit Errors (Highest byte)

[225] Pattern: 01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined

[226] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

[227] Histogram Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

111) Bit Errors
112) Bit Errors
113) Bit Errors (Lowest byte)
114) User Defined Pattern (convert to binary for pattern) (Highest byte)
115) User Defined Pattern
116) User Defined Pattern
117) User Defined Pattern (Lowest byte)
118 – 125) Measurement Start Time String (ASCII string: “HH:MM:SS”)
126 – 136) Measurement Stop Time String (ASCII string: “DD:HH:MM:SS”)
137 – 147) Elapsed Time String (ASCII string: “DD:HH:MM:SS”)
148 – 155) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
156 – 655) 100 data points with 5 bytes for each data point.
1st byte has information about Carrier Loss, Frame Loss, BPV and CRC
Following 4 bytes corresponds to the Bit Error Count
Break down of the 1st byte :

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not Used	Not Used	Not Used	Carrier Loss	Frame Loss	BPV Error	CRC / E-Bit Error	Any Error

656) Vpp or dBdsx (Higher byte) (Only in Vpp mode. See T1/E1 Read Vpp command for data format)
657) Vpp or dBdsx (Lower byte)
658) T1 or E1 Receive Frequency in Hz (Highest byte) (Only in BER mode)
659) T1 or E1 Receive Frequency in Hz
660) T1 or E1 Receive Frequency in Hz
661) T1 or E1 Receive Frequency in Hz (Lowest byte)
662 – 750) Not Used

For Channel Scanner Mode:
57) Reference Level (Highest Byte)
58) Reference Level
59) Reference Level
60) Reference Level (Lowest Byte)
61) Scale Division (Highest Byte)
62) Scale Division
63) Scale Division
64) Scale Division (Lowest Byte)
65) Start Frequency (Highest Byte)
66) Start Frequency
67) Start Frequency
68) Start Frequency (Lowest Byte)
69) Span Frequency (Highest Byte)
70) Span Frequency
71) Span Frequency
72) Span Frequency (Lowest Byte)
73) Channel Step (Highest Byte)
74) Channel Step (Lowest Byte)
75) Channel Frequency Step (Highest Byte)
76) Channel Frequency Step
77) Channel Frequency Step
78) Channel Frequency Step (Lowest Byte)
79) Number of Channels Displayed
80) External Reference Frequency[228]
81) Display Type Channels or Frequencies[229]

[228] Frequency in MHz, OFF if 0
[229] 0 – Channel, 1 - Frequency

82) Display Type Graph or Text[230]
83) Signal Standard (Highest Byte)
84) Signal Standard
85) Signal Standard
86) Signal Standard (Lowest Byte)
87-90) GPS Position – Latitude (long integer)[231]
91-94) GPS Position – Longitude (long integer)
95-96) GPS Position – Altitude (short integer)
97) Start Channel (Highest Byte)
98) Start Channel
99) Start Channel
100) Start Channel (Lowest Byte)
101 – 124) Signal Standard Name, 24 bytes in ASCII
125 – 152) Reserved
153 – 272) Channel Scanner Data[232]

For Interference Analyzer RSSI Mode

57) Center Frequency (Highest Byte)
58) Center Frequency
59) Center Frequency
60) Center Frequency (Lowest Byte)
61) Reference Level (Highest Byte)
62) Reference Level
63) Reference Level
64) Reference Level (Lowest Byte)
65) Scale (Highest Byte)
66) Scale
67) Scale
68) Scale (Lowest Byte)
69) RBW (Highest Byte)
70) RBW
71) RBW
72) RBW (Lowest Byte)
73) VBW (Highest Byte)
74) VBW
75) VBW
76) VBW (Lowest Byte)
77) Status Byte 1
    Bit 0 - Detection Algorithm (Lowest Bit)[233]
    Bit 1 - Detection Algorithm
    Bit 2 - Detection Algorithm (Highest Bit)
    Bit 3 - Not Used
    Bit 4 - Not Used
    Bit 5 - Not Used
    Bit 6 - Not Used
78) Reference Level Offset (Highest Byte)
79) Reference Level Offset
80) Reference Level Offset

[230] 0 – Graph, 1 - Text
[231] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[232] 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as (value in dBm) * 1000 + 270,000
[233] 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode

81) Reference Level Offset (Lowest Byte)
82) External Reference Frequency[234]
83) Signal Standard (Highest Byte)
84) Signal Standard (Lowest Byte)
85) Channel (Highest Byte)[235]
86) Channel (Lowest Byte)
87) Min RSSI Measured (Highest Byte)
88) Min RSSI Measured
89) Min RSSI Measured
90) Min RSSI Measured (Lowest Byte)
91) Max RSSI Measured (Highest Byte)
92) Max RSSI Measured
93) Max RSSI Measured
94) Max RSSI Measured (Lowest Byte)
95) Measure Duration (Highest Byte)[236]
96) Measure Duration
97) Measure Duration
98) Measure Duration (Lowest Byte)
99) Sweep Point Interval(Highest Byte)[237]
100) Sweep Point Interval
101) Sweep Point Interval
102) Sweep Point Interval (Lowest Byte)
103 – 106) GPS Position – Latitude (long integer)[238]
107 – 110) GPS Position – Longitude (long integer)
111 – 112) GPS Position – Altitude (short integer)
113) Signal Standard
114 – 117) Start GPS Position – Latitude (long integer)[239]
118 – 121) Start GPS Position – Longitude (long integer)
122 – 123) Start GPS Position – Altitude (short integer)
124) Attenuation (Highest Byte)[240]
125) Attenuation
126) Attenuation
127) Attenuation (Lowest Byte)
128 – 151) Signal Standard Name, 24 bytes in ASCII
152) Measure Offset Status (0h = Off, 1h = On)
153 – 207) Reserved
208 – 3415) RSSI Sweep data[241]

For High Accuracy Power Meter Mode
57) Center Frequency(Highest Byte)[242]

---

[234] Frequency in MHz, OFF if 0
[235] Invalid channels are sent as 0xFFFF
[236] Measure Duration time in minutes
[237] Sweep Point Interval time in milliseconds
[238] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[239] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[240] Attenuation is sent as (Att in dB * 1000)
[241] Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPSposition.
[242] in kHz

58) Center Frequency
59) Center Frequency
60) Center Frequency(Lowest Byte)
61) Power Reading(Highest Byte)[243]
62) Power Reading(Lowest Byte)
63) Max Hold Status (0h = Off, 1h = On)
64) Offset Status (0h = Off, 1h = On)
65) Offset Value(Highest Byte) [244]
66) Offset Value(Lowest Byte)
67) Measure Offset Status (0h = Off, 1h = On)
68) Measure Offset Value(Highest Byte) [245]
69) Measure Offset Value(Lowest Byte)
70) Relative Value(Highest Byte) [246]
71) Relative Value(Lowest Byte)
72) Relative Status (0h = Off, 1h = On)
73) Running Averages Number(Highest Byte)
74) Running Averages Number(Lowest Byte)
75 – 76) Signal Standard ID
77 – 100) Signal Standard Name
101) Zero Status (0h = Off, 1h = On)
102) Limit Status (0h = Off, 1h = On)
103) Upper Limit dBm(Highest Byte) [247]
104) Upper Limit dBm(Lowest Byte)
105) Lower Limit dBm(Highest Byte) [248]
106) Lower Limit dBm(Lowest Byte)
107) Limit Unit Display
108) Error Message Status[249]
109 – 112) GPS Position – Latitude (long integer)[250]
113 – 116) GPS Position – Longitude (long integer)
117 – 118) GPS Position – Altitude (short integer)
119 – 128) UTC Time, 10 bytes in ASCII
129 – 256) Reserved Byte

*Site Master Returns (*For invalid sweeps/empty stored sweep locations)*:* 11 bytes
1-2) Number of following bytes (9 bytes for invalid sweep recall)
3) Current Instrument Date Format[251]
4) Model # (unsigned integer, 10h for Site Master model S331D, 11h for Site Master model S332D)
5-11) Extended Model # (7 bytes in ASCII)

Site Master Returns (Invalid sweep location): 1 byte
1) 224 (E0) Parameter Error: Invalid sweep location

---

[243] in 2-complement and in dBm
[244] in 2-complement and in dB
[245] in 2-complement and in dB
[246] in 2-complement and in dBm
[247] in 2-complement
[248] in 2-complement
[249] Bit 0: set to 1 if there is power supply error in the power sensor module. Bit 1: set to 1 if there is too much RF power going into the sensor module. Bit 2: set to 1 if zeroing is done incorrectly. Bit 3: set to 1 if power sensor's operating temperature range is exceeded. Bit 4: set to 1 if temperature has drifted by more than specified degree since the last zeroing.
[250] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[251] 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD

***Set Site Master VNA Trace Overlay* – Control Byte #34 (22h)**

Description: Setup trace overlay operation and trace for VNA modes.

Bytes to Follow: 2 bytes
1) Trace Overlay Operation (0 or 1)
   00h = Off
   01h = On
2) Trace on which to Perform Overlay Operation (1 to 200)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Trace Overlay Operation
   238 (EEh) Time-out Error

***Set SPA A/B Trace* – Control Byte #35 (23h)**

Description: Defines traces "A" and "B" for Spectrum Analyzer mode.

Trace A is always the currently measured data (with or without trace math). It is always visible.

Trace B is always stored data and may come from a saved sweep or a previous "A" trace. There is no default for trace B. Trace B can be ON (visible) or OFF.

Bytes to Follow: 3 bytes
1) "A" trace display (00h = A only, 01h = A-B, 02h = A+B)
2) "B" trace status (00h = Off, 01h = On)
3) "B" trace number
   0 = save current "A" data into "B" buffer, use that as "B"
   1-200 = trace number
   255 = no "B" trace defined

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Not enough bytes transferred, "B" trace requested to be used in calculations or displayed, but no trace or invalid trace specified
   238 (EEh) Time-out Error

***Upload Sweep Trace* – Control Byte #36 (24h)**

This command is new to the S33xD. Use it instead of Control Bytes #26 and #28 to access the new features.

Description: Uploads a sweep trace to the Site Master.

Bytes to Follow:
For All Modes:
- 1-2) # of following bytes
- 3) Measurement Mode[252]
- 4-7) Time/Date (in Long Integer)
- 8-17) Date in String Format (MM/DD/YYYY)
- 18-25) Time in String Format (HH:MM:SS)

[252] See Control Byte #3 "Set Measurement Mode" for available measurement modes.

26-41) Reference number stamp (16 ASCII bytes)
42-43) # of data points (130, 259, 517 or 401 or 100)

For VNA Modes:

44) Start Frequency[253] (Highest byte)
45) Start Frequency
46) Start Frequency
47) Start Frequency (Lowest byte)
48) Stop Frequency[254] (Highest byte)
49) Stop Frequency
50) Stop Frequency
51) Stop Frequency (Lowest byte)
52) Minimum Frequency Step Size (Highest byte)
53) Minimum Frequency Step Size
54) Minimum Frequency Step Size
55) Minimum Frequency Step Size (Lowest byte)
56) Scale Top (Highest byte)[255]
57) Scale Top
58) Scale Top
59) Scale Top (Lowest byte)
60) Scale Bottom (Highest byte)
61) Scale Bottom
62) Scale Bottom
63) Scale Bottom (Lowest byte)
64) Frequency Marker 1 (Higher byte)[256]
65) Frequency Marker 1 (Lower byte)
66) Frequency Marker 2 (Higher byte)
67) Frequency Marker 2 (Lower byte)
68) Frequency Marker 3 (Higher byte)
69) Frequency Marker 3 (Lower byte)
70) Frequency Marker 4 (Higher byte)
71) Frequency Marker 4 (Lower byte)
72) Frequency Marker 5 (Higher byte)
73) Frequency Marker 5 (Lower byte)
74) Frequency Marker 6 (Higher byte)
75) Frequency Marker 6 (Lower byte)
76) Single Limit Line Value (Highest byte)[257]
77) Single Limit Line Value
78) Single Limit Line Value
79) Single Limit Line Value (Lowest byte)
80) Multiple Limit Segment # (1)
81) Multiple Limit Segment Status (00h = Off, 01h = On)
82) Multiple Limit Start X (Highest byte)[258]
83) Multiple Limit Start X
84) Multiple Limit Start X
85) Multiple Limit Start X (Lowest byte)
86) Multiple Limit Start Y (Higher byte)
87) Multiple Limit Start Y (Lower byte)

[253] Frequency is scaled by the frequency scale factor specified in byte 245-246.
[254] Frequency is scaled by the frequency scale factor specified in byte 245-246.
[255] See Control Byte #4, "Set Site Master VNA Scale" for data format.
[256] Marker point = (Number of data points – 1) * (marker freq – start freq) / (stop freq – start freq)
[257] See Control Byte #6, "Set Site Master VNA Single Limit" for data format
[258] See Control Byte #112, "Set Site Master VNA Segmented Limit Lines" for data format. Frequency is scaled by the frequency scale factor specified in bytes 245-246.

88) Multiple Limit End X (Highest byte)[259]
89) Multiple Limit End X
90) Multiple Limit End X
91) Multiple Limit End X (Lowest byte)
92) Multiple Limit End Y (Higher byte)
93) Multiple Limit End Y (Lower byte)
94-149) Repeat bytes 80-93 for segments 2-5
150) Start Distance (Highest byte)[260]
151) Start Distance
152) Start Distance
153) Start Distance (Lowest byte)
154) Stop Distance (Highest byte)
155) Stop Distance
156) Stop Distance
157) Stop Distance (Lowest byte)
158) Distance Marker 1 (Higher byte)[261]
159) Distance Marker 1 (Lower byte)
160) Distance Marker 2 (Higher byte)
161) Distance Marker 2 (Lower byte)
162) Distance Marker 3 (Higher byte)
163) Distance Marker 3 (Lower byte)
164) Distance Marker 4 (Higher byte)
165) Distance Marker 4 (Lower byte)
166) Distance Marker 5 (Higher byte)
167) Distance Marker 5 (Lower byte)
168) Distance Marker 6 (Higher byte)
169) Distance Marker 6 (Lower byte)
170) Relative Propagation Velocity (Highest byte)[262]
171) Relative Propagation Velocity
172) Relative Propagation Velocity
173) Relative Propagation Velocity (Lowest byte)
174) Cable Loss (Highest byte)[263]
175) Cable Loss
176) Cable Loss
177) Cable Loss (Lowest byte)
178) Average Cable Loss[264] (Highest byte)
179) Average Cable Loss
180) Average Cable Loss
181) Average Cable Loss (Lowest byte)
182) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
183) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 2 Delta On/Off

[259] Frequency is scaled by the frequency scale factor specified in bytes 245-246.
[260] Distance data uses units 1/100,000m or 1/100,000 ft
[261] Marker point = (# of data points – 1) * (marker dist – start dist) / (stop dist – start dist)
[262] Relative Propagation Velocity uses units 1/100,000
[263] Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft
[264] Average Cable Loss is dB * 1000.

bit 1 : Marker 3 Delta On/Off
bit 2 : Marker 4 Delta On/Off
bits 3-7: Not Used

184) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bit 2: Trace Math On/Off
bits 3-5: Not Used
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of measurement (1b = Metric, 0b = English)

185) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

186) Status Byte 5 (Cal Status) :
00h : Calibration Off
01h : Standard Calibration On
02h : InstaCal Calibration On
03h : Standard FlexCal On
04h : InstaCal FlexCal On

187) VNA Signal Standard[265] (Higher byte)
188) VNA Signal Standard (Lower byte)
189-192) GPS Position – Latitude (long integer)[266]
193-196) GPS Position – Longitude (long integer)
197-198) GPS Position – Altitude (short integer)
199) Reserved
200-223) Signal Standard Name, 24 bytes in ASCII
224-244) Cable Name, 21 bytes in ASCII
245) Frequency Scale Factor[267] (Higher byte)
246) Frequency Scale Factor (Lower byte)
248-314) Not Used
315-1354) Sweep Data (130 points * 8 bytes/point= 1040 bytes)
315-2386) (259 points * 8 bytes/point= 2072 bytes)
315-4450) (517 points * 8 bytes/point= 4136 bytes)
8 bytes for each data point
1. Gamma[268] (Highest byte)
2. Gamma
3. Gamma
4. Gamma (Lowest byte)
5. Phase[269] (Highest byte)
6. Phase
7. Phase
8. Phase (Lowest byte)

[265] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[266] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[267] Frequency Scale Factor is in number of Hz.
[268] Gamma uses units scaled to 1/10,000
[269] Phase is transmitted in 1/10ths of a degree

Notes:
return loss = - 20* (log(Gamma) / log(10))
VSWR = (1+Gamma)/(1-Gamma)
Phase compares the reflected to the incident (reference)

For Spectrum Analyzer Mode:

44) Start Frequency[270] (Highest byte)
45) Start Frequency
46) Start Frequency
47) Start Frequency (Lowest byte)
48) Stop Frequency[271] (Highest byte)
49) Stop Frequency
50) Stop Frequency
51) Stop Frequency (Lowest byte)
52) Center Frequency[272] (Highest byte)
53) Center Frequency
54) Center Frequency
55) Center Frequency (Lowest byte)
56) Frequency Span[273] (Highest byte)
57) Frequency Span
58) Frequency Span
59) Frequency Span (Lowest byte)
60) Ref Level[274] (Highest byte)
61) Ref Level
62) Ref Level
63) Ref Level (Lowest byte)
64) Scale per div[275] (Highest byte)
65) Scale per div
66) Scale per div
67) Scale per div (Lowest byte)
68) Marker 1[276] (Higher byte)
69) Marker 1 (Lower byte)
70) Marker 2 (Higher byte)
71) Marker 2 (Lower byte)
72) Marker 3 (Higher byte)
73) Marker 3 (Lower byte)
74) Marker 4 (Higher byte)
75) Marker 4 (Lower byte)
76) Marker 5 (Higher byte)
77) Marker 5 (Lower byte)
78) Marker 6 (Higher byte)
79) Marker 6 (Lower byte)
80) Single Limit[277] (Highest byte)
81) Single Limit
82) Single Limit

---

[270] Scaled by Frequency Scale Factor (bytes 318-319)
[271] Scaled by Frequency Scale Factor (bytes 318-319)
[272] Scaled by Frequency Scale Factor (bytes 318-319)
[273] Scaled by Frequency Scale Factor (bytes 318-319)
[274] Value sent as (value in dBm * 1000) + 270,000
[275] Value sent as (value * 1000)
[276] Marker values are sent as # of data point on display.
See Control Byte #102, "Set Spectrum Analyzer Marker" for calculation of data point.
[277] All amplitude values are sent as (value in dBm * 1000) + 270,000

83) Single Limit (Lowest byte)
84) Multiple Upper Limit 1 Start X[278] (Highest byte)
85) Multiple Upper Limit 1 Start X
86) Multiple Upper Limit 1 Start X
87) Multiple Upper Limit 1 Start X (Lowest byte)
88) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte)
89) Multiple Upper Limit 1 Start Y (Power Level)
90) Multiple Upper Limit 1 Start Y (Power Level)
91) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
92) Multiple Upper Limit 1 End X[279] (Highest byte)
93) Multiple Upper Limit 1 End X
94) Multiple Upper Limit 1 End X
95) Multiple Upper Limit 1 End X (Lowest byte)
96) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
97) Multiple Upper Limit 1 End Y (Power Level)
98) Multiple Upper Limit 1 End Y (Power Level)
99) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
100-243) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 84-99 for format)
244) RBW Setting[280] (Highest byte)
245) RBW Setting
246) RBW Setting
247) RBW Setting (Lowest byte)
248) VBW Setting[281] (Highest byte)
249) VBW Setting
250) VBW Setting
251) VBW Setting (Lowest byte)
252) OCC BW Method (00h = % of power, 01h = dB down)
253) OCC BW % Value (0-99)
254) OCC BW dBc (0-120)
255) Attenuation[282] (Highest byte)
256) Attenuation
257) Attenuation
258) Attenuation (Lowest byte)
259-274) Antenna Name (16 bytes in ASCII)
275) Status Byte 1: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7: Not Used
276) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off

[278] Scaled by Frequency Scale Factor (bytes 318-319)
[279] Scaled by Frequency Scale Factor (bytes 318-319)
[280] Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000, 1,000,000
[281] Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000
[282] Value sent as (value * 1000)

bit 7 : Normalization On/Off

277) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = RMS Averaging 10b= neg. peak, 11 = Sampling Mode)
bits 3-4 : Amplitude Units (log) (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
(Linear) – (00b = Watts 01b = Volts)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power Ratio On/Off
bit 7 : Units Type (0b = Log 1b = Linear)

278) Status Byte 4
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit On/Off
bit 2 : Single Limit Beep Level (0b = beep when data is below line 1b = above)
bit 3 : Not Used
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

279) Status Byte 5
(0b = Off/Beep if data is BELOW line, 1b =On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW

280) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

281) Status Byte 7
(LSB) bits 0-6: Number of Sweeps to Average (1-25, 1 implies averaging OFF)
bit 7 : Not Used

282) Reference Level Offset[283] (Highest byte)
283) Reference Level Offset
284) Reference Level Offset
285) Reference Level Offset (Lowest byte)
286) External Reference Frequency[284]
287) Signal Standard[285] (Higher byte)
288) Signal Standard (Lower byte)
289) Channel Selection[286] (Higher byte)

[283] Value sent as (Value in dBm * 1000) + 270,000
[284] byte in MHz (i.e. 20 = 20MHz)
[285] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh.
[286] "No Channel" is sent as FFFEh.

290) Channel Selection (Lower byte)
291) Interference Analysis Cellular Standard[287]
292) Interference Analysis Estimated Bandwidth (Highest byte)
293) Interference Analysis Estimated Bandwidth
294) Interference Analysis Estimated Bandwidth
295) Interference Analysis Estimated Bandwidth (Lowest byte)
296) Interference Analysis Frequency[288] (Highest byte)
297) Interference Analysis Frequency
298) Interference Analysis Frequency
299) Interference Analysis Frequency (Lowest byte)
300-303) Reserved
304) Trigger Type[289]
305) Trigger Position (0 – 100%)
306) Min Sweep Time (in µs) (Highest byte)
307) Min Sweep Time (in µs)
308) Min Sweep Time (in µs)
309) Min Sweep Time (in µs) (Lowest byte)
310) Video Trigger Level[290] (Highest byte)
311) Video Trigger Level
312) Video Trigger Level
313) Video Trigger Level (Lowest byte)
314) Status Byte 8 (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: Transmission Calibration Status (Option 21 Only)
bit 5: Bias Tee On/Off (Option 10 Only)
bit 6: Occupied BW Measurement On/Off
bit 7: Not Used
315) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
316) Impedance Loss[291] (Higher byte)
317) Impedance Loss (Lower byte)
318) Frequency Scale Factor[292] (Higher byte)
319) Frequency Scale Factor (Lower byte)
320) Frequency Range Minimum[293] (Highest byte)
321) Frequency Range Minimum
322) Frequency Range Minimum
323) Frequency Range Minimum (Lowest byte)
324) Frequency Range Maximum[294] (Highest byte)
325) Frequency Range Maximum
326) Frequency Range Maximum
327) Frequency Range Maximum (Lowest byte)
328) Linked Trace Number (1-200)
329) Status Byte 9 (0b = Off, 1b = On)
(LSB) bit 0: C/I Measurement On/Off

[287] 4 Standards – 00h = 1250kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown FFh = Interference Analysis Measurement OFF
[288] Scaled by Frequency Scale Factor (bytes 318-319)
[289] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[290] Value sent as (Value in dBm * 1000) + 270,000
[291] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[292] In number of Hz
[293] Scaled by Frequency Scale Factor
[294] Scaled by Frequency Scale Factor

bits 1-3: C/I Carrier Trace/Signal Type[295]
bits 4-7: Not Used

330) C/I Calculated Power[296] (Carrier or Interference – NB FHSS[297]) (Highest byte)
331) C/I Calculated Power (Carrier or Interference – NB FHSS)
332) C/I Calculated Power (Carrier or Interference – NB FHSS)
333) C/I Calculated Power (Carrier or Interference – NB FHSS) (Lowest byte)
334) C/I Calculated Power [298] (Interference – WB FHSS[299]) (Highest byte)
335) C/I Calculated Power (Interference – WB FHSS)
336) C/I Calculated Power (Interference – WB FHSS)
337) C/I Calculated Power (Interference – WB FHSS) (Lowest byte)
338) C/I Calculated Power [300] (Interference – Broadband[301]) (Highest byte)
339) C/I Calculated Power (Interference – Broadband)
340) C/I Calculated Power (Interference – Broadband)
341) C/I Calculated Power (Interference – Broadband) (Lowest byte)
342) Marker Type[302]
343-400) Not Used
401-2004) Sweep Data (401 points * 4 bytes/point = 1604 bytes)
4 bytes for each data point
1. dBm[303] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

For Power Meter:

44) Power Monitor Mode (00h = Off, 01h = On)
45) Power Meter Unit (00h = dBm, 01h = Watts)
46) Start Frequency[304] (Highest byte)
47) Start Frequency
48) Start Frequency
49) Start Frequency (Lowest byte)
50) Stop Frequency[305] (Highest byte)
51) Stop Frequency
52) Stop Frequency
53) Stop Frequency (Lowest byte)
54) Center Frequency[306] (Highest byte)
55) Center Frequency
56) Center Frequency
57) Center Frequency (Lowest byte)
58) Frequency Span[307] (Highest byte)

---

[295] 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference
[296] Value sent as (value in dBm * 1000) + 270,000
[297] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes represent the calculated Carrier power.
[298] Value sent as (value in dBm * 1000) + 270,000
[299] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – WB FHSS trace. Otherwise, these bytes should be ignored.
[300] Value sent as (value in dBm * 1000) + 270,000
[301] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – Broadband trace. Otherwise, these bytes should be ignored.
[302] 00h = Regular Marker, 01h = Noise Marker
[303] Value sent as (Value in dBm * 1000) + 270,000
[304] Scaled by Frequency Scale Factor (bytes 96-97)
[305] Scaled by Frequency Scale Factor (bytes 96-97)
[306] Scaled by Frequency Scale Factor (bytes 96-97)
[307] Scaled by Frequency Scale Factor (bytes 96-97)

59) Frequency Span
60) Frequency Span
61) Frequency Span (Lowest byte)
62) Power Offset Status (00h = Off, 01h = On)
63) Power Offset[308] (Highest byte)
64) Power Offset
65) Power Offset
66) Power Offset (Lowest byte)
67) Power Relative Status (00h = Off, 01h = On
68) Power Relative Value[309] (Highest byte)
69) Power Relative Value
70) Power Relative Value
71) Power Relative Value (Lowest byte)
72) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
73) Power Zero Status (00h = Off, 01h = On)
74) External Reference Status (00h = Off, 01h = On)
75) External Reference Frequency (in Hz) (Highest byte)
76) External Reference Frequency (in Hz)
77) External Reference Frequency (in Hz)
78) External Reference Frequency (in Hz) (Lowest byte)
79) Signal Standard[310] (higher byte)
80) Signal Standard (lower byte)
81) Channel Selection[311] (higher byte)
82) Channel Selection (lower byte)
83) Frequency Scale Factor[312] (higher byte)
84) Frequency Scale Factor (lower byte)
85) Frequency Range Minimum[313] (Highest byte)
86) Frequency Range Minimum
87) Frequency Range Minimum
88) Frequency Range Minimum (Lowest byte)
89) Frequency Range Maximum[314] (Highest byte)
90) Frequency Range Maximum
91) Frequency Range Maximum
92) Frequency Range Maximum (Lowest byte)
93-96) GPS Position – Latitude (long integer)[315]
97-100) GPS Position – Longitude (long integer)
101-102) GPS Position – Altitude (short integer)
103) Reserved
104 – 127) Signal Standard Name, 24 bytes in ASCII
128 – 150) Not Used
151) Power Meter Reading[316] (Highest byte)
152) Power Meter Reading
153) Power Meter Reading
154) Power Meter Reading (Lowest byte)

[308] Value sent as (value in dB * 1000), valid values are 0 to 60 dB
[309] Value sent as (value in dBm * 1000)
[310] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[311] "No Channel" is sent as FFFEh
[312] In number of Hz
[313] Scaled by Frequency Scale Factor
[314] Scaled by Frequency Scale Factor
[315] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[316] Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.

155) Measure Offset Status (00h = Off, 01h = On)

For T1/E1 Modes (Option 50):

44) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
45) Framing Mode[317]
46) Line Coding (01h: B8ZS, 02h: AMI, 03h: HDB3)
47) Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
48) Clock Source (00h: External, 01h: Internal)
49) Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
50) Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
51) Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)
52) CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
53) Display Type (00h: Histogram, 01h: Raw Data)
54) Impedance (Valid for E1 Only) (01h: 75 Ω, 02h: 120 Ω)
55) Pattern[318]
56) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
57) Insert Bit Error Value (1-1000) (Higher byte)
58) Insert Bit Error Value (Lower byte)
59) Insert BPV Error Value (1-1000) (Higher byte)
60) Insert BPV Error Value (Lower byte)
61) Insert Frame Error Value (1-1000) (Higher byte)
62) Insert Frame Error Value (Lower byte)
63) Measurement Duration[319]
64) Histogram Resolution[320]
65) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
66) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
67) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
68) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
69) BPV Error Count (Highest byte)
70) BPV Error Count
71) BPV Error Count
72) BPV Error Count (Lowest byte)
73) CRC Error Count (Highest byte)
74) CRC Error Count
75) CRC Error Count
76) CRC Error Count (Lowest byte)
77) Frame Error Count (Highest byte)
78) Frame Error Count
79) Frame Error Count
80) Frame Error Count (Lowest byte)
81) LOF Error Count (Highest byte)
82) LOF Error Count
83) LOF Error Count
84) LOF Error Count (Lowest byte)
85) E Bit Error Count (E1 Only) (Highest byte)
86) E Bit Error Count (E1 Only)

[317] T1 Mode: 01h: ESF, 02h: D4SF
E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC

[318] Pattern: 01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined

[319] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

[320] Histogram Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

87) E Bit Error Count (E1 Only)
88) E Bit Error Count (E1 Only) (Lowest byte)
89) Errored Seconds (Highest byte)
90) Errored Seconds
91) Errored Seconds
92) Errored Seconds (Lowest byte)
93) Bit Count (Highest byte)
94) Bit Count
95) Bit Count
96) Bit Count (Lowest byte)
97) Bit Errors (Highest byte)
98) Bit Errors
99) Bit Errors
100) Bit Errors (Lowest byte)
101) User Defined Pattern (convert to binary for pattern) (Highest byte)
102) User Defined Pattern
103) User Defined Pattern
104) User Defined Pattern (Lowest byte)
105 – 112) Measurement Start Time String (ASCII string: "HH:MM:SS")
113 – 123) Measurement Stop Time String (ASCII string: "DD:HH:MM:SS")
124 – 134) Elapsed Time String (ASCII string: "DD:HH:MM:SS")
135 – 142) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
143 – 642) 100 data points with 5 bytes for each data point.
1st byte has information about Carrier Loss, Frame Loss, BPV and CRC
Following 4 bytes corresponds to the Bit Error Count
Break down of the 1st byte :

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not Used	Not Used	Not Used	Carrier Loss	Frame Loss	BPV Error	CRC / E-Bit Error	Any Error

643) Vpp or dBdsx (Higher byte)
644) Vpp or dBdsx (Lower byte)
645) T1 or E1 Receive Frequency in Hz (Highest byte)
646) T1 or E1 Receive Frequency in Hz
647) T1 or E1 Receive Frequency in Hz
648) T1 or E1 Receive Frequency in Hz (Lowest byte)
649 – 750) Not Used

For Channel Scanner Mode:
44) Reference Level (Highest Byte)
45) Reference Level
46) Reference Level
47) Reference Level (Lowest Byte)
48) Scale Division (Highest Byte)
49) Scale Division
50) Scale Division
51) Scale Division (Lowest Byte)
52) Start Frequency (Highest Byte)
53) Start Frequency
54) Start Frequency
55) Start Frequency (Lowest Byte)
56) Span Frequency (Highest Byte)
57) Span Frequency
58) Span Frequency
59) Span Frequency (Lowest Byte)
60) Channel Step (Highest Byte)

61) Channel Step (Lowest Byte)
62) Channel Frequency Step (Highest Byte)
63) Channel Frequency Step
64) Channel Frequency Step
65) Channel Frequency Step (Lowest Byte)
66) Number of Channels Displayed
67) External Reference Frequency[321]
68) Display Type Channels or Frequencies[322]
69) Display Type Graph or Text[323]
70) Signal Standard (Highest Byte)
71) Signal Standard (Lowest Byte)
72-75) GPS Position – Latitude (long integer)[324]
76-79) GPS Position – Longitude (long integer)
80-81) GPS Position – Altitude (short integer)
82) Start Channel (Highest Byte)
83) Start Channel
84) Start Channel
85) Start Channel (Lowest Byte)
86 – 109) Signal Standard Name, 24bytes in ASCII
110 – 137) Reserved
138 – 257) Channel Scanner Data[325]

For Interference Analyzer RSSI Mode

44) Center Frequency (Highest Byte)
45) Center Frequency
46) Center Frequency
47) Center Frequency (Lowest Byte)
48) Reference Level (Highest Byte)
49) Reference Level
50) Reference Level
51) Reference Level (Lowest Byte)
52) Scale (Highest Byte)
53) Scale
54) Scale
55) Scale (Lowest Byte)
56) RBW (Highest Byte)
57) RBW
58) RBW
59) RBW (Lowest Byte)
60) VBW (Highest Byte)
61) VBW
62) VBW
63) VBW (Lowest Byte)
64) Status Byte 1
    Bit 0 - Detection Algorithm (Lowest Bit)[326]
    Bit 1 - Detection Algorithm

[321] Frequency in MHz, OFF if 0
[322] 0 – Channel, 1 - Frequency
[323] 0 – Graph, 1 - Text
[324] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[325] 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as (value in dBm) * 1000 + 270,000
[326] 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode

Bit 2 - Detection Algorithm (Highest Bit)
Bit 3 - Not Used
Bit 4 - Not Used
Bit 5 - Not Used
Bit 6 - Not Used

65) Reference Level Offset (Highest Byte)
66) Reference Level Offset
67) Reference Level Offset
68) Reference Level Offset (Lowest Byte)
69) External Reference Frequency[327]
70) Signal Standard (Highest Byte)
71) Signal Standard (Lowest Byte)
72) Channel (Highest Byte)[328]
73) Channel (Lowest Byte)
74) Min RSSI Measured (Highest Byte)
75) Min RSSI Measured
76) Min RSSI Measured
77) Min RSSI Measured (Lowest Byte)
78) Max RSSI Measured (Highest Byte)
79) Max RSSI Measured
80) Max RSSI Measured
81) Max RSSI Measured (Lowest Byte)
82) Measure Duration (Highest Byte)[329]
83) Measure Duration
84) Measure Duration
85) Measure Duration (Lowest Byte)
86) Sweep Point Interval(Highest Byte)[330]
87) Sweep Point Interval
88) Sweep Point Interval
89) Sweep Point Interval (Lowest Byte)
90 - 93) GPS Position – Latitude (long integer)[331]
94 - 97) GPS Position – Longitude (long integer)
98 - 99) GPS Position – Altitude (short integer)
100) Signal Standard
101-104) Start GPS Position – Latitude (long integer)[332]
105-108) Start GPS Position – Longitude (long integer)
109-110) Start GPS Position – Altitude (short integer)
111) Attenuation (Highest Byte)[333]
112) Attenuation
113) Attenuation
114) Attenuation (Lowest Byte)
115– 138) Signal Standard Name, 24bytes in ASCII
139) Measure Offset Status (0h = Off, 1h = On)
140– 194) Reserved

[327] Frequency in MHz, OFF if 0
[328] Invalid channels are sent as 0xFFFF
[329] Measure Duration time in minutes
[330] Sweep Point Interval time in milliseconds
[331] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[332] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
[333] Attenuation is sent as (Att in dB * 1000)

195 – 3402) RSSI Sweep data[334]

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Not enough bytes transferred
   225 (E1h) Memory Error: Not enough memory to store data
   238 (EEh) Time-out Error

***Get Options* – Control Byte #37 (25h)**

Description: Queries the option(s) installed on the Site Master, returns a list as an ASCII string.

Bytes to Follow: 0 bytes

Site Master Returns: Number of bytes depends on the option(s) installed

Option 2:	"2/"
Option 3:	"3/"
Option 5:	"5/"
Option 6:	"6/"
Option 10:	"10/"
Option 16:	"16/"
Option 19:	"19/"
Option 21:	"21/"
Option 25:	"25/"
Option 27:	"27/"
Option 29:	"29/"
Option 50:	"50/"
If NO options are installed:	"None"

***Query Power Level* – Control Byte #39 (27h)**

This command is available with Option 29 and/or Option 5.

Description: Return Power Level at the RF In port. Also returns power meter settings.

Bytes to Follow: 0 bytes

Site Master Returns: 30 bytes

1) Status Byte # 1 (0b = Off, 1b = On)
   (LSB) bit 0 : Unit (0b - Watt/%, 1b - dBm/dBr)
   bit 2 : Relative Mode On/Off
   bit 3: Offset Mode On/Off
   bit 4: Zero Mode On/Off
   bits 5-7: Not Used
2) RMS Averaging Status[335]
3 - 6) Relative Mode Reference Power Level in dBm
7 - 10) Offset Mode Power Level
11 - 14) Zero Mode Power Level

[334] Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPSposition.

[335] RMS Averaging – 00h = Off, 01h = Low, 02h = Medium, 03h = High

15 - 18) Absolute Power Level
19 - 22) Power
23 - 26) Center Frequency
27 - 30) Span Frequency

Notes:
Power is returned as (dBm * 1000)
Relative power is returned as (dB * 1000)
Offset is returned as (dB * 1000)
Frequencies are scaled by the frequency scale factor.

Set Power Meter Units – Control Byte #40 (28h)

This command is available with Option 29 and/or Option 5.

Description: Set Power Meter units to watts or dBm.

Bytes to Follow: 1 byte
1) Units
   00h = Watt (% if in relative mode)
   01h = dBm (dB if in relative mode)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Units
   238 (EEh) Time-out Error

Power Meter Relative Mode On/Off – Control Byte #41 (29h)

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter Relative Mode.

Bytes to Follow: 1 byte
1) Relative Mode State
   00h = Off
   01h = On w/ trigger (use the current power level as a reference power level)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid parameter
   238 (EEh) Time-out Error

Power Meter Offset Mode On/Off – Control Byte #42 (2Ah)

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter Offset Mode.

Bytes to Follow: 5 bytes
1) On/Off (01h = On, 00h = Off)
2 - 5) Offset Power level in dB (Multiplied by 1000)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid parameter
   238 (EEh) Time-out Error

Note:
If you turn the Offset mode off, you must still send the other bytes. Bytes 2 - 5 will be ignored.

***Power Meter Zero Mode On/Off* – Control Byte #43 (2Bh)**

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter Zeroing Mode.

Bytes to Follow: 1 byte
1) Zero Mode Status
   00h = Off
   01h = On with trigger (current power level is referenced as -80 dBm)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid status
   238 (EEh) Time-out Error

***Power Meter RMS Averaging On/Off* – Control Byte #44 (2Ch)**

This command is available with Option 29 only.

Description: Disable/enable Power Meter RMS Averaging. Enabling can be set to 3 different levels.

Bytes to Follow: 1 byte
1) RMS Averaging State
   00h = Off
   01h = On (Low) with trigger (current power level is referenced as -80 dBm)
   02h = On (Medium)
   03h = On (High)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid state
   238 (EEh) Time-out Error

***Power Meter Center Frequency and Span Setup* – Control Byte #45 (2Dh)**

This command is available with Option 29 only.

Description: Sets the center frequency and span frequency for the Power Meter mode.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 8 bytes
1) Center Frequency (Highest byte)
2) Center Frequency
3) Center Frequency

4) Center Frequency (Lowest byte)
5) Span (Highest byte)
6) Span
7) Span
8) Span (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid frequency range
   238 (EEh) Time-out Error

Trigger Sweep – Control Byte #48 (30h)

Description: Causes the Site Master to perform a sweep if it is in single sweep mode.

This command works only when the Site Master is NOT in remote mode. Send this command, then wait for the "Sweep Complete Byte" to signify the end of the sweep.

Note: The "Sweep Complete Byte" is not returned unless serial echo status is turned on using command #10.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte
1) 192 (C0h) Sweep Complete Byte (at the end of the sweep)

Trigger Sweep – Control Word (AA30h)

Description: Causes the Site Master to perform a sweep if it is in single sweep mode.

This command works only when the Site Master is NOT in remote mode. Send this command, receive the "Operation Complete Byte" and then wait for the "Sweep Complete Byte" to signify the end of the sweep.

Note: The "Sweep Complete Byte" is not returned unless serial echo status is turned on using command #10.

Bytes to Follow: 0 bytes

Site Master Returns: 2 bytes
1) 255 (FFh) Operation Complete Byte (when the command is received)
2) 192 (C0h) Sweep Complete Byte (at the end of the sweep)

Sweep Data Echo On/Off – Control Byte #49 (31h)

Description: Sets the sweep data echo mode On/Off.

Sweep Data Echo Mode behaves much like the Serial Port Echo Mode (see Control Byte #10). It automatically puts the unit into single sweep mode. At the end of each sweep cycle, the Site Master sends a Sweep Complete Byte #192 (C0h) to the serial port. At this time, sweep data can be queried (see Control Byte #33) without having to enter remote mode first or exit remote mode when done. Depending on the value of the second following byte, the next sweep can be automatically triggered after the sweep data has been sent.

This mode activates once the Site Master exits from the remote mode. Sweep Data Echo status can't be saved to or recalled from saved setups. Cycling power resets the Sweep Data Echo status to Off.

The Sweep Data Echo Mode allows run-time handshaking between the Site Master and computer by doing the following:

1) Enter remote mode. Set Sweep Data Echo Mode On. Exit remote mode.
2) The Site Master sweeps once and then sends the Sweep Complete Byte.
3) After you receive it: Recall sweep 0 (last sweep trace in RAM).
4) If using auto triggering, repeat steps 2-3. If using manual triggering, go to step 5.
5) Send Sweep Triggering Byte #48 (30h) and wait for the next sweep cycle.
6) Repeat steps 2-5.

Note: To execute commands other than #33, you must use the traditional Enter Remote, Send Commands, Exit Remote communication sequence.

Bytes to Follow: 2 bytes

1) Sweep Data Echo Status
   00h : Off
   01h : On
2) Next Sweep Trigger
   00h : Manual
   01h : Automatic

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid sweep data echo status
   238 (EEh) Time-out Error

***Check Battery Status* – Control Byte #50 (32h)**

Description: Return Smart Battery status.

Bytes to Follow: 0 bytes

Site Master Returns: 17 bytes

1-2) Battery Status flags (Refer to Smart Battery Data Spec 5.1.2.1)
3-4) State of Charge (unsigned integer 0 to 100(%)Full)
5-6) Battery Voltage (unsigned integer 0 to 65535 in mV)
7-8) Battery Current (signed integer -32,768 to +32,7687 mA, positive = Charging)
9-10) Battery Average current (signed integer -32,768 to +32,7687 mA, positive = Charging)
11-12) Average time to empty (unsigned integer 0 to 65535 minute)
13-14) Battery Charge Cycle Count (unsigned integer 0 to 65535 cycles)
15-16) Battery Capacity at Full Charge in mA Hours (unsigned integer 0 to 65535 cycles)
17) Unit under battery power (1 = YES; 0 = NO)

Note:
The Smart Battery Data Spec can be found at http://www.sbs-forum.org/specs/index.html

---

***Set SPA Minimum Sweep Time* – Control Byte #53 (35h)**

Description: Sets the minimum sweep time (in µs) for the spectrum analyzer when the span is 0.

Valid range is 50 to 200,000,000.

Bytes to Follow: 4 bytes

1) Minimum Sweep Time (in µs) (Highest byte)
2) Minimum Sweep Time (in µs)
3) Minimum Sweep Time (in µs)
4) Minimum Sweep Time (in µs) (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid sweep time
   238 (EEh) Time-out Error

Set Trigger Position – Control Byte #54 (36h)

Description: Sets the trigger position (in percent) for the spectrum analyzer when the span is 0.

Bytes to Follow: 1 byte

1) Trigger Position (0 – 100%)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid trigger position
   238 (EEh) Time-out Error

Set Video Trigger Level – Control Byte #55 (37h)

Description: Sets the trigger level (-120 - +20 dBm) for the spectrum analyzer when the span is 0 and trigger mode is video.

The trigger level should be sent as (value in dBm * 1000) + 120,000.

Bytes to Follow: 4 bytes

1) Trigger Level (Highest byte)
2) Trigger Level
3) Trigger Level
4) Trigger Level (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid trigger level
   238 (EEh) Time-out Error

Automatically Save Runtime Setup – Control Byte #64 (40h)

Description: Automatically save the runtime setup when exiting remote mode.
This flag must be set once per power cycle of the Site Master. It returns to its default value when the unit is turned off. The default value is (0), DO NOT automatically save the runtime setup.

Bytes to Follow: 1 byte

1) Save runtime setup On/Off
   00h = Off (default)
   01h = On

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time Out Error

Download Saved Setup – Control Byte #65 (41h)

Description: Returns parameters associated with the specified setup number. Since different modes have different numbers of setup locations available, the command requires the mode be specified as well as the setup number.

Bytes to Follow: 2 bytes

1) Measurement Mode[336]
2) Setup Number
   - 0 = Run time setup
   - 1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
   - 1 – 5 = Saved setups for Power Meter mode (Option 29 Only)
   - 255 = Default setup

Site Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[337]

5-20) Not Used

For Site Master VNA Modes:

21) Number of Data Points (Higher byte)
22) Number of Data Points (Lower byte)
23) VNA Start Frequency[338] (Highest byte)
24) VNA Start Frequency
25) VNA Start Frequency
26) VNA Start Frequency (Lowest byte)
27) VNA Stop Frequency[339] (Highest byte)
28) VNA Stop Frequency
29) VNA Stop Frequency
30) VNA Stop Frequency (Lowest byte)
31) Return Loss Scale Start (Higher byte)[340]
32) Return Loss Scale Start (Lower byte)
33) Return Loss Scale Stop (Higher byte)
34) Return Loss Scale Stop (Lower byte)
35) SWR Scale Start (Higher byte)[341]
36) SWR Scale Start (Lower byte)
37) SWR Scale Stop (Higher byte)
38) SWR Scale Stop (Lower byte)
39) Cable Loss Scale Start (Higher byte)[342]
40) Cable Loss Scale Start (Lower byte)
41) Cable Loss Scale Stop (Higher byte)
42) Cable Loss Scale Stop (Lower byte)
43) DTF-RL Scale Start (Higher byte)[343]
44) DTF-RL Scale Start (Lower byte)
45) DTF-RL Scale Stop (Higher byte)
46) DTF-RL Scale Stop (Lower byte)

---

[336] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[337] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[338] Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[339] Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[340] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[341] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[342] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[343] See “Set Site Master VNA Scale” Control Byte #4 for data format.

47) DTF-SWR Scale Start (Higher byte)[344]
48) DTF-SWR Scale Start (Lower byte)
49) DTF-SWR Scale Stop (Higher byte)
50) DTF-SWR Scale Stop (Lower byte)
51) VNA Frequency Marker 1 (Higher byte)[345]
52) VNA Frequency Marker 1(Lower byte)
53) VNA Frequency Marker 2 (Higher byte)
54) VNA Frequency Marker 2 (Lower byte)
55) VNA Frequency Marker 3 (Higher byte)
56) VNA Frequency Marker 3 (Lower byte)
57) VNA Frequency Marker 4 (Higher byte)
58) VNA Frequency Marker 4 (Lower byte)
59) VNA Frequency Marker 5 (Higher byte)
60) VNA Frequency Marker 5 (Lower byte)
61) VNA Frequency Marker 6 (Higher byte)
62) VNA Frequency Marker 6 (Lower byte)
63) Return Loss Single Limit (Higher byte)[346]
64) Return Loss Single Limit (Lower byte)
65) SWR Single Limit (Higher byte)[347]
66) SWR Single Limit (Lower byte)
67) Cable Loss Single Limit (Higher byte)[348]
68) Cable Loss Single Limit (Lower byte)
69) DTF-RL Single Limit (Higher byte)[349]
70) DTF-RL Single Limit (Lower byte)
71) DTF-SWR Single Limit (Higher byte)[350]
72) DTF-SWR Single Limit (Lower byte)
73) Return Loss Multiple Limit Segment # (1)
74) Return Loss Multiple Limit Segment Status (00h = Off, 01h = On)
75) Return Loss Multiple Limit Segment Start X (Highest byte)[351]
76) Return Loss Multiple Limit Segment Start X
77) Return Loss Multiple Limit Segment Start X
78) Return Loss Multiple Limit Segment Start X (Lowest byte)
79) Return Loss Multiple Limit Segment Start Y (Higher byte)
80) Return Loss Multiple Limit Segment Start Y (Lowest byte)
81) Return Loss Multiple Limit Segment End X (Highest byte)[352]
82) Return Loss Multiple Limit Segment End X
83) Return Loss Multiple Limit Segment End X
84) Return Loss Multiple Limit Segment End X (Lowest byte)
85) Return Loss Multiple Limit Segment End Y (Higher byte)
86) Return Loss Multiple Limit Segment End Y (Lowest byte)
87-142) Repeat bytes 63 – 76 for segments 2 – 5
143-212) Repeat bytes 63 – 132 for SWR Multiple Limit
213-282) Repeat bytes 63 – 132 for Cable Loss Multiple Limit
283-352) Repeat bytes 63 – 132 for DTF-RL Multiple Limit

---

[344] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[345] Marker Point = (# data points – 1) * (marker freq – start freq) / (stop freq – start freq)
Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.
[346] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[347] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[348] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[349] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[350] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[351] See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format. Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[352] Frequency is scaled by the frequency scale factor specified in bytes 465-466.

353-422) Repeat bytes 63 – 132 for DTF-SWR Multiple Limit
423) Start Distance (Highest byte)[353]
424) Start Distance
425) Start Distance
426) Start Distance (Lowest byte)
427) Stop Distance (Highest byte)
428) Stop Distance
429) Stop Distance
430) Stop Distance (Lowest byte)
431) Distance Marker 1 (Higher byte)[354]
432) Distance Marker 1 (Lower byte)
433) Distance Marker 2 (Higher byte)
434) Distance Marker 2 (Lower byte)
435) Distance Marker 3 (Higher byte)
436) Distance Marker 3 (Lower byte)
437) Distance Marker 4 (Higher byte)
438) Distance Marker 4 (Lower byte)
439) Distance Marker 5 (Higher byte)
440) Distance Marker 5 (Lower byte)
441) Distance Marker 6 (Higher byte)
442) Distance Marker 6 (Lower byte)
443) Relative Propagation Velocity (Highest byte)[355]
444) Relative Propagation Velocity
445) Relative Propagation Velocity
446) Relative Propagation Velocity (Lowest byte)
447) Cable Loss (Highest byte)[356]
448) Cable Loss
449) Cable Loss
450) Cable Loss (Lowest byte)
451) Average Cable Loss[357] (Highest byte)
452) Average Cable Loss
453) Average Cable Loss
454) Average Cable Loss (Lowest byte)
455) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Marker 1 On/Off
bit 1 : Site Master Marker 2 On/Off
bit 2 : Site Master Marker 3 On/Off
bit 3 : Site Master Marker 4 On/Off
bit 4 : Site Master Marker 5 On/Off
bit 5 : Site Master Marker 6 On/Off
bits 6- 7 : Not Used
456) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Site Master Marker 2 Delta On/Off
bit 2 : Site Master Marker 3 Delta On/Off
bit 3 : Site Master Marker 4 Delta On/Off
bits 4-7: Not Used
457) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)

[353] Distance data uses units 1/100,000m or 1/100,000 ft
[354] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.
[355] Relative Propagation Velocity uses units 1/100,000.
[356] Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[357] Average Cable Loss is dB * 1000.

bit 1 : Site Master Limit Beep On/Off
bits 2-6 : Not Used
bit 7 : Site Master Single Limit Status On/Off

458) Status Byte 4:
(LSB) bits 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

459) Status Byte 5: (0b = Off, 1b = On)
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Single Sweep On/Off
bit 2 : Trace Overlay On/Off
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bits 4-6: Not Used
bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)

460) VNA Signal Standard[358] (Higher byte)
461) VNA Signal Standard (Lower byte)
462) Cable Index
463) Cable Folder[359]
464) Trace Overlay Index (1-200)
465) Frequency Scale Factor[360] (Higher byte)
466) Frequency Scale Factor (Lower byte)
467-550) Not Used

For Spectrum Analyzer Mode:

21) Spectrum Analyzer Start Frequency[361] (Highest byte)
22) Spectrum Analyzer Start Frequency
23) Spectrum Analyzer Start Frequency
24) Spectrum Analyzer Start Frequency (Lowest byte)
25) Spectrum Analyzer Stop Frequency[362] (Highest byte)
26) Spectrum Analyzer Stop Frequency
27) Spectrum Analyzer Stop Frequency
28) Spectrum Analyzer Stop Frequency (Lowest byte)
29) Spectrum Analyzer Center Frequency[363] (Highest byte)
30) Spectrum Analyzer Center Frequency
31) Spectrum Analyzer Center Frequency
32) Spectrum Analyzer Center Frequency (Lowest byte)
33) Spectrum Analyzer Frequency Span[364] (Highest byte)
34) Spectrum Analyzer Frequency Span
35) Spectrum Analyzer Frequency Span
36) Spectrum Analyzer Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[365]
38) Ref Level

[358] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[359] 00h=Standard at 1000 MHz, 01h=Standard at 2000 MHz, 02h=Standard at 2500 MHz, 03h=Custom
[360] Frequency Scale Factor is in number of Hz.
[361] Scaled by Frequency Scale Factor (bytes 301-302)
[362] Scaled by Frequency Scale Factor (bytes 301-302)
[363] Scaled by Frequency Scale Factor (bytes 301-302)
[364] Scaled by Frequency Scale Factor (bytes 301-302)
[365] Value sent as (value in dBm * 1000) + 270,000)

39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[366]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Spectrum Analyzer Frequency Marker 1 (Higher byte)[367]
46) Spectrum Analyzer Frequency Marker 1 (Lower byte)
47) Spectrum Analyzer Frequency Marker 2 (Higher byte)
48) Spectrum Analyzer Frequency Marker 2 (Lower byte)
49) Spectrum Analyzer Frequency Marker 3 (Higher byte)
50) Spectrum Analyzer Frequency Marker 3 (Lower byte)
51) Spectrum Analyzer Frequency Marker 4 (Higher byte)
52) Spectrum Analyzer Frequency Marker 4 (Lower byte)
53) Spectrum Analyzer Frequency Marker 5 (Higher byte)
54) Spectrum Analyzer Frequency Marker 5 (Lower byte)
55) Spectrum Analyzer Frequency Marker 6 (Higher byte)
56) Spectrum Analyzer Frequency Marker 6 (Lower byte)
57) Spectrum Analyzer Single Limit (Highest byte)[368]
58) Spectrum Analyzer Single Limit
59) Spectrum Analyzer Single Limit
60) Spectrum Analyzer Single Limit (Lowest byte)
61) SPA Multiple Upper Limit 1 Start X[369] (Highest byte)
62) SPA Multiple Upper Limit 1 Start X
63) SPA Multiple Upper Limit 1 Start X
64) SPA Multiple Upper Limit 1 Start X (Lowest byte)
65) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [370]
66) SPA Multiple Upper Limit 1 Start Y (Power Level)
67) SPA Multiple Upper Limit 1 Start Y (Power Level)
68) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) SPA Multiple Upper Limit 1 End X[371] (Highest byte)
70) SPA Multiple Upper Limit 1 End X
71) SPA Multiple Upper Limit 1 End X
72) SPA Multiple Upper Limit 1 End X (Lowest byte)
73) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [372]
74) SPA Multiple Upper Limit 1 End Y (Power Level)
75) SPA Multiple Upper Limit 1 End Y (Power Level)
76) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[373]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[374]
226) VBW Setting

[366] Value sent as (value * 1000)
[367] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[368] Value sent as (value in dBm * 1000) + 270000
[369] Scaled by Frequency Scale Factor (bytes 301-302)
[370] Value sent as (value in dBm * 1000) + 270000
[371] Scaled by Frequency Scale Factor (bytes 301-302)
[372] Value sent as (value in dBm * 1000) + 270000
[373] RBW frequency sent in Hz.
[374] VBW frequency sent in Hz.

227) VBW Setting
228) VBW Setting (Lowest byte)
229) OCC BW Method[375]
230) OCC BW % Value[376]
231) OCC BW dBc[377]
232) Attenuation
233) Antenna Index (0-14)
234-249) Antenna Name (16 bytes in ASCII)
250) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
251) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off
252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[378]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
253) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [379]
254) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off

[375] 00h = % of power, 01h = dB down
[376] 0 – 99%
[377] 0 – 120 dBc
[378] Beep level is always 1b for upper segmented limit line
[379] Beep level is always 0b for lower segmented limit line

bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

255) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

257) Reference Level Offset[380] (Highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (Lowest byte)
261) External Reference Frequency [381]
262) Signal Standard[382] (Higher byte)
263) Signal Standard (Lower byte)
264) Channel Selection[383] (Higher byte)
265) Channel Selection (Lower byte)
266) Trigger Type[384]
267) Interference Analysis Frequency[385] (Highest byte)
268) Interference Analysis Frequency
269) Interference Analysis Frequency
270) Interference Analysis Frequency (Lowest byte)
271) Trigger Position (0 – 100%)
272) Min Sweep Time (in µs) (Highest byte)
273) Min Sweep Time (in µs)
274) Min Sweep Time (in µs)
275) Min Sweep Time (in µs) (Lowest byte)
276) Video Trigger Level[386] (Highest byte)
277) Video Trigger Level
278) Video Trigger Level
279) Video Trigger Level (Lowest byte)
280) Status Byte 8
(LSB) bit 0: Reserved
bits 1-7: Not Used

[380] Value sent as (value in dBm * 1000) + 270,000
[381] 1 byte in MHz (i.e. 20 = 20MHz)
[382] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[383] "No Channel" is sent as FFFEh
[384] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[385] Scaled by Frequency Scale Factor (bytes 301-302)
[386] Value sent as (value in dBm * 1000) + 270,000

281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off
bit 5: External Reference Frequency On/Off
bits 6-7: Not Used
283) Impedance (00h = 50Ω, 10h = 75Ω Anritsu Adapter, 12h = 75Ω Other Adapter)
284) Impedance Loss[387] (Higher byte)
285) Impedance Loss (Lower byte)
286) AM/FM Demod Type[388]
287) AM/FM Demod Status (01h = On, 00h = Off)
288) AM/FM Demod Volume (0 to 100)
289) AM/FM Demod Frequency[389] (Highest byte)
290) AM/FM Demod Frequency
291) AM/FM Demod Frequency
292) AM/FM Demod Frequency (Lowest byte)
293) AM/FM Demod Time (in ms) (Highest byte)
294) AM/FM Demod Time (in ms)
295) AM/FM Demod Time (in ms)
296) AM/FM Demod Time (in ms) (Lowest byte)
297) SSB BFO Offset[390] (Highest byte)
298) SSB BFO Offset
299) SSB BFO Offset
300) SSB BFO Offset (Lowest byte)
301) Frequency Scale Factor[391] (Higher byte)
302) Frequency Scale Factor (Lower byte)
303) Frequency Range Minimum[392] (Highest byte)
304) Frequency Range Minimum
305) Frequency Range Minimum
306) Frequency Range Minimum (Lowest byte)
307) Frequency Range Maximum[393] (Highest byte)
308) Frequency Range Maximum
309) Frequency Range Maximum
310) Frequency Range Maximum (Lowest byte)
311) Marker Type[394]
312) Channel Power Int BW[395] (Highest byte)
313) Channel Power Int BW
314) Channel Power Int BW
315) Channel Power Int BW (Lowest byte)
316) ACPR Main Channel BW[396] (Highest byte)

[387] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[388] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[389] Scaled by Frequency Scale Factor (bytes 301-302)
[390] Value sent as ((value in Hz) – 10,000)
[391] In number of Hz
[392] Scaled by Frequency Scale Factor (bytes 301-302)
[393] Scaled by Frequency Scale Factor (bytes 301-302)
[394] 00h = Regular Marker, 01h = Noise Marker
[395] Scaled by Frequency Scale Factor (bytes 301-302)
[396] Scaled by Frequency Scale Factor (bytes 301-302)

317) ACPR Main Channel BW
318) ACPR Main Channel BW
319) ACPR Main Channel BW (Lowest byte)
320) ACPR Adjacent Channel BW[397] (Highest byte)
321) ACPR Adjacent Channel BW
322) ACPR Adjacent Channel BW
323) ACPR Adjacent Channel BW (Lowest byte)
324) ACPR Channel Spacing[398] (Highest byte)
325) ACPR Channel Spacing
326) ACPR Channel Spacing
327) ACPR Channel Spacing (Lowest byte)
328) Interference Analysis Cell Std[399]
329) Interference Analysis Est. BW[400] (Highest byte)
330) Interference Analysis Est. BW
331) Interference Analysis Est. BW
332) Interference Analysis Est. BW (Lowest byte)
333) Trace B Trace Id[401]
334-500) Not Used

For Transmission Mode (Option 21):

21) Start Frequency[402] (Highest byte)
22) Start Frequency
23) Start Frequency
24) Start Frequency (Lowest byte)
25) Stop Frequency[403] (Highest byte)
26) Stop Frequency
27) Stop Frequency
28) Stop Frequency (Lowest byte)
29) Center Frequency[404] (Highest byte)
30) Center Frequency
31) Center Frequency
32) Center Frequency (Lowest byte)
33) Frequency Span[405] (Highest byte)
34) Frequency Span
35) Frequency Span
36) Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[406]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[407]
42) Scale per div
43) Scale per div

---

[397] Scaled by Frequency Scale Factor (bytes 301-302)
[398] Scaled by Frequency Scale Factor (bytes 301-302)
[399] 4 Standards – 00h = 1250 kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[400] Frequency in Hz
[401] FFh indicates no trace selected
[402] Scaled by Frequency Scale Factor (bytes 244-245)
[403] Scaled by Frequency Scale Factor (bytes 244-245)
[404] Scaled by Frequency Scale Factor (bytes 244-245)
[405] Scaled by Frequency Scale Factor (bytes 244-245)
[406] Value sent as (value in dBm * 1000) + 270,000)
[407] Value sent as (value * 1000)

44) Scale per div (Lowest byte)
45) Frequency Marker 1 (Higher byte)[408]
46) Frequency Marker 1 (Lower byte)
47) Frequency Marker 2 (Higher byte)
48) Frequency Marker 2 (Lower byte)
49) Frequency Marker 3 (Higher byte)
50) Frequency Marker 3 (Lower byte)
51) Frequency Marker 4 (Higher byte)
52) Frequency Marker 4 (Lower byte)
53) Frequency Marker 5 (Higher byte)
54) Frequency Marker 5 (Lower byte)
55) Frequency Marker 6 (Higher byte)
56) Frequency Marker 6 (Lower byte)
57) Single Limit (Highest byte)[409]
58) Single Limit
59) Single Limit
60) Single Limit (Lowest byte)
61) Multiple Upper Limit 1 Start X[410] (Highest byte)
62) Multiple Upper Limit 1 Start X
63) Multiple Upper Limit 1 Start X
64) Multiple Upper Limit 1 Start X (Lowest byte)
65) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [411]
66) Multiple Upper Limit 1 Start Y (Power Level)
67) Multiple Upper Limit 1 Start Y (Power Level)
68) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) Multiple Upper Limit 1 End X[412] (Highest byte)
70) Multiple Upper Limit 1 End X
71) Multiple Upper Limit 1 End X
72) Multiple Upper Limit 1 End X (Lowest byte)
73) Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [413]
74) Multiple Upper Limit 1 End Y (Power Level)
75) Multiple Upper Limit 1 End Y (Power Level)
76) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[414]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[415]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) Attenuation
230) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off

[408] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[409] Value sent as (value in dBm * 1000) + 270000
[410] Scaled by Frequency Scale Factor (bytes 244-245)
[411] Value sent as (value in dBm * 1000) + 270000
[412] Scaled by Frequency Scale Factor (bytes 244-245)
[413] Value sent as (value in dBm * 1000) + 270000
[414] RBW frequency sent in Hz.
[415] VBW frequency sent in Hz.

bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6 - 7 : Not Used

231) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Not Used

232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit Beep On/Off
bit 2 : Single Limit Status On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[416]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

233) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [417]

234) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

235) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : External Reference Freq On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

[416] Beep level is always 1b for upper segmented limit line
[417] Beep level is always 0b for lower segmented limit line

236) External Reference Frequency [418]
237) Signal Standard[419] (Higher byte)
238) Signal Standard (Lower byte)
239) Channel Selection[420] (Higher byte)
240) Channel Selection (Lower byte)
241) Trigger Type[421]
242) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
243) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: RBW Coupling (1b = Auto, 0b = Manual)
bit 5: VBW Coupling (1b = Auto, 0b = Manual)
bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 7: View B On/Off
244) Frequency Scale Factor[422] (Higher byte)
245) Frequency Scale Factor (Lower byte)
246) Frequency Range Minimum[423] (Highest byte)
247) Frequency Range Minimum
248) Frequency Range Minimum
249) Frequency Range Minimum (Lowest byte)
250) Frequency Range Maximum[424] (Highest byte)
251) Frequency Range Maximum
252) Frequency Range Maximum
253) Frequency Range Maximum (Lowest byte)
254) Marker Type[425]
255) Trace B Trace Id[426]
256) Status Byte 9
(LSB) bit 0: Reserved
bits 1-7: Not Used
257-400) Not Used

For Power Meter Mode (Option 29 Only):
21) Power Meter Start Freq[427] (Highest byte)
22) Power Meter Start Freq
23) Power Meter Start Freq
24) Power Meter Start Freq[428] (Lowest byte)
25) Power Meter Stop Freq (Highest byte)
26) Power Meter Stop Freq
27) Power Meter Stop Freq
28) Power Meter Stop Freq (Lowest byte)
29) Power Meter Center Freq[429] (Highest byte)

[418] 1 byte in MHz (i.e. 20 = 20MHz)
[419] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[420] "No Channel" is sent as FFFEh
[421] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[422] In number of Hz
[423] Scaled by Frequency Scale Factor (bytes 244-245)
[424] Scaled by Frequency Scale Factor (bytes 244-245)
[425] 00h = Regular Marker, 01h = Noise Marker
[426] FFh indicates no trace selected
[427] Scaled by Frequency Scale Factor (bytes 54-55)
[428] Scaled by Frequency Scale Factor (bytes 54-55)

30) Power Meter Center Freq
31) Power Meter Center Freq
32) Power Meter Center Freq (Lowest byte)
33) Power Meter Span[430] (Highest byte)
34) Power Meter Span
35) Power Meter Span
36) Power Meter Span (Lowest byte)
37) Signal Standard[431] (Higher byte)
38) Signal Standard (Lower byte)
39) Channel Selection[432] (Higher byte)
40) Channel Selection (Lower byte)
41) Power Meter Offset[433] (Highest byte)
42) Power Meter Offset
43) Power Meter Offset
44) Power Meter Offset (Lowest byte)
45) Power Meter Relative (Highest byte)[434]
46) Power Meter Relative
47) Power Meter Relative
48) Power Meter Relative (Lowest byte)
49) Not Used
50) Power Meter Unit (00h = Watts, 01h = dBm)
51) Power Meter Relative Status (00h = Off, 01h = On)
52) Power Meter Offset Status (00h = Off, 01h = On)
53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
54) Frequency Scale Factor[435] (Higher byte)
55) Frequency Scale Factor (Lower byte)
56) Frequency Range Minimum[436] (Highest byte)
57) Frequency Range Minimum
58) Frequency Range Minimum
59) Frequency Range Minimum (Lowest byte)
60) Frequency Range Maximum[437] (Highest byte)
61) Frequency Range Maximum
62) Frequency Range Maximum
63) Frequency Range Maximum (Lowest byte)
64) Zero Status (00h = Off, 01h = On)
65) Zero Value[438] (Highest byte)
66) Zero Value
67) Zero Value
68) Zero Value (Lowest byte)
69-120) Not Used

For T1 Mode (Option 50):

21) T1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
22) T1 Framing Mode (01h = ESF, 02h = D4SF)
23) T1 Line Coding (01h = B8ZS, 02h = AMI)

---

[429] Scaled by Frequency Scale Factor (bytes 54-55)
[430] Scaled by Frequency Scale Factor (bytes 54-55)
[431] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[432] "No Channel" is sent as FFFEh
[433] Value sent as (value in dB * 1000)
[434] Value sent as ((value in dBm * 1000) + 100)
[435] In number of Hz
[436] Scaled by Frequency Scale Factor
[437] Scaled by Frequency Scale Factor
[438] Value sent as ((value in dBm * 1000) + 100)

24) T1 Clock Source (00h = External, 01h = Internal)
25) T1 Tx Level (01h = 0 dB, 02h = -7.5 dB, 03h = -15 dB)
26) T1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
27) T1 Loop Code (00h = CSU, 01h = NIU, 02h = User 1, 03h = User 2)
28) T1 CRC Method (00h = ANSI CRC, 01h = Japanese CRC)
29) T1 Loop Type (00h = In Band, 01h = Data Link)
30) T1 Pattern (Higher byte)
31) T1 Pattern (Lower byte) 01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
32) T1 Pattern Invert Status (00h = Non-Inverted, 01h = Inverted)
33) T1 Display Type (00h = Histogram, 01h = Raw Data)
34) T1 Impedance
35 - 50) First User Defined Loop Code Down (16 bytes)
51 - 66) Second User Defined Loop Code Down (16 bytes)
67 - 82) First User Defined Loop Code Up (16 bytes)
83 - 98) Second User Defined Loop Code Up (16 bytes)
99 - 130) User Defined Pattern (32 bytes)
131) T1 1st User Defined Loop Up (Highest byte)
132) T1 1st User Defined Loop Up (Lowest byte)
133) T1 2nd User Defined Loop Up (Highest byte)
134) T1 2nd User Defined Loop Up (Lowest byte)
135) T1 1st User Defined Loop Down (Highest byte)
136) T1 1st User Defined Loop Down (Lowest byte)
137) T1 2nd User Defined Loop Down (Highest byte)
138) T1 2nd User Defined Loop Down (Lowest byte)
139) T1 User Defined Pattern (Highest byte)
140) T1 User Defined Pattern
141) T1 User Defined Pattern
142) T1 User Defined Pattern (Lowest Byte)
143) T1 Bit Error Insert Value (1-1000) (Highest byte)
144) T1 Bit Error Insert Value (Lowest byte)
145) T1 Frame Error Insert Value (1-1000) (Highest byte)
146) T1 Frame Error Insert Value (Lowest byte)
147) T1 BPV Error Insert Value (1-1000) (Highest byte)
148) T1 BPV Error Insert Value (Lowest byte)
149) T1 Graph Resolution[439]
150) T1 Measurement Duration[440]
151) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
152) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
153) T1 Auto Pattern Sync Status (00h = Off, 01h = On)
154) Vpp Input Config (00h = Terminate, 01h = Bridged)
155) Data Logging Status (00h = Off, 01h = On)
156 – 250) Not Used

For E1 Mode (Option 50):
21) E1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
22) E1 Framing Mode (03h = PCM30, 04h = PCM30CRC, 05h = PCM31, 06h = PCM31CRC)
23) E1 Line Coding (02h = AMI, 03h = HDB3)
24) E1 Clock Source (00h = External, 01h = Internal)
25) E1 Tx Level

[439] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[440] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

26) E1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
27) E1 Loop Code
28) E1 CRC Method
29) E1 Loop Type
30) E1 Pattern (Higher byte)
31) E1 Pattern (Lower byte) (01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
32) E1 Pattern Invert (00h = Non-Inverted, 01h = Inverted)
33) E1 Display Type (00h = Histogram, 01h = Raw Data)
34) E1 Impedance (01h = 75 Ω, 02h = 120 Ω)
35 - 50) First User Defined Loop Code Down (16 bytes)
51 - 66) Second User Defined Loop Code Down (16 bytes)
67 - 82) First User Defined Loop Code Up (16 bytes)
83 - 98) Second User Defined Loop Code Up (16 bytes)
99 - 130) User Defined Pattern (32 bytes)
131) E1 1st User Defined Loop Up (Higher byte)
132) E1 1st User Defined Loop Up (Lower byte)
133) E1 2nd User Defined Loop Up (Higher byte)
134) E1 2nd User Defined Loop Up (Lower byte)
135) E1 1st User Defined Loop Down (Higher byte)
136) E1 1st User Defined Loop Down (Lower byte)
137) E1 2nd User Defined Loop Down (Higher byte)
138) E1 2nd User Defined Loop Down (Lower byte)
139) E1 User Defined Pattern (Highest byte)
140) E1 User Defined Pattern
141) E1 User Defined Pattern
142) E1 User Defined Pattern (Lowest byte)
143) E1 Bit Error Insert Value (1-1000) (Higher byte)
144) E1 Bit Error Insert Value (Lower byte)
145) E1 Frame Error Insert Value (1-1000) (Higher byte)
146) E1 Frame Error Insert Value (Lower byte)
147) E1 BPV Error Insert Value (1-1000) (Higher byte)
148) E1 BPV Error Insert Value (Lower byte)
149) E1 Graph Resolution[441]
150) E1 Measurement Duration[442]
151) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
152) E1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
153) E1 Auto Pattern Sync Status (00h = Off, 01h = On)
154) Vpp Input Config (00h = Terminate, 01h = Bridged)
155) Data Logging Status (00h = Off, 01h = On)
156) E1 Vpp Input Impedance (01h = 75 Ω, 02h = 120 Ω)
157-250) Not Used

***Upload Setup* – Control Byte #66 (42h)**

Description: Receives parameters defining a setup and saves them in the memory location associated with the specified setup number. Since different modes have different numbers of setup locations available, the command requires the mode be specified as well as the setup number.

Setup numbers as follows:

[441] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[442] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

0 = Run time setup
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 2 bytes

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[443]
4) Setup Number in which to store setup

5-20) Not Used

For Site Master VNA Modes:

21) Number of Data Points (Higher byte)
22) Number of Data Points (Lower byte)
23) VNA Start Frequency[444] (Highest byte)
24) VNA Start Frequency
25) VNA Start Frequency
26) VNA Start Frequency (Lowest byte)
27) VNA Stop Frequency[445] (Highest byte)
28) VNA Stop Frequency
29) VNA Stop Frequency
30) VNA Stop Frequency (Lowest byte)
31) Return Loss Scale Start (Higher byte)[446]
32) Return Loss Scale Start (Lower byte)
33) Return Loss Scale Stop (Higher byte)
34) Return Loss Scale Stop (Lower byte)
35) SWR Scale Start (Higher byte)[447]
36) SWR Scale Start (Lower byte)
37) SWR Scale Stop (Higher byte)
38) SWR Scale Stop (Lower byte)
39) Cable Loss Scale Start (Higher byte)[448]
40) Cable Loss Scale Start (Lower byte)
41) Cable Loss Scale Stop (Higher byte)
42) Cable Loss Scale Stop (Lower byte)
43) DTF-RL Scale Start (Higher byte)[449]
44) DTF-RL Scale Start (Lower byte)
45) DTF-RL Scale Stop (Higher byte)
46) DTF-RL Scale Stop (Lower byte)
47) DTF-SWR Scale Start (Higher byte)[450]
48) DTF-SWR Scale Start (Lower byte)
49) DTF-SWR Scale Stop (Higher byte)
50) DTF-SWR Scale Stop (Lower byte)
51) VNA Frequency Marker 1 (Higher byte)[451]
52) VNA Frequency Marker 1(Lower byte)

---

[443] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[444] Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[445] Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[446] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[447] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[448] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[449] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[450] See “Set Site Master VNA Scale” Control Byte #4 for data format.
[451] Marker Point = (# data points – 1) * (marker freq – start freq) / (stop freq – start freq)
Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.

53) VNA Frequency Marker 2 (Higher byte)
54) VNA Frequency Marker 2 (Lower byte)
55) VNA Frequency Marker 3 (Higher byte)
56) VNA Frequency Marker 3 (Lower byte)
57) VNA Frequency Marker 4 (Higher byte)
58) VNA Frequency Marker 4 (Lower byte)
59) VNA Frequency Marker 5 (Higher byte)
60) VNA Frequency Marker 5 (Lower byte)
61) VNA Frequency Marker 6 (Higher byte)
62) VNA Frequency Marker 6 (Lower byte)
63) Return Loss Single Limit (Higher byte)[452]
64) Return Loss Single Limit (Lower byte)
65) SWR Single Limit (Higher byte)[453]
66) SWR Single Limit (Lower byte)
67) Cable Loss Single Limit (Higher byte)[454]
68) Cable Loss Single Limit (Lower byte)
69) DTF-RL Single Limit (Higher byte)[455]
70) DTF-RL Single Limit (Lower byte)
71) DTF-SWR Single Limit (Higher byte)[456]
72) DTF-SWR Single Limit (Lower byte)
73) Return Loss Multiple Limit Segment # (1)
74) Return Loss Multiple Limit Segment Status (00h = Off, 01h = On)
75) Return Loss Multiple Limit Segment Start X (Highest byte)[457]
76) Return Loss Multiple Limit Segment Start X
77) Return Loss Multiple Limit Segment Start X
78) Return Loss Multiple Limit Segment Start X (Lowest byte)
79) Return Loss Multiple Limit Segment Start Y (Higher byte)
80) Return Loss Multiple Limit Segment Start Y (Lowest byte)
81) Return Loss Multiple Limit Segment End X (Highest byte)[458]
82) Return Loss Multiple Limit Segment End X
83) Return Loss Multiple Limit Segment End X
84) Return Loss Multiple Limit Segment End X (Lowest byte)
85) Return Loss Multiple Limit Segment End Y (Higher byte)
86) Return Loss Multiple Limit Segment End Y (Lowest byte)
87-142) Repeat bytes 63 – 76 for segments 2 – 5
143-212) Repeat bytes 63 – 132 for SWR Multiple Limit
213-282) Repeat bytes 63 – 132 for Cable Loss Multiple Limit
283-352) Repeat bytes 63 – 132 for DTF-RL Multiple Limit
353-422) Repeat bytes 63 – 132 for DTF-SWR Multiple Limit
423) Start Distance (Highest byte)[459]
424) Start Distance
425) Start Distance
426) Start Distance (Lowest byte)
427) Stop Distance (Highest byte)
428) Stop Distance
429) Stop Distance

[452] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[453] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[454] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[455] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[456] See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
[457] See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format. Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[458] Frequency is scaled by the frequency scale factor specified in bytes 465-466.
[459] Distance data uses units 1/100,000m or 1/100,000 ft

430) Stop Distance (Lowest byte)
431) Distance Marker 1 (Higher byte)[460]
432) Distance Marker 1 (Lower byte)
433) Distance Marker 2 (Higher byte)
434) Distance Marker 2 (Lower byte)
435) Distance Marker 3 (Higher byte)
436) Distance Marker 3 (Lower byte)
437) Distance Marker 4 (Higher byte)
438) Distance Marker 4 (Lower byte)
439) Distance Marker 5 (Higher byte)
440) Distance Marker 5 (Lower byte)
441) Distance Marker 6 (Higher byte)
442) Distance Marker 6 (Lower byte)
443) Relative Propagation Velocity (Highest byte)[461]
444) Relative Propagation Velocity
445) Relative Propagation Velocity
446) Relative Propagation Velocity (Lowest byte)
447) Cable Loss (Highest byte)[462]
448) Cable Loss
449) Cable Loss
450) Cable Loss (Lowest byte)
451) Average Cable Loss[463] (Highest byte)
452) Average Cable Loss
453) Average Cable Loss
454) Average Cable Loss (Lowest byte)
455) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Marker 1 On/Off
bit 1 : Site Master Marker 2 On/Off
bit 2 : Site Master Marker 3 On/Off
bit 3 : Site Master Marker 4 On/Off
bit 4 : Site Master Marker 5 On/Off
bit 5 : Site Master Marker 6 On/Off
bits 6- 7 : Not Used
456) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Site Master Marker 2 Delta On/Off
bit 2 : Site Master Marker 3 Delta On/Off
bit 3 : Site Master Marker 4 Delta On/Off
bits 4-7: Not Used
457) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)
bit 1 : Site Master Limit Beep On/Off
bits 2-6 : Not Used
bit 7 : Site Master Single Limit Status On/Off
458) Status Byte 4:
(LSB) bits 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe

[460] Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.
[461] Relative Propagation Velocity uses units 1/100,000.
[462] Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
[463] Average Cable Loss is dB * 1000.

1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

459) Status Byte 5: (0b = Off, 1b = On)
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Single Sweep On/Off
bit 2 : Trace Overlay On/Off
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bits 4-6: Not Used
bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)

460) VNA Signal Standard[464] (Higher byte)
461) VNA Signal Standard (Lower byte)
462) Cable Index
463) Cable Folder[465]
464) Trace Overlay Index (1-200)
465) Frequency Scale Factor (Higher byte)[466]
466) Frequency Scale Factor (Lower byte)
467-550) Not Used

For Spectrum Analyzer Mode:

21) Spectrum Analyzer Start Frequency[467] (Highest byte)
22) Spectrum Analyzer Start Frequency
23) Spectrum Analyzer Start Frequency
24) Spectrum Analyzer Start Frequency (Lowest byte)
25) Spectrum Analyzer Stop Frequency[468] (Highest byte)
26) Spectrum Analyzer Stop Frequency
27) Spectrum Analyzer Stop Frequency
28) Spectrum Analyzer Stop Frequency (Lowest byte)
29) Spectrum Analyzer Center Frequency[469] (Highest byte)
30) Spectrum Analyzer Center Frequency
31) Spectrum Analyzer Center Frequency
32) Spectrum Analyzer Center Frequency (Lowest byte)
33) Spectrum Analyzer Frequency Span[470] (Highest byte)
34) Spectrum Analyzer Frequency Span
35) Spectrum Analyzer Frequency Span
36) Spectrum Analyzer Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[471]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[472]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Spectrum Analyzer Frequency Marker 1 (Higher byte)[473]

---

[464] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[465] 00h=Standard at 1000 MHz, 01h=Standard at 2000 MHz, 02h=Standard at 2500 MHz, 03h=Custom
[466] Frequency Scale Factor is in number of Hz.
[467] Scaled by Frequency Scale Factor (bytes 301-302)
[468] Scaled by Frequency Scale Factor (bytes 301-302)
[469] Scaled by Frequency Scale Factor (bytes 301-302)
[470] Scaled by Frequency Scale Factor (bytes 301-302)
[471] Value sent as (value in dBm * 1000) + 270,000)
[472] Value sent as (value * 1000)

46) Spectrum Analyzer Frequency Marker 1 (Lower byte)
47) Spectrum Analyzer Frequency Marker 2 (Higher byte)
48) Spectrum Analyzer Frequency Marker 2 (Lower byte)
49) Spectrum Analyzer Frequency Marker 3 (Higher byte)
50) Spectrum Analyzer Frequency Marker 3 (Lower byte)
51) Spectrum Analyzer Frequency Marker 4 (Higher byte)
52) Spectrum Analyzer Frequency Marker 4 (Lower byte)
53) Spectrum Analyzer Frequency Marker 5 (Higher byte)
54) Spectrum Analyzer Frequency Marker 5 (Lower byte)
55) Spectrum Analyzer Frequency Marker 6 (Higher byte)
56) Spectrum Analyzer Frequency Marker 6 (Lower byte)
57) Spectrum Analyzer Single Limit (Highest byte)[474]
58) Spectrum Analyzer Single Limit
59) Spectrum Analyzer Single Limit
60) Spectrum Analyzer Single Limit (Lowest byte)
61) SPA Multiple Upper Limit 1 Start X[475] (Highest byte)
62) SPA Multiple Upper Limit 1 Start X
63) SPA Multiple Upper Limit 1 Start X
64) SPA Multiple Upper Limit 1 Start X (Lowest byte)
65) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [476]
66) SPA Multiple Upper Limit 1 Start Y (Power Level)
67) SPA Multiple Upper Limit 1 Start Y (Power Level)
68) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) SPA Multiple Upper Limit 1 End X[477] (Highest byte)
70) SPA Multiple Upper Limit 1 End X
71) SPA Multiple Upper Limit 1 End X
72) SPA Multiple Upper Limit 1 End X (Lowest byte)
73) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [478]
74) SPA Multiple Upper Limit 1 End Y (Power Level)
75) SPA Multiple Upper Limit 1 End Y (Power Level)
76) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[479]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[480]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) OCC BW Method[481]
230) OCC BW % Value[482]
231) OCC BW dBc[483]

---

[473] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[474] Value sent as (value in dBm * 1000) + 270000
[475] Scaled by Frequency Scale Factor (bytes 301-302)
[476] Value sent as (value in dBm * 1000) + 270000
[477] Scaled by Frequency Scale Factor (bytes 301-302)
[478] Value sent as (value in dBm * 1000) + 270000
[479] RBW frequency sent in Hz.
[480] VBW frequency sent in Hz.
[481] 00h = % of power, 01h = dB down
[482] 0 – 99%
[483] 0 – 120 dBc

232) Attenuation
233) Antenna Index (0-14)
234-249) Antenna Name (16 bytes in ASCII)
250) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
251) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off
252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[484]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
253) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [485]
254) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
255) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)

[484] Beep level is always 1b for upper segmented limit line
[485] Beep level is always 0b for lower segmented limit line

bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

257) Reference Level Offset[486] (Highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (Lowest byte)
261) External Reference Frequency [487]
262) Signal Standard[488] (Higher byte)
263) Signal Standard (Lower byte)
264) Channel Selection[489] (Higher byte)
265) Channel Selection (Lower byte)
266) Trigger Type[490]
267) Interference Analysis Frequency[491] (Highest byte)
268) Interference Analysis Frequency
269) Interference Analysis Frequency
270) Interference Analysis Frequency (Lowest byte)
271) Trigger Position (0 – 100%)
272) Min Sweep Time (in µs) (Highest byte)
273) Min Sweep Time (in µs)
274) Min Sweep Time (in µs)
275) Min Sweep Time (in µs) (Lowest byte)
276) Video Trigger Level[492] (Highest byte)
277) Video Trigger Level
278) Video Trigger Level
279) Video Trigger Level (Lowest byte)
280) Status Byte 8
(LSB) bit 0: Reserved
bits 1-7: Not Used
281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off

[486] Value sent as (value in dBm * 1000) + 270,000
[487] 1 byte in MHz (i.e. 20 = 20MHz)
[488] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[489] "No Channel" is sent as FFFEh
[490] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[491] Scaled by Frequency Scale Factor (bytes 301-302)
[492] Value sent as (value in dBm * 1000) + 270,000

bit 5: External Reference Frequency On/Off
bits 6-7: Not Used

283) Impedance (00h = 50Ω, 10h = 75Ω Anritsu Adapter, 12h = 75Ω Other Adapter)
284) Impedance Loss[493] (Higher byte)
285) Impedance Loss (Lower byte)
286) AM/FM Demod Type[494]
287) AM/FM Demod Status (01h = On, 00h = Off)
288) AM/FM Demod Volume (0 to 100)
289) AM/FM Demod Frequency[495] (Highest byte)
290) AM/FM Demod Frequency
291) AM/FM Demod Frequency
292) AM/FM Demod Frequency (Lowest byte)
293) AM/FM Demod Time (in ms) (Highest byte)
294) AM/FM Demod Time (in ms)
295) AM/FM Demod Time (in ms)
296) AM/FM Demod Time (in ms) (Lowest byte)
297) SSB BFO Offset[496] (Highest byte)
298) SSB BFO Offset
299) SSB BFO Offset
300) SSB BFO Offset (Lowest byte)
301) Frequency Scale Factor[497] (Higher byte)
302) Frequency Scale Factor (Lower byte)
303) Frequency Range Minimum[498] (Highest byte)
304) Frequency Range Minimum
305) Frequency Range Minimum
306) Frequency Range Minimum (Lowest byte)
307) Frequency Range Maximum[499] (Highest byte)
308) Frequency Range Maximum
309) Frequency Range Maximum
310) Frequency Range Maximum (Lowest byte)
311) Marker Type[500]
312) Channel Power Int BW[501] (Highest byte)
313) Channel Power Int BW
314) Channel Power Int BW
315) Channel Power Int BW (Lowest byte)
316) ACPR Main Channel BW[502] (Highest byte)
317) ACPR Main Channel BW
318) ACPR Main Channel BW
319) ACPR Main Channel BW (Lowest byte)
320) ACPR Adjacent Channel BW[503] (Highest byte)
321) ACPR Adjacent Channel BW
322) ACPR Adjacent Channel BW
323) ACPR Adjacent Channel BW (Lowest byte)

---

[493] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[494] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[495] Scaled by Frequency Scale Factor (bytes 301-302)
[496] Value sent as ((value in Hz) – 10,000)
[497] In number of Hz
[498] Scaled by Frequency Scale Factor (bytes 301-302)
[499] Scaled by Frequency Scale Factor (bytes 301-302)
[500] 00h = Regular Marker, 01h = Noise Marker
[501] Scaled by Frequency Scale Factor (bytes 301-302)
[502] Scaled by Frequency Scale Factor (bytes 301-302)
[503] Scaled by Frequency Scale Factor (bytes 301-302)

324) ACPR Channel Spacing[504] (Highest byte)
325) ACPR Channel Spacing
326) ACPR Channel Spacing
327) ACPR Channel Spacing (Lowest byte)
328) Interference Analysis Cell Std[505]
329) Interference Analysis Est. BW[506] (Highest byte)
330) Interference Analysis Est. BW
331) Interference Analysis Est. BW
332) Interference Analysis Est. BW (Lowest byte)
333) Trace B Trace Id[507]
334-500) Not Used

For Transmission Mode (Option 21 Only):
21) Start Frequency[508] (Highest byte)
22) Start Frequency
23) Start Frequency
24) Start Frequency (Lowest byte)
25) Stop Frequency[509] (Highest byte)
26) Stop Frequency
27) Stop Frequency
28) Stop Frequency (Lowest byte)
29) Center Frequency[510] (Highest byte)
30) Center Frequency
31) Center Frequency
32) Center Frequency (Lowest byte)
33) Frequency Span[511] (Highest byte)
34) Frequency Span
35) Frequency Span
36) Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[512]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[513]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Frequency Marker 1 (Higher byte)[514]
46) Frequency Marker 1 (Lower byte)
47) Frequency Marker 2 (Higher byte)
48) Frequency Marker 2 (Lower byte)
49) Frequency Marker 3 (Higher byte)

---

[504] Scaled by Frequency Scale Factor (bytes 301-302)
[505] 4 Standards – 00h = 1250 kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[506] Frequency in Hz
[507] FFh indicates to trace selected
[508] Scaled by Frequency Scale Factor (bytes 244-245)
[509] Scaled by Frequency Scale Factor (bytes 244-245)
[510] Scaled by Frequency Scale Factor (bytes 244-245)
[511] Scaled by Frequency Scale Factor (bytes 244-245)
[512] Value sent as (value in dBm * 1000) + 270,000)
[513] Value sent as (value * 1000)
[514] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

50) Frequency Marker 3 (Lower byte)
51) Frequency Marker 4 (Higher byte)
52) Frequency Marker 4 (Lower byte)
53) Frequency Marker 5 (Higher byte)
54) Frequency Marker 5 (Lower byte)
55) Frequency Marker 6 (Higher byte)
56) Frequency Marker 6 (Lower byte)
57) Single Limit (Highest byte)[515]
58) Single Limit
59) Single Limit
60) Single Limit (Lowest byte)
61) Multiple Upper Limit 1 Start X[516] (Highest byte)
62) Multiple Upper Limit 1 Start X
63) Multiple Upper Limit 1 Start X
64) Multiple Upper Limit 1 Start X (Lowest byte)
65) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [517]
66) Multiple Upper Limit 1 Start Y (Power Level)
67) Multiple Upper Limit 1 Start Y (Power Level)
68) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) Multiple Upper Limit 1 End X[518] (Highest byte)
70) Multiple Upper Limit 1 End X
71) Multiple Upper Limit 1 End X
72) Multiple Upper Limit 1 End X (Lowest byte)
73) Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [519]
74) Multiple Upper Limit 1 End Y (Power Level)
75) Multiple Upper Limit 1 End Y (Power Level)
76) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 67-82 for format)
221) RBW Setting (Highest byte)[520]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[521]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) Attenuation
230) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6 - 7 : Not Used
231) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
bit 1 : Marker 2 Delta On/Off

[515] Value sent as (value in dBm * 1000) + 270000
[516] Scaled by Frequency Scale Factor (bytes 244-245)
[517] Value sent as (value in dBm * 1000) + 270000
[518] Scaled by Frequency Scale Factor (bytes 244-245)
[519] Value sent as (value in dBm * 1000) + 270000
[520] RBW frequency sent in Hz.
[521] VBW frequency sent in Hz.

bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Not Used

232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit Beep On/Off
bit 2 : Single Limit Status On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[522]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

233) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [523]

234) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

235) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : External Reference Frequency On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

236) External Reference Frequency [524]
237) Signal Standard[525] (Higher byte)
238) Signal Standard (Lower byte)
239) Channel Selection[526] (Higher byte)
240) Channel Selection (Lower byte)
241) Trigger Type[527]

[522] Beep level is always 1b for upper segmented limit line
[523] Beep level is always 0b for lower segmented limit line
[524] 1 byte in MHz (i.e. 20 = 20MHz)
[525] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[526] "No Channel" is sent as FFFEh

242) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
243) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: RBW Coupling (1b = Auto, 0b = Manual)
bit 5: VBW Coupling (1b = Auto, 0b = Manual)
bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 7: View B On/Off
244) Frequency Scale Factor[528] (Higher byte)
245) Frequency Scale Factor (Lower byte)
246) Frequency Range Minimum[529] (Highest byte)
247) Frequency Range Minimum
248) Frequency Range Minimum
249) Frequency Range Minimum (Lowest byte)
250) Frequency Range Maximum[530] (Highest byte)
251) Frequency Range Maximum
252) Frequency Range Maximum
253) Frequency Range Maximum (Lowest byte)
254) Marker Type[531]
255) Trace B Trace Id[532]
256) Status Byte 9
(LSB) bit 0: Reserved
bits 1-7: Not Used
257-400) Not Used

For Power Meter Mode (Option 29 Only):
21) Power Meter Start Freq[533] (Highest byte)
22) Power Meter Start Freq
23) Power Meter Start Freq
24) Power Meter Start Freq[534] (Lowest byte)
25) Power Meter Stop Freq (Highest byte)
26) Power Meter Stop Freq
27) Power Meter Stop Freq
28) Power Meter Stop Freq (Lowest byte)
29) Power Meter Center Freq[535] (Highest byte)
30) Power Meter Center Freq
31) Power Meter Center Freq
32) Power Meter Center Freq (Lowest byte)
33) Power Meter Span[536] (Highest byte)
34) Power Meter Span
35) Power Meter Span
36) Power Meter Span (Lowest byte)

---

[527] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[528] In number of Hz
[529] Scaled by Frequency Scale Factor (bytes 244-245)
[530] Scaled by Frequency Scale Factor (bytes 244-245)
[531] 00h = Regular Marker, 01h = Noise Marker
[532] FFh indicates no trace selected
[533] Scaled by Frequency Scale Factor (bytes 54-55)
[534] Scaled by Frequency Scale Factor (bytes 54-55)
[535] Scaled by Frequency Scale Factor (bytes 54-55)
[536] Scaled by Frequency Scale Factor (bytes 54-55)

37) Signal Standard[537] (Higher byte)
38) Signal Standard (Lower byte)
39) Channel Selection[538] (Higher byte)
40) Channel Selection (Lower byte)
41) Power Meter Offset[539] (Highest byte)
42) Power Meter Offset
43) Power Meter Offset
44) Power Meter Offset (Lowest byte)
45) Power Meter Relative (Highest byte)[540]
46) Power Meter Relative
47) Power Meter Relative
48) Power Meter Relative (Lowest byte)
49) Not Used
50) Power Meter Unit (00h = Watts, 01h = dBm)
51) Power Meter Relative Status (00h = Off, 01h = On)
52) Power Meter Offset Status (00h = Off, 01h = On)
53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
54) Frequency Scale Factor[541] (Higher byte)
55) Frequency Scale Factor (Lower byte)
56) Frequency Range Minimum[542] (Highest byte)
57) Frequency Range Minimum
58) Frequency Range Minimum
59) Frequency Range Minimum (Lowest byte)
60) Frequency Range Maximum[543] (Highest byte)
61) Frequency Range Maximum
62) Frequency Range Maximum
63) Frequency Range Maximum (Lowest byte)
64) Zero Status (00h = Off, 01h = On)
65) Zero Value[544] (Highest byte)
66) Zero Value
67) Zero Value
68) Zero Value (Lowest byte)
69-120) Not Used

For T1 Mode (Option 50):

21) T1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
22) T1 Framing Mode (01h = ESF, 02h = D4SF)
23) T1 Line Coding (01h = B8ZS, 02h = AMI)
24) T1 Clock Source (00h = External, 01h = Internal)
25) T1 Tx Level (01h = 0 dB, 02h = -7.5 dB, 03h = -15 dB)
26) T1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
27) T1 Loop Code (00h = CSU, 01h = NIU, 02h = User 1, 03h = User 2)
28) T1 CRC Method (00h = ANSI CRC, 01h = Japanese CRC)
29) T1 Loop Type (00h = In Band, 01h = Data Link)
30) T1 Pattern (Higher byte)
31) T1 Pattern (Lower byte) (01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh =

[537] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[538] "No Channel" is sent as FFFEh
[539] Value sent as (value in dB * 1000)
[540] Value sent as ((value in dBm * 1000) + 100)
[541] In number of Hz
[542] Scaled by Frequency Scale Factor
[543] Scaled by Frequency Scale Factor
[544] Value sent as ((value in dBm * 1000) + 100)

All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
32) T1 Pattern Invert Status (00h = Non-Inverted, 01h = Inverted)
33) T1 Display Type (00h = Histogram, 01h = Raw Data)
34) T1 Impedance
35 - 50) First User Defined Loop Code Down (16 bytes)
51 - 66) Second User Defined Loop Code Down (16 bytes)
67 - 82) First User Defined Loop Code Up (16 bytes)
83 - 98) Second User Defined Loop Code Up (16 bytes)
99 - 130) User Defined Pattern (32 bytes)
131) T1 1st User Defined Loop Up (Highest byte)
132) T1 1st User Defined Loop Up (Lowest byte)
133) T1 2nd User Defined Loop Up (Highest byte)
134) T1 2nd User Defined Loop Up (Lowest byte)
135) T1 1st User Defined Loop Down (Highest byte)
136) T1 1st User Defined Loop Down (Lowest byte)
137) T1 2nd User Defined Loop Down (Highest byte)
138) T1 2nd User Defined Loop Down (Lowest byte)
139) T1 User Defined Pattern (Highest byte)
140) T1 User Defined Pattern
141) T1 User Defined Pattern
142) T1 User Defined Pattern (Lowest Byte)
143) T1 Bit Error Insert Value (1-1000) (Highest byte)
144) T1 Bit Error Insert Value (Lowest byte)
145) T1 Frame Error Insert Value (1-1000) (Highest byte)
146) T1 Frame Error Insert Value (Lowest byte)
147) T1 BPV Error Insert Value (1-1000) (Highest byte)
148) T1 BPV Error Insert Value (Lowest byte)
149) T1 Graph Resolution[545]
150) T1 Measurement Duration[546]
151) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
152) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
153) T1 Auto Pattern Sync Status (00h = Off, 01h = On)
154) Vpp Input Config (00h = Terminate, 01h = Bridged)
155) Data Logging Status (00h = Off, 01h = On)
156 – 250) Not Used

For E1 Mode (Option 50):
21) E1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
22) E1 Framing Mode (03h = PCM30, 04h = PCM30CRC, 05h = PCM31, 06h = PCM31CRC)
23) E1 Line Coding (02h = AMI, 03h = HDB3)
24) E1 Clock Source (00h = External, 01h = Internal)
25) E1 Tx Level
26) E1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
27) E1 Loop Code
28) E1 CRC Method
29) E1 Loop Type
30) E1 Pattern (Higher byte)
31) E1 Pattern (Lower byte) (01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
32) E1 Pattern Invert (00h = Non-Inverted, 01h = Inverted)

[545] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[546] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

33) E1 Display Type (00h = Histogram, 01h = Raw Data)
34) E1 Impedance (01h = 75 Ω, 02h = 120 Ω)
35 - 50) First User Defined Loop Code Down (16 bytes)
51 - 66) Second User Defined Loop Code Down (16 bytes)
67 - 82) First User Defined Loop Code Up (16 bytes)
83 - 98) Second User Defined Loop Code Up (16 bytes)
99 - 130) User Defined Pattern (32 bytes)
131) E1 1st User Defined Loop Up (Higher byte)
132) E1 1st User Defined Loop Up (Lower byte)
133) E1 2nd User Defined Loop Up (Higher byte)
134) E1 2nd User Defined Loop Up (Lower byte)
135) E1 1st User Defined Loop Down (Higher byte)
136) E1 1st User Defined Loop Down (Lower byte)
137) E1 2nd User Defined Loop Down (Higher byte)
138) E1 2nd User Defined Loop Down (Lower byte)
139) E1 User Defined Pattern (Highest byte)
140) E1 User Defined Pattern
141) E1 User Defined Pattern
142) E1 User Defined Pattern (Lowest byte)
143) E1 Bit Error Insert Value (1-1000) (Higher byte)
144) E1 Bit Error Insert Value (Lower byte)
145) E1 Frame Error Insert Value (1-1000) (Higher byte)
146) E1 Frame Error Insert Value (Lower byte)
147) E1 BPV Error Insert Value (1-1000) (Higher byte)
148) E1 BPV Error Insert Value (Lower byte)
149) E1 Graph Resolution[547]
150) E1 Measurement Duration[548]
151) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
152) E1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
153) E1 Auto Pattern Sync Status (00h = Off, 01h = On)
154) Vpp Input Config (00h = Terminate, 01h = Bridged)
155) Data Logging Status (00h = Off, 01h = On)
156) E1 Vpp Input Impedance (01h = 75 Ω, 02h = 120 Ω)
157-250) Not Used

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

Read Parameter Limits – Control Byte #67 (43h)

Description: Returns limits (minimum and maximum values) associated with each parameter defined for the specified measurement mode.

"Frequency Parameters (for SPA, TM and PM)" are start, stop, and center frequencies, multiple limit "x" parameters and AM/FM demod frequency parameters.

"Frequency Parameters (for VNA modes)" are start and stop frequencies and multiple limit "x" parameters.

"Distance Parameters" are start and stop distances, multiple limit "x" parameters and cable loss.

[547] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[548] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

Bytes to Follow: 2 bytes

1) Measurement Mode[549]
2) Limits to Read (00h = Frequency Parameter Limits (Spectrum Analyzer, Transmission Mode, Power Meter), 01h = Available RBWs, 02h = Available VBWs, 03h = Distance Parameter Limits (Metric Units, VNA DTF Modes) 04h = Distance Parameter Limits (English Units, VNA DTF Modes), FFh = All Other Parameter Limits)

Site Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[550]

5-20) Not Used

For Spectrum Analyzer, Transmission (Option 21) and Power Meter (Option 29) Modes, Frequency Parameter Limits:

21) Number of Valid Frequency Ranges

For each range:

1) Range Scale Factor[551] (Higher byte)
2) Range Scale Factor (Lower byte)
3) Range Start Frequency[552] (Highest byte)
4) Range Start Frequency
5) Range Start Frequency
6) Range Start Frequency (Lowest byte)
7) Range Stop Frequency[553] (Highest byte)
8) Range Stop Frequency
9) Range Stop Frequency
10) Range Stop Frequency (Lowest byte)

For Spectrum Analyzer, Transmission (Option 21) Modes, Available RBWS:

21) Number of Valid RBWs

For each RBW:

1) RBW Frequency (in Hz) (Highest byte)
2) RBW Frequency (in Hz)
3) RBW Frequency (in Hz)
4) RBW Frequency (in Hz) (Lowest byte)

For Spectrum Analyzer, Transmission (Option 21) Modes, Available VBWS:

21) Number of Valid VBWs

For each VBW:

1) VBW Frequency (in Hz) (Highest byte)
2) VBW Frequency (in Hz)
3) VBW Frequency (in Hz)
4) VBW Frequency (in Hz) (Lowest byte)

For VNA Modes, Distance Parameter Limits, in Metric Units:

[549] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[550] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[551] Scale Factor in number of Hz
[552] Scaled by Span Scale Factor
[553] Scaled by Span Scale Factor

21) Distance Minimum[554] (Highest byte)
22) Distance Minimum
23) Distance Minimum
24) Distance Minimum (Lowest byte)
25) Distance Maximum[555] (Highest byte)
26) Distance Maximum
27) Distance Maximum
28) Distance Maximum (Lowest byte)
29) Cable Loss Minimum[556] (Highest byte)
30) Cable Loss Minimum
31) Cable Loss Minimum
32) Cable Loss Minimum (Lowest byte)
33) Cable Loss Maximum[557] (Highest byte)
34) Cable Loss Maximum
35) Cable Loss Maximum
36) Cable Loss Maximum (Lowest byte)

For VNA Modes, Distance Parameter Limits, in English Units:

21) Distance Minimum[558] (Highest byte)
22) Distance Minimum
23) Distance Minimum
24) Distance Minimum (Lowest byte)
25) Distance Maximum[559] (Highest byte)
26) Distance Maximum
27) Distance Maximum
28) Distance Maximum (Lowest byte)
29) Cable Loss Minimum[560] (Highest byte)
30) Cable Loss Minimum
31) Cable Loss Minimum
32) Cable Loss Minimum (Lowest byte)
33) Cable Loss Maximum[561] (Highest byte)
34) Cable Loss Maximum
35) Cable Loss Maximum
36) Cable Loss Maximum (Lowest byte)

For VNA Modes, All Other Parameter Limits:

21) Frequency Minimum[562] (Highest byte)
22) Frequency Minimum
23) Frequency Minimum
24) Frequency Minimum (Lowest byte)
25) Frequency Maximum[563] (Highest byte)
26) Frequency Maximum
27) Frequency Maximum
28) Frequency Maximum (Lowest byte)
29) Return Loss Scale/Limit Y Minimum[564] (Highest byte)

---

[554] Distance sent as (distance in meters * 100,000)
[555] Distance sent as (distance in meters * 100,000)
[556] Cable loss sent as (loss in dB/m * 100,000)
[557] Cable loss sent as (loss in dB/m * 100,000)
[558] Distance sent as (distance in feet * 100,000)
[559] Distance sent as (distance in feet * 100,000)
[560] Cable loss sent as (loss in dB/ft * 100,000)
[561] Cable loss sent as (loss in dB/ft * 100,000)
[562] Frequency is scaled by the frequency scale factor specified in bytes 69-70.
[563] Frequency is scaled by the frequency scale factor specified in bytes 69-70.

30) Return Loss Scale/Limit Y Minimum
31) Return Loss Scale/Limit Y Minimum
32) Return Loss Scale/Limit Y Minimum (Lowest byte)
33) Return Loss Scale/Limit Y Maximum[565] (Highest byte)
34) Return Loss Scale/Limit Y Maximum
35) Return Loss Scale/Limit Y Maximum
36) Return Loss Scale/Limit Y Maximum (Lowest byte)
37) Cable Loss Scale/Limit Y Minimum[566] (Highest byte)
38) Cable Loss Scale/Limit Y Minimum
39) Cable Loss Scale/Limit Y Minimum
40) Cable Loss Scale/Limit Y Minimum (Lowest byte)
41) Cable Loss Scale/Limit Y Maximum[567] (Highest byte)
42) Cable Loss Scale/Limit Y Maximum
43) Cable Loss Scale/Limit Y Maximum
44) Cable Loss Scale/Limit Y Maximum (Lowest byte)
45) SWR Scale/Limit Y Minimum[568] (Highest byte)
46) SWR Scale/Limit Y Minimum
47) SWR Scale/Limit Y Minimum
48) SWR Scale/Limit Y Minimum (Lowest byte)
49) SWR Scale/Limit Y Maximum[569] (Highest byte)
50) SWR Scale/Limit Y Maximum
51) SWR Scale/Limit Y Maximum
52) SWR Scale/Limit Y Maximum (Lowest byte)
53) Marker Minimum[570] (Higher byte)
54) Marker Minimum (Lower byte)
55) Marker Maximum[571] (Higher byte)
56) Marker Minimum (Lower byte)
57) Propagation Velocity Minimum (Highest byte)
58) Propagation Velocity Minimum
59) Propagation Velocity Minimum
60) Propagation Velocity Minimum (Lowest byte)
61) Propagation Velocity Maximum[572] (Highest byte)
62) Propagation Velocity Maximum
63) Propagation Velocity Maximum
64) Propagation Velocity Maximum (Lowest byte)
65) Cable Folder Minimum
66) Cable Folder Maximum
67) Trace Overlay Index Minimum
68) Trace Overlay Index Maximum
69) Frequency Scale Factor[573] (Higher byte)
70) Frequency Scale Factor (Lower byte)
71-200) Not Used

---

[564] Scale sent in (dB * 1000)
[565] Scale sent in (dB * 1000)
[566] Scale sent in (dB * 1000)
[567] Scale sent in (dB * 1000)
[568] Scale sent in (ratio * 1000)
[569] Scale sent in (ratio * 1000)
[570] Value sent as data point on the display. Equivalent frequency (or distance) = (# data points – 1) * (marker X – start X) / (stop X – start X)
[571] Value sent as data point on the display. Equivalent frequency (or distance) = (# data points – 1) * (marker X – start X) / (stop X – start X)
[572] Propagation velocity sent as (velocity * 100,000)
[573] Frequency Scale Factor is in number of Hz.

For T1 Mode (Option 50), All Other Parameter Limits:

21) Receive Input Minimum
22) Receive Input Maximum
23) Framing Mode Minimum
24) Framing Mode Maximum
25) Line Coding Minimum
26) Line Coding Maximum
27) Clock Source Minimum
28) Clock Source Maximum
29) Tx Level Minimum
30) Tx Level Maximum
31) Error Insert Type Minimum
32) Error Insert Type Maximum
33) Loop Code Minimum
34) Loop Code Maximum
35) CRC Method Minimum
36) CRC Method Maximum
37) Loop Type Minimum
38) Loop Type Maximum
39) Pattern Minimum
40) Pattern Maximum
41) Display Type Minimum
42) Display Type Maximum
43) Bit Error Insert Value Minimum (Higher byte)
44) Bit Error Insert Value Minimum (Lower byte)
45) Bit Error Insert Value Maximum (Higher byte)
46) Bit Error Insert Value Maximum (Lower byte)
47) Frame Error Insert Value Minimum (Higher byte)
48) Frame Error Insert Value Minimum (Lower byte)
49) Frame Error Insert Value Maximum (Higher byte)
50) Frame Error Insert Value Maximum (Lower byte)
51) BPV Error Insert Value Minimum (Higher byte)
52) BPV Error Insert Value Minimum (Lower byte)
53) BPV Error Insert Value Maximum (Higher byte)
54) BPV Error Insert Value Maximum (Lower byte)
55) Graph Resolution Minimum
56) Graph Resolution Maximum
57) Measurement Duration Minimum
58) Measurement Duration Maximum
59) Voltage Scale Minimum
60) Voltage Scale Maximum
61) Vpp Input Config Minimum
62) Vpp Input Config Maximum
63-150) Not Used

For E1 Mode (Option 50), All Other Parameter Limits:

21) Receive Input Minimum
22) Receive Input Maximum
23) Framing Mode Minimum
24) Framing Mode Maximum
25) Line Coding Minimum
26) Line Coding Maximum
27) Clock Source Minimum
28) Clock Source Maximum
29) Tx Level Minimum
30) Tx Level Maximum

31) Error Insert Type Minimum
32) Error Insert Type Maximum
33) Loop Code Minimum
34) Loop Code Maximum
35) CRC Method Minimum
36) CRC Method Maximum
37) Loop Type Minimum
38) Loop Type Maximum
39) Pattern Minimum
40) Pattern Maximum
41) Display Type Minimum
42) Display Type Maximum
43) Bit Error Insert Value Minimum (Higher byte)
44) Bit Error Insert Value Minimum (Lower byte)
45) Bit Error Insert Value Maximum (Higher byte)
46) Bit Error Insert Value Maximum (Lower byte)
47) Frame Error Insert Value Minimum (Higher byte)
48) Frame Error Insert Value Minimum (Lower byte)
49) Frame Error Insert Value Maximum (Higher byte)
50) Frame Error Insert Value Maximum (Lower byte)
51) BPV Error Insert Value Minimum (Higher byte)
52) BPV Error Insert Value Minimum (Lower byte)
53) BPV Error Insert Value Maximum (Higher byte)
54) BPV Error Insert Value Maximum (Lower byte)
55) Graph Resolution Minimum
56) Graph Resolution Maximum
57) Measurement Duration Minimum
58) Measurement Duration Maximum
59) Voltage Scale Minimum
60) Voltage Scale Maximum
61) Vpp Input Config Minimum
62) Vpp Input Config Maximum
63) Impedance Minimum
64) Impedance Maximum
65-150) Not Used

For Spectrum Analyzer Mode, All Other Parameter Limits:
21) Frequency Scale Factor Minimum[574] (Higher byte)
22) Frequency Scale Factor Minimum (Lower byte)
23) Frequency Scale Factor Maximum[575] (Higher byte)
24) Frequency Scale Factor Maximum (Lower byte)
25) Span Minimum[576] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[577] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Reference Level Minimum[578] (Highest byte)

[574] Scale Factor in number of Hz
[575] Scale Factor in number of Hz
[576] Scaled by Span Scale Factor
[577] Scaled by Span Scale Factor
[578] Value sent as (value * 1000) + 270,000

34) Reference Level Minimum
35) Reference Level Minimum
36) Reference Level Minimum (Lowest byte)
37) Reference Level Maximum[579] (Highest byte)
38) Reference Level Maximum
39) Reference Level Maximum
40) Reference Level Maximum (Lowest byte)
41) Scale Minimum[580] (Highest byte)
42) Scale Minimum
43) Scale Minimum
44) Scale Minimum (Lowest byte)
45) Scale Maximum[581] (Highest byte)
46) Scale Maximum
47) Scale Maximum
48) Scale Maximum (Lowest byte)
49) Marker Minimum[582] (Higher byte)
50) Marker Minimum (Lower byte)
51) Marker Maximum[583] (Higher byte)
52) Marker Maximum (Lower byte)
53) Limit Y Minimum[584] (Highest byte)
54) Limit Y Minimum
55) Limit Y Minimum
56) Limit Y Minimum (Lowest byte)
57) Limit Y Maximum[585] (Highest byte)
58) Limit Y Maximum
59) Limit Y Maximum
60) Limit Y Maximum (Lowest byte)
61) OBW Method Minimum
62) OBW Method Maximum
63) OBW % of Power Minimum
64) OBW % of Power Maximum
65) OBW dBc Minimum
66) OBW dBc Maximum
67) Attenuation Minimum
68) Attenuation Maximum
69) Amplitude Units Minimum
70) Amplitude Units Maximum
71) Detection Algorithm Minimum
72) Detection Algorithm Maximum
73) RL Offset Minimum[586] (Highest byte)
74) RL Offset Minimum
75) RL Offset Minimum
76) RL Offset Minimum (Lowest byte)
77) RL Offset Maximum[587] (Highest byte)

---

[579] Value sent as (value * 1000) + 270,000
[580] Value sent as (value * 1000)
[581] Value sent as (value * 1000)
[582] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[583] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[584] Value sent as (value * 1000) + 270,000
[585] Value sent as (value * 1000) + 270,000
[586] Value sent as (value * 1000) + 270,000
[587] Value sent as (value * 1000) + 270,000

78) RL Offset Maximum
79) RL Offset Maximum
80) RL Offset Maximum (Lowest byte)
81) External Reference Frequency Minimum[588] (Highest byte)
82) External Reference Frequency Minimum
83) External Reference Frequency Minimum
84) External Reference Frequency Minimum (Lowest byte)
85) External Reference Frequency Maximum[589] (Highest byte)
86) External Reference Frequency Maximum
87) External Reference Frequency Maximum
88) External Reference Frequency Maximum (Lowest byte)
89) Trigger Type Minimum
90) Trigger Type Maximum
91) Minimum Sweep Type (in µs) Minimum (Highest byte)
92) Minimum Sweep Type (in µs) Minimum
93) Minimum Sweep Type (in µs) Minimum
94) Minimum Sweep Type (in µs) Minimum (Lowest byte)
95) Minimum Sweep Type (in µs) Maximum (Highest byte)
96) Minimum Sweep Type (in µs) Maximum
97) Minimum Sweep Type (in µs) Maximum
98) Minimum Sweep Type (in µs) Maximum (Lowest byte)
99) Video Trigger Level Minimum[590] (Highest byte)
100) Video Trigger Level Minimum
101) Video Trigger Level Minimum
102) Video Trigger Level Minimum (Lowest byte)
103) Video Trigger Level Maximum[591] (Highest byte)
104) Video Trigger Level Maximum
105) Video Trigger Level Maximum
106) Video Trigger Level Maximum (Lowest byte)
107) Sweep Average Minimum
108) Sweep Average Maximum
109) Trace Math Minimum
110) Trace Math Maximum
111) Impedance Loss Minimum[592] (Highest byte)
112) Impedance Loss Minimum
113) Impedance Loss Minimum
114) Impedance Loss Minimum (Lowest byte)
115) Impedance Loss Maximum[593] (Highest byte)
116) Impedance Loss Maximum
117) Impedance Loss Maximum
118) Impedance Loss Maximum (Lowest byte)
119) Demod Type Minimum
120) Demod Type Maximum
121) Demod Volume Minimum
122) Demod Volume Maximum
123) Demod Time Minimum (in ms) (Highest byte)
124) Demod Time Minimum (in ms)
125) Demod Time Minimum (in ms)
126) Demod Time Minimum (in ms) (Lowest byte)

[588] Reference frequency in Hz
[589] Reference frequency in Hz
[590] Value sent as (value * 1000) + 270,000
[591] Value sent as (value * 1000) + 270,000
[592] Value sent as (value in dB * 1000)
[593] Value sent as (value in dB * 1000)

127) Demod Time Maximum (in ms) (Highest byte)
128) Demod Time Maximum (in ms)
129) Demod Time Maximum (in ms)
130) Demod Time Maximum (in ms) (Lowest byte)
131) SSB BFO Offset Minimum[594] (Highest byte)
132) SSB BFO Offset Minimum
133) SSB BFO Offset Minimum
134) SSB BFO Offset Minimum (Lowest byte)
135) SSB BFO Offset Maximum[595] (Highest byte)
136) SSB BFO Offset Maximum
137) SSB BFO Offset Maximum
138) SSB BFO Offset Maximum (Lowest byte)
139) ACPR Main Channel BW Minimum (in Hz) (Highest byte)
140) ACPR Main Channel BW Minimum (in Hz)
141) ACPR Main Channel BW Minimum (in Hz)
142) ACPR Main Channel BW Minimum (in Hz) (Lowest byte)
143) ACPR Main Channel BW Maximum (in Hz) (Highest byte)
144) ACPR Main Channel BW Maximum (in Hz)
145) ACPR Main Channel BW Maximum (in Hz)
146) ACPR Main Channel BW Maximum (in Hz) (Lowest byte)
147) ACPR Adjacent Channel BW Minimum (in Hz) (Highest byte)
148) ACPR Adjacent Channel BW Minimum (in Hz)
149) ACPR Adjacent Channel BW Minimum (in Hz)
150) ACPR Adjacent Channel BW Minimum (in Hz) (Lowest byte)
151) ACPR Adjacent Channel BW Maximum (in Hz) (Highest byte)
152) ACPR Adjacent Channel BW Maximum (in Hz)
153) ACPR Adjacent Channel BW Maximum (in Hz)
154) ACPR Adjacent Channel BW Maximum (in Hz) (Lowest byte)
155) ACPR Channel Spacing Minimum (in Hz) (Highest byte)
156) ACPR Channel Spacing Minimum (in Hz)
157) ACPR Channel Spacing Minimum (in Hz)
158) ACPR Channel Spacing Minimum (in Hz) (Lowest byte)
159) ACPR Channel Spacing Maximum (in Hz) (Highest byte)
160) ACPR Channel Spacing Maximum (in Hz)
161) ACPR Channel Spacing Maximum (in Hz)
162) ACPR Channel Spacing Maximum (in Hz) (Lowest byte)
163) Channel Power Integration BW Minimum (in Hz) (Highest byte)
164) Channel Power Integration BW Minimum (in Hz)
165) Channel Power Integration BW Minimum (in Hz)
166) Channel Power Integration BW Minimum (in Hz) (Lowest byte)
167) Channel Power Integration BW Maximum (in Hz) (Highest byte)
168) Channel Power Integration BW Maximum (in Hz)
169) Channel Power Integration BW Maximum (in Hz)
170) Channel Power Integration BW Maximum (in Hz) (Lowest byte)
171-300) Not Used

For Transmission Measurement Mode (Option 21 Only), All Other Parameter Limits:
21) Span Scale Factor Minimum[596] (Higher byte)
22) Span Scale Factor Minimum (Lower byte)
23) Span Scale Factor Maximum[597] (Higher byte)
24) Span Scale Factor Maximum (Lower byte)

[594] Value sent as ((value in Hz) – 10,000)
[595] Value sent as ((value in Hz) – 10,000)
[596] Scale Factor in number of Hz
[597] Scale Factor in number of Hz

25) Span Minimum[598] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[599] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Reference Level Minimum[600] (Highest byte)
34) Reference Level Minimum
35) Reference Level Minimum
36) Reference Level Minimum (Lowest byte)
37) Reference Level Maximum[601] (Highest byte)
38) Reference Level Maximum
39) Reference Level Maximum
40) Reference Level Maximum (Lowest byte)
41) Scale Minimum[602] (Highest byte)
42) Scale Minimum
43) Scale Minimum
44) Scale Minimum (Lowest byte)
45) Scale Maximum[603] (Highest byte)
46) Scale Maximum
47) Scale Maximum
48) Scale Maximum (Lowest byte)
49) Marker Minimum[604] (Higher byte)
50) Marker Minimum (Lower byte)
51) Marker Maximum[605] (Higher byte)
52) Marker Maximum (Lower byte)
53) Limit Y Minimum[606] (Highest byte)
54) Limit Y Minimum
55) Limit Y Minimum
56) Limit Y Minimum (Lowest byte)
57) Limit Y Maximum[607] (Highest byte)
58) Limit Y Maximum
59) Limit Y Maximum
60) Limit Y Maximum (Lowest byte)
61) Attenuation Minimum
62) Attenuation Maximum
63) Amplitude Units Minimum
64) Amplitude Units Maximum
65) Detection Algorithm Minimum
66) Detection Algorithm Maximum
67) External Reference Frequency Minimum[608] (Highest byte)

---

[598] Scaled by Span Scale Factor
[599] Scaled by Span Scale Factor
[600] Value sent as (value * 1000) + 270,000
[601] Value sent as (value * 1000) + 270,000
[602] Value sent as (value * 1000)
[603] Value sent as (value * 1000)
[604] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[605] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[606] Value sent as (value * 1000) + 270,000
[607] Value sent as (value * 1000) + 270,000

68) External Reference Frequency Minimum
69) External Reference Frequency Minimum
70) External Reference Frequency Minimum (Lowest byte)
71) External Reference Frequency Maximum[609] (Highest byte)
72) External Reference Frequency Maximum
73) External Reference Frequency Maximum
74) External Reference Frequency Maximum (Lowest byte)
75) Trigger Type Minimum
76) Trigger Type Maximum
77) Sweep Average Minimum
78) Sweep Average Maximum
79) Trace Math Minimum
80) Trace Math Maximum
81-200) Not Used

For Power Meter Mode (Option 29 Only), All Other Parameter Limits:
21) Span Scale Factor Minimum[610] (Higher byte)
22) Span Scale Factor Minimum (Lower byte)
23) Span Scale Factor Maximum[611] (Higher byte)
24) Span Scale Factor Maximum (Lower byte)
25) Span Minimum[612] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[613] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Power Meter Offset Minimum (Highest byte)
34) Power Meter Offset Minimum
35) Power Meter Offset Minimum
36) Power Meter Offset Minimum (Lowest byte)
37) Power Meter Offset Maximum (Highest byte)
38) Power Meter Offset Maximum
39) Power Meter Offset Maximum
40) Power Meter Offset Maximum (Lowest byte)
41) Power Meter Relative Minimum[614] (Highest byte)
42) Power Meter Relative Minimum
43) Power Meter Relative Minimum
44) Power Meter Relative Minimum (Lowest byte)
45) Power Meter Relative Maximum[615] (Highest byte)
46) Power Meter Relative Maximum
47) Power Meter Relative Maximum
48) Power Meter Relative Maximum (Lowest byte)
49-150) Not Used

---

[608] Reference frequency in MHz
[609] Reference frequency in MHz
[610] Scale Factor in number of Hz
[611] Scale Factor in number of Hz
[612] Scaled by Span Scale Factor
[613] Scaled by Span Scale Factor
[614] Value sent as ((value in dBm + 100) * 1000)
[615] Value sent as ((value in dBm + 100) * 1000)

Query Saved Setups – Control Byte #68 (44h)

Description: Returns a list of setups saved for the specified measurement mode. Modes that are stored in the same table (i.e. Spectrum Analyzer and Transmission Measurement modes or RL, CL and SWR modes) will be returned by this command when any of the modes in that list are specified.

Bytes to Follow: 1 byte

1) Measurement Mode[616]

Site Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Number of Setups

For Each Setup, VNA Modes – Frequency Domain:

1) Setup Number
2) Attributes
   bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
   bits 1-7: Not Used
3) Measurement Mode[617]
4) Cal Status[618]
5) Frequency Scale Factor[619] (Higher byte)
6) Frequency Scale Factor (Lower byte)
7) Start Frequency[620] (Highest byte)
8) Start Frequency
9) Start Frequency
10) Start Frequency (Lowest byte)
11) Stop Frequency[621] (Highest byte)
12) Stop Frequency
13) Stop Frequency
14) Stop Frequency (Lowest byte)

15-20) Not Used

For Each Setup, VNA Modes – Time Domain (i.e. DTF):

1) Setup Number
2) Attributes
   bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
   bits 1-7: Not Used
3) Measurement Mode[622]
4) Cal Status[623]
5) Not Used
6) Measurement Units (00h = Feet, 01h = Meters)
7) Start Distance[624] (Highest byte)
8) Start Distance
9) Start Distance

---

[616] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[617] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[618] 00h = Cal Off, 01h = OSL Cal On, 02h = OSL InstaCal On, 03h = FlexCal On, 04h = FlexCal InstaCal On
[619] Frequency Scale Factor is in number of Hz
[620] Frequency is scaled by the frequency scale factor specified in bytes 5-6.
[621] Frequency is scaled by the frequency scale factor specified in bytes 5-6.
[622] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[623] 00h = Cal Off, 01h = OSL Cal On, 02h = OSL InstaCal On, 03h = FlexCal On, 04h = FlexCal InstaCal On
[624] Distance sent as (distance * 100,000) where "distance" is in the units specified in byte 6.

10) Start Distance (Lowest byte)
11) Stop Distance[625] (Highest byte)
12) Stop Distance
13) Stop Distance
14) Stop Distance (Lowest byte)
15-20) Not Used

For Each Setup, Spectrum Analyzer, Transmission Mode, Power Meter Modes:

1) Setup Number
2) Attributes
   bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
   bits 1-7: Not Used
3) Measurement Mode[626]
4) Cal Status (Transmission Mode Setup Only, 00h = Off, 01h = On)
5) Frequency Scale Factor[627] (Higher byte)
6) Frequency Scale Factor (Lower byte)
7) Start Frequency[628] (Highest byte)
8) Start Frequency
9) Start Frequency
10) Start Frequency (Lowest byte)
11) Stop Frequency[629] (Highest byte)
12) Stop Frequency
13) Stop Frequency
14) Stop Frequency (Lowest byte)
15-20) Not Used

For Each Setup, T1 and E1 Modes:

1) Setup Number
2) Attributes
   bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
   bits 1-7: Not Used
3) Measurement Mode[630]
4) Framing Mode[631]
5) Pattern[632]
6) Pattern Invert Status (00h = Not Inverted, 01h = Inverted)
7-20) Not Used

***Enter Remote Mode* – Control Byte #69 (45h)**

Description: Enter remote mode at the end of a sweep then send model number and firmware version to the computer.

The computer sends Enter Remote mode byte #69 (45h) to the Site Master and waits for response.

---

[625] Distance sent as (distance * 100,000) where "distance" is in the units specified in byte 6.
[626] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[627] Frequency Scale Factor is in number of Hz
[628] Frequency is scaled by the frequency scale factor specified in bytes 5-6.
[629] Frequency is scaled by the frequency scale factor specified in bytes 5-6.
[630] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[631] 01h = ESF (T1), 02h = D4SF (T1),
03h = PCM30 (E1), 04h = PCM30CRC (E1), 05h = PCM31 (E1), 06h = PCM31CRC (E1)
[632] 01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined

Since the Site Master polls its serial port buffer at the end of each sweep, the computer must wait until the Site Master sends the return bytes before sending a new control byte. Otherwise, the new control byte overwrites the old one (saying enter remote) and the Site Master does not respond as expected.

Once in remote mode, the Site Master stops sweeping. A Remote Mode Indicator appears on the LCD.

The Site Master sends its model and software version numbers to the computer. The Site Master is now able to take multiple control bytes. It waits for the next control byte.

Bytes to Follow: 0 bytes

Site Master Returns: 13 bytes
1-2) Model # (unsigned integer, 14h for Site Master S331D, 15h for S332D)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version - 4 bytes (ASCII)

***Enter Remote Mode Immediately* – Control Byte #70 (46h)**

Description: Enter remote mode in the middle of a sweep, then send the model number and firmware version to the computer.

The computer sends Enter Remote Mode Immediately byte #70 (46h) to the Site Master and waits for a response. This control byte causes the unit to enter remote mode immediately. Note that this could result in incomplete sweep data. Use control byte #69 if complete data is required.

Once in remote mode, the Site Master stops sweeping. A Remote Mode Indicator appears on the LCD.

The Site Master sends its model and software version numbers to the computer. The Site Master is now able to take multiple control bytes. It waits for the next control byte.

Bytes to Follow: 0 bytes

Site Master Returns: 13 bytes
1-2) Model # (unsigned integer, 14h for Site Master S331D, 15h for S332D)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version (4 bytes in ASCII)

***Write Protect Setup* – Control Byte #71 (47h)**

Description: Makes a saved setup either read-only or write-able.

Setup numbers as follows:
255 = All Setups in the Specified Mode
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 3 bytes
1) Measurement Mode[633]
2) Setup Number
3) Write-Protect Status (00h = Allow Writes (default), 01h = Lock Setup (i.e. "read only"))

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

---

[633] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.

Clear Setup Memory Location – Control Byte #72 (48h)

Description: Clears a setup memory location such that it appears as "<EMPTY>" in the Recall Setup list.

Setup numbers as follows:

255 = All Setups in the Specified Mode
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 2 bytes

1) Measurement Mode[634]
2) Setup Number

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

Write Signal Standards – Control Byte #78 (4Eh)

Description: Write user-defined signal standards to the unit.

Bytes to Follow: Variable bytes

1-2) Version # (integer, e.g. 100 for 1.00)
3-4) Total number of records in this package (Maximum 200)
(1st record)
5) Type of record (bit7: selected in SPA mode; bit6: selected in VNA mode; bit1: CDMA std; bit2: GSM std; Others are reserved)
6) # of sub-band (When the standard includes multiple sub-bands)
7-30) Name of Standard (ASCII 24 bytes)
31-34) Uplink Frequency (integer)
35-38) Downlink Frequency (integer)
39-40) Start Ch# (integer)
41-42) Stop Ch# (integer)
43-46) Channel occupied band width (integer)
47-50) Channel spacing (integer)
51-52) Channel step (integer)
(2nd record)
53-100) Repeat from 5 to 52
… …

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

---

[634] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.

***Recall Signal Standards* – Control Byte #79 (4Fh)**

Description: Download signal standards to PC.
Bytes to Follow: 0 byte
Cell Master Returns:
Command received correctly : Variable bytes
1-2) Version # (integer, e.g. 100 for 1.00)
3-4) Total number of records in this package (Maximum 200)
(1st record)
5-6) Type of record
7-30) Name of Standard (ASCII 24 bytes)
31-34) Start Frequency (integer)
35-38) Stop Frequency (integer)
39-40) Start Ch# (integer)
41-42) Stop Ch# (integer)
43-46) Channel occupied band width (integer)
47-50) Channel spacing (integer)
51-52) Channel step (integer)
(2nd record)
53-100) Repeat from 5 to 52
… …
Last byte) FF (End of the return bytes)
Command error : 1 byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

***Write Custom Cable* – Control Byte #80 (50h)**

Description: Write a cable parameter in the custom cable list.

Bytes to Follow: 25 bytes
1) Not Used
2) Cable List index (0 - 49)
3 – 17) Cable Description (string)
18) Propagation Velocity (Highest byte)[635]
19) Propagation Velocity
20) Propagation Velocity
21) Propagation Velocity (Lowest byte)
22) Insertion Loss (Highest byte)[636]
23) Insertion Loss
24) Insertion Loss
25) Insertion Loss (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

---

[635] Propagation Velocity in units 1/100,000
[636] Insertion Loss in units 1/100,000 dB/m or 1/100,000 dB/ft

***Recall Custom Cable* – Control Byte #81 (51h)**

Description: Query a cable in the custom cable list.

Bytes to Follow: 2 bytes
1) Not Used
2) Cable list index (0-49)

Site Master Returns: 24 bytes
1) Upper bound of Custom Cable Index
2 – 16) Cable Description (string)
17) Propagation Velocity (Highest byte)[637]
18) Propagation Velocity
19) Propagation Velocity
20) Propagation Velocity (Lowest byte)
21) Insertion Loss (Highest byte)[638]
22) Insertion Loss
23) Insertion Loss
24) Insertion Loss (Lowest byte)

***Write Antenna* – Control Byte #82 (52h)**

Description: Receives an antenna to the Site Master via the serial port.

An antenna is described with an index into the list (1-10) and an ASCII name that appears in the list on the Site Master. Each antenna can have up to 60 antenna factors. Each antenna factor has an associated frequency and value. These are specified one at a time.

Frequencies are sent in Hz scaled by the Scale Factor.

The value of the antenna factor should be sent as (value * 100).

Bytes to Follow: 26 – 380, depending on the number of antenna factors
1) Antenna List Index (1-10)
2-17) Antenna Name (in ASCII)
18) Number of Antenna Factors (max = 60)
19-20) Frequency Scale Factor (in Hz)
For each antenna factor:
1) Frequency (scaled by Scale Factor) (Highest byte)
2) Frequency (scaled by Scale Factor)
3) Frequency (scaled by Scale Factor)
4) Frequency (scaled by Scale Factor) (Lowest byte)
5) Antenna Factor (Higher byte)
6) Antenna Factor (Lower byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

---

[637] Propagation Velocity in units 1/100,000
[638] Insertion Loss in units 1/100,000 dB/m or 1/100,000 dB/ft

***Recall Antenna* – Control Byte #83 (53h)**

Description: Sends an antenna from the Site Master via the serial port.

An antenna is described with an index into the list (1-10) and an ASCII name that appears in the list on the Site Master. Each antenna can have up to 60 antenna factors. The number of antenna factors will be sent before the actual values are sent. Each antenna factor has an associated frequency and value. These are specified one at a time.

Frequencies are sent in Hz scaled by the Scale Factor.

The value of the antenna factor should be sent as (value * 100).

Bytes to Follow: 1 byte
1) Antenna List index (1-10)

Site Master Returns: (28-382 bytes, depending on the number of antenna factors)
1) Maximum Antenna Number (10)
2-17) Antenna Name (in ASCII)
18) Number of Antenna Factors (max = 60)
19-20) Frequency Scale Factor (in Hz)
21-22) Number of Following Bytes
For each antenna factor:
1) Frequency (scaled by Scale Factor) (Highest byte)
2) Frequency (scaled by Scale Factor)
3) Frequency (scaled by Scale Factor)
4) Frequency (scaled by Scale Factor) (Lowest byte)
5) Antenna Factor (Higher byte)
6) Antenna Factor (Lower byte)

***Set Field Strength Measurement* – Control Byte #84 (54h)**

Description: Sets the state of the measurement (ON or OFF) and the antenna index for the field strength measurement. Antennas 1-10 are custom antennas. Antennas 11-15 are the standard antennas. The standard antennas are as follows:

11. Anritsu #2000-1030 (MAXRAD MPA1750) – 1710-1880 MHz
12. Anritsu #2000-1031 (MAXRAD MPA1850) – 1850-1990 MHz
13. Anritsu #2000-1032 (MAXRAD MPA2450) – 2400-2483.5 MHz
14. Anritsu #2000-1200 (Centurion EXCSM806) – 806-899 MHz
15. Anritsu #2000-1035 (Centurion EXE-902-SM) – 896-941 MHz

If the FCN4760 frequency converter module is attached, the standard antenna is:

11. Anritsu #2000-1361 – 5725-5825 MHz

Note that if the field strength measurement is turned ON, all other measurements (channel power, adjacent channel power) are turned OFF.

Bytes to Follow: 2 bytes
1) Field Strength Measurement State (On/Off)
2) Antenna List index (1-15)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid state or index
238 (EEh) Time Out Error

***Set Channel Power* – Control Byte #85 (55h)**

Description: Sets the state of the measurement (ON or OFF), and the setup parameters to perform the channel power measurement.

Send a 0 (zero) following the command to set the channel power measurement in the current setup.

Send a 1 (one) to set the channel power associated with the trace that was most recently uploaded by command #36, Upload Sweep Trace.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Note that if the channel power measurement is turned ON, all other measurements (field strength, adjacent channel power) are turned OFF.

Bytes to Follow: 14 bytes

1) Channel Power Location (0 = current setup, 1 = last uploaded trace)
2) Channel Power Measurement State (On/Off)
3-6) Center Frequency
7-10) Integration Bandwidth
11-14) Span Frequency

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

***Read Channel Power* – Control Byte #86 (56h)**

Description: Read the current channel power or the channel power of a stored trace.

Send a 0 (zero) following the command to read the current channel power measurement (i.e. the one that is updated as the unit is sweeping).

Send 1-200 to read the channel power associated with a stored trace (use Query Trace Names, #24, to obtain trace numbers).

If option 6 is installed and the frequency converter module is attached, the frequencies will be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Channel Power Location (0 = current measured value, 1-200 = value in stored trace)

Site Master Returns: 21 bytes

1) Channel Power On/Off
2-5) Channel Center Frequency
6-9) Integration Bandwidth
10-13) Channel Span Frequency
14-17) Channel Power (= (power in *dBm* * 100) + 270000)
18-21) Channel Power Density (= (density in *dBm/Hz* * 100) + 270000)

Set Adjacent Channel Power Ratio (ACPR) – Control Byte #87 (57h)

Description: Sets the state of the measurement (ON or OFF), the center frequency, the main channel bandwidth, the adjacent channel bandwidth and the channel spacing.

Send a 0 (zero) following the command to set the channel power measurement in the current setup.

Send a 1 (one) to set the adjacent channel power associated with the trace that was most recently uploaded by command #36, Upload Sweep Trace.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Note that if the ACPR measurement is turned ON, all other measurements (field strength, channel power) are turned OFF.

Bytes to Follow: 18 bytes

1) Adjacent Channel Power Location (0 = current setup, 1 = last uploaded trace)
2) Adjacent Channel Power Measurement State (On/Off)
3-6) Center Frequency
7-10) Main Channel Bandwidth
11-14) Adjacent Channel Bandwidth
15-18) Channel Spacing

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

Read Adjacent Channel Power (ACPR) – Control Byte #88 (58h)

Description: Read the current adjacent channel power or the adjacent channel power of a stored trace.

Send a 0 (zero) following the command to read the current adjacent channel power measurement (i.e. the one that is updated as the unit is sweeping).

Send 1-200 to read the channel power associated with a stored trace (use Query Trace Names, #24, to obtain trace numbers).

If option 6 is installed and the frequency extension module is attached, the frequencies will be scaled by the scale factor of the module. If the module is not attached, frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Adjacent Channel Power Ratio Location (0 = current measured value, 1-200 = value in stored trace)

Site Master Returns: 29 bytes

1) ACPR On/Off
2-5) Main Channel Center Frequency
6-9) Main Channel Bandwidth
10-13) Adjacent Channel Bandwidth
14-17) Channel Spacing
18-21) Main Channel Power (= (power in *dBm* * 100) + 270000)
22-25) Lower Adjacent Channel Power (= (power in *dBm* * 100) + 270000)
26-29) Upper Adjacent Channel Power (= (power in *dBm* * 100) + 270000)

***Read Signal Standard Name* – Control Byte #89 (59h)**

Description: Returns the name corresponding to the desired signal standard index as an ASCII string in English.

Bytes to Follow: 3 bytes
1) Mode (00h = VNA, 01h = Spectrum Analyzer/Transmission)
2) Signal Standard Index (higher byte)
3) Signal Standard Index (lower byte)

Site Master Returns: 2 bytes + number of bytes in string (or 1 byte on error)
1) String length (in number of bytes – referred to as "X" on the next line)
2-(X+1)) Standard Name in ASCII
X+2) 255 (FFh) Operation Complete Byte

OR

1) 224 (E0h) Parameter Error
238 (EEh) Time Out Error

***Measure OCC BW % of Power* – Control Byte #96 (60h)**

Description: Measure OCC BW with % of Power method.

If option 6 is installed and the frequency extension module is attached, the OBW frequencies will be scaled by the scale factor of the module. If the module is not attached, the OBW frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 4 bytes
1) % of Power (Highest byte)
2) % of Power
3) % of Power
4) % of Power (Lowest byte) (in 100^{th} of %, 9123 = 91.23%)

Site Master Returns: 16 bytes
1-4) Occupied Bandwidth (in Hz)
5-8) Measure dB down (dB * 100,000)
9-12) Low Frequency OCC BW
13-16) High Frequency OCC BW

***Measure OCC BW dB Down* – Control Byte #97 (61h)**

Description: Measure OCC BW with dB down method.

If option 6 is installed and the frequency converter module is attached, the OBW frequencies will be scaled by the scale factor of the module. If the module is not attached, the OBW frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 4 bytes
1-4) dB down (in 100^{th} of dB, 1234 = 12.34dB)

Site Master Returns: 16 bytes
1-4) Occupied Bandwidth (in Hz)
5-8) Measure % of Power (% of power * 100)
9-12) Low Frequency OCC BW
13-16) High Frequency OCC BW

***Set Bias Tee Function* - Control Byte #98 (62h)**

This command is available only with Option 10.

Description: Set the Bias Tee function On/Off. If the Bias Tee is turned on, the Spectrum Master returns the results of Bias Tee.

Bytes to Follow: 1 byte
00h – Turns the Bias Tee Off
01h – Turns the Bias Tee On

Site Master Returns:
If bias tee is turned Off (1 byte)
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid state
238 (EEh) Time-out Error

If bias tee is turned On (10 bytes)
1) Bias Tee Board Indicator (00h = No Hardware Installed, 01h = Hardware Installed)
2) Bias Tee Current (Highest byte)
3) Bias Tee Current
4) Bias Tee Current
5) Bias Tee Current (Lowest byte)
6) 10 * Bias Tee Voltage (Highest byte) : voltage value is in volt/10
7) 10 * Bias Tee Voltage
8) 10 * Bias Tee Voltage
9) 10 * Bias Tee Voltage (Lowest byte)
10) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time-out Error

Note: Due to the hardware delay, the Spectrum Master does not return the results of the Bias Tee until approximately 3 seconds after the Bias Tee is turned on.

***Set Spectrum Analyzer Start/Stop Frequency* – Control Byte #99 (63h)**

Description: Sets the spectrum analyzer start and stop frequencies.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 8 bytes
1) Start Frequency (Highest byte)
2) Start Frequency
3) Start Frequency
4) Start Frequency (Lowest byte)
5) Stop Frequency (Highest byte)
6) Stop Frequency
7) Stop Frequency
8) Stop Frequency (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid frequency range
238 (EEh) Time Out Error

Set Spectrum Analyzer Center Freq./Span – Control Byte #100 (64h)

Description: Sets the spectrum analyzer center frequency and span.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 8 bytes

1) Center Frequency (Highest byte)
2) Center Frequency
3) Center Frequency
4) Center Frequency (Lowest byte)
5) Frequency Span (Highest byte)
6) Frequency Span
7) Frequency Span
8) Frequency Span (Lowest byte)

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid frequency range
   238 (EEh) Time Out Error

Set Spectrum Analyzer Scale – Control Byte #101 (65h)

Description: Sets the reference level and the number of dB represented by each graph division.

Ref Level will be the "top" scale of the graph, and there are total of 10 division, so bottom scale can be determined by : Ref level + 10 x dB/div.

Bytes to Follow: 8 bytes

1) Ref Level (Highest byte)
2) Ref Level
3) Ref Level
4) Ref Level (Lowest byte)
5) dB/div (Highest byte)
6) dB/div
7) dB/div
8) dB/div (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid scale
   238 (EEh) Time Out Error

Notes:
Ref Level is sent as the (Ref Level * 1000) + 270,000 (0 dBm = 270,000, 20 dBm = 290000, -120 dBm = 150,000)
Scale should be sent as (dBm * 1000) (e.g. -12.34 dBm = -12340)

Set Spectrum Analyzer Marker – Control Byte #102 (66h)

Description: Sets an individual Spectrum Analyzer marker.

Bytes to Follow: 5 bytes

1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4,05h = marker 5, 06h = marker 6)

2) Marker Line On/Off (01h = On, 00h = Off)
3) Marker Delta Status On/Off (01h = On, 00h = Off)
4) Marker Value (Higher byte)
5) Marker Value (Lower byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid marker number, status or position
   238 (EEh) Time Out Error

Note:
Marker Value is between 0 and 400, inclusive: Point = (400 * (marker freq - start freq)) / span

---

Set Spectrum Analyzer Single Limit – Control Byte #103 (67h)

Description: Sets the position and On/Off Status of the Limit Line.

Bytes to Follow: 6 bytes

1) Limit Number (1 for Site Master)
2) Limit Line On/Off (01h = On, 00h = Off)
3) Beep at Limit On/Off (01h = On, 00h = Off)
4) Limit Value (Highest byte)
5) Limit Value
6) Limit Value
7) Limit Value (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid limit number, status or value
   238 (EEh) Time Out Error

Note:
Limit Value is sent as the (Limit Value * 1000) + 270,000 (0 dBm=270,000, 20 dBm=290000, -120 dBm=150,000)

Set Spectrum Analyzer Peak Hold – Control Byte #105 (69h)

Description: Sets the max hold and min hold settings on the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Peak Hold State
   00h – Peak Hold Off
   01h – Max Hold On
   02h – Min Hold On

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid state
   238 (EEh) Time Out Error

OBSOLETE: Set Spectrum Analyzer Resolution Bandwidth – Control Byte #106 (6Ah)

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models

are not available here. To access the new features use Control Byte #141 (8Dh).

Description: Sets the resolution BW frequency for the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Resolution Bandwidth Index
   - 00h – 10 kHz BW
   - 01h – 30 kHz BW
   - 02h – 100 kHz BW
   - 03h – 1 MHz BW

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid RBW Index
   238 (EEh) Time Out Error

OBSOLETE: Set Spectrum Analyzer Video Bandwidth – Control Byte #107 (6Bh)

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #142 (8Eh).

Description: Sets the video BW frequency for the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Video Bandwidth Index
   - 00h – 100 Hz BW
   - 01h – 300 Hz BW
   - 02h – 1 kHz BW
   - 03h – 3 kHz BW
   - 04h – 10 kHz BW
   - 05h – 30 kHz BW
   - 06h – 100 kHz BW
   - 07h – 300 kHz BW

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid VBW Index
   238 (EEh) Time Out Error

Set Spectrum Analyzer Sweep Mode – Control Byte #108 (6Ch)

Description: Enables or disables the Single Sweep Mode during Spectrum Analyzer mode of operation.

Single Sweep Mode activates once the Site Master exits from the remote mode.

For Single Sweep Mode during Site Master VNA modes of operation see control byte #11 (0Bh).

Bytes to Follow: 1 byte

1) Sweep Mode
   - 00h – Single Sweep
   - 01h – Continuous Sweep
   - 02h – Video Trigger (span must be 0)
   - 03h – External Trigger (span must be 0)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Mode

238 (EEh) Time Out Error

***Set Spectrum Analyzer Marker to Peak* – Control Byte #109 (6Dh)**

Description: Sets the specified marker to the peak value of the sweep.

Bytes to Follow: 1 byte
1) Marker Number (1-6)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Marker Number
   238 (EEh) Time Out Error

***Set Spectrum Analyzer Marker to Center* – Control Byte #110 (6Eh)**

Description: Sets the center frequency equal to the frequency of the specified marker.

Bytes to Follow: 1 byte
1) Marker Number (1-4)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Marker Number
   238 (EEh) Time Out Error

***OBSOLETE: Set Spectrum Analyzer Attenuation* – Control Byte #111 (6Fh)**

This command exists for backward compatibility with the S33xC models. Features new to the S33xD models are not available here. To access the new features use Control Byte #143 (8Fh).

Description: Sets the attenuation for the Site Master Spectrum Analyzer mode. Send a value of 255 (FFh) to enable dynamic attenuation.

Automatic control couples the attenuation to the reference level. Note that setting the attenuation using this command automatically sets the attenuation coupling to "MANUAL", thereby allowing it to be defined independently of the reference level.

Bytes to Follow: 1 byte
1) Attenuation Index
   00h – 0 dB
   01h – 10 dB
   02h – 20 dB
   03h – 30 dB
   04h – 40 dB
   05h – 50 dB

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid Attenuation Index
   238 (EEh) Time Out Error

***Set Site Master VNA Segmented Limit Lines* – Control Byte #112 (70h)**

Description: Sets the position and On/Off status of the limit lines.

Site Master VNA modes support 5 limit segments. Each segment may have any finite slope and can be enabled and disabled independently of every other segment. The limit beep is enabled for all segments or no segments.

Limit segments are specified by their end points (starting and ending "x" and "y" values).

See control byte #29 (1Dh) response bytes 60 to 129 for the current Site Master configuration.

Bytes to Follow: 14 bytes

1) Limit Number
2) Limit Line On/Off (01h = On, 00h = Off)
3) Starting X (Highest byte)[639]
4) Starting X
5) Starting X
6) Starting X (Lowest byte)
7) Starting Y (Higher byte)
8) Starting Y (Lower byte)
9) Ending X (Highest byte)[640]
10) Ending X
11) Ending X
12) Ending X (Lowest byte)
13) Ending Y (Higher byte)
14) Ending Y (Lower byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid limit segment, status or value
   238 (EEh) Time Out Error

Notes:

Limit Value depends on the current display mode selected.

Return Loss &:	Limit should be sent as (dB * 1000)
Cable Loss	Maximum value sent is 60000 which represents 60.00 dB
	Minimum value sent is 0 which represents 0.0 dB
SWR:	Limit is in thousandths (of ratio), so it should be sent as (ratio * 1000)
	Maximum value sent is 65530 which represents 65.53
	Minimum value sent is 1000 which represents 1.00

***Set Spectrum Analyzer Multiple Limit* – Control Byte #113 (71h)**

Description: Sets the position and On/Off Status of a limit segment.

Multiple limits are defined by multiple limit segments, each with a different finite slope. The single limit is a single, horizontal line that can be defined to act as an upper limit or as a lower limit. See control byte #103 for information about the single limit.

The limit types are mutually exclusive. That is, you cannot have both single and multiple limits at the same time. Note that setting a limit segment ON automatically makes the limit type "MULTIPLE".

One segment is defined each time this command is sent to the Spectrum Master. The first two bytes of the command specify which segment is being defined. There are 5 upper limits and 5 lower limits available in Spectrum Analyzer mode. Byte 1 selects the segment number. Byte 2 specifies whether it is an upper limit or a lower limit. Byte 3 turns the segment ON or OFF. Byte 4 specifies whether the error beep sounds when the bound set by the segment is exceeded by the measured data.

[639] Frequency in Hz or Distance in 1/100,000 ft (or meters)
[640] Frequency in Hz or Distance in 1/100,000 ft (or meters)

The segment location is defined by its endpoints. The "Start" endpoint must appear to the left of the "End" endpoint on the graph. That is, Start X < End X. If Start X = End X then Start Y must equal End Y. Vertical segments are not allowed.

Bytes to Follow: 20 bytes

1) Segment number (1-5)
2) Segment type (00h = LOWER limit, 01h = UPPER limit)
3) Limit Line On/Off (01h = On, 00h = Off)
4) Limit Beep On/Off (01h = On, 00h = Off)
5) Limit Value Start X [641](Highest byte)
6) Limit Value Start X
7) Limit Value Start X
8) Limit Value Start X (Lowest byte)
9) Limit Value Start Y [642](Highest byte)
10) Limit Value Start Y
11) Limit Value Start Y
12) Limit Value Start Y (Lowest byte)
13) Limit Value End X [643](Highest byte)
14) Limit Value End X
15) Limit Value End X
16) Limit Value End X (Lowest byte)
17) Limit Value End Y [644](Highest byte)
18) Limit Value End Y
19) Limit Value End Y
20) Limit Value End Y (Lowest byte)

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid limit segment, status or value
   238 (EEh) Time Out Error

***Set Return Spectrum Analyzer Sweep Time* – Control Byte #114 (72h)**

Description: If this is enabled, the duration of the current sweep (in milliseconds) will be returned as 4 bytes via the serial port at the end of the sweep. If Serial Echo Status is enabled, the 4 bytes will be returned AFTER the sweep complete byte.

Bytes to Follow: 1 byte

1) Return SPA Sweep Time flag state
   00h = Don't Return Sweep Time
   01h = Return Sweep Time

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid state
   238 (EEh) Time Out Error

---

[641] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[642] (Value in dBm * 1000) + 270,000
[643] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[644] (Value in dBm * 1000) + 270,000

***Set Reference Level Offset* – Control Byte #115 (73h)**

Description: Set the value of the reference level offset.

The reference level offset allows the user to view the result of trace math (A+B, A-B) even if it is greater than +20 dBm or less than –120 dBm. The offset is a constant that is subtracted from the reference level.

Note that the valid range is –100 to +100 dB.
Send the value as (value in dB * 1000) + 270,000.
For example, to compensate for a 30 dB attenuator, the reference level offset should be -30 dB. That value would be sent over the serial port as (-30 * 1000) + 270,000 = 240,000.

Bytes to Follow: 4 bytes

1) Reference Level Offset (Highest byte)
2) Reference Level Offset
3) Reference Level Offset
4) Reference Level Offset (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

***Set Spectrum Analyzer Impedance* – Control Byte #116 (74h)**

Description: Set the impedance and the loss value due to an adapter.

The Site Master can automatically compensate for the effects of impedance adapters. The impedance of the Site Master is 50Ω, so there is no need for an adapter in this case. The loss for the Anritsu 75Ω adapter 12N50-75B is known by the Site Master.

This control byte also allows for the specification of the impedance and the loss due to an adapter the system does not know. In either case, 5 bytes must be sent to the unit. If the impedance is 50Ω or one of the known adapters is specified, bytes 2-5 are ignored. If an unknown adapter is specified, the unit uses bytes 2-5 to correct for the adapter.

Bytes to Follow: 5 bytes

1) Impedance Adapter[645]
2) Impedance Loss[646] (Highest byte)
3) Impedance Loss
4) Impedance Loss
5) Impedance Loss (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

***Read Marker Value* – Control Byte #117 (75h)**

Description: Returns the frequency location of the specified marker, and the value at that location.

[645] Impedance Adapter: 00h = 50 Ω 0Ah = 75Ω, adapter 12N50-75B 0Ch = 75Ω, other adapter offset
[646] Send the loss value as value in dB* 1,000

If option 6 is installed and the frequency converter module is attached, the frequency will be scaled by the scale factor of the module. If the module is not attached, the frequency is sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Marker number (1-6)

Spectrum Master Returns: 8 bytes (1 byte if an error occurs)

1) Frequency (Highest byte)
2) Frequency
3) Frequency
4) Frequency (Lowest byte)
5) Value at Marker (Highest byte)
6) Value at Marker
7) Value at Marker
8) Value at Marker (Lowest byte)

OR

1) 224 (E0h) Parameter Error: Invalid marker number
   238 (EEh) Time-out Error

Note:
Marker value sent as (value in dBm * 1,000) +270,000
If markers are set to be noise markers, convert the returned dBm value to dBm/Hz using this formula (only if detection method is RMS Average):

marker (in dBm/Hz) = marker value (in dBm) - 10 * log10(RBW) - 0.13

***Set Sweep Averaging* – Control Byte #118 (76h)**

Description: Sets the number of sweeps to average. The maximum number is 25. Sending a 1 turns averaging off. Note: This only works in Spectrum Analyzer mode.

Bytes to Follow: 1 byte

1) Number of sweeps to average (1-25, 1 turns averaging OFF)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

***Field InstaCal* – Control Byte #120 (78h)**

Description: This command is used by the customer in the field to start an InstaCal sequence.

Prior to sending this command to the Site Master, the InstaCal module should be connected to the R/F Out port. To execute this command, exit remote mode after sending this command.

Byte to Follow: 0 bytes

Site Master Returns: 2 bytes

1) 255 (FFh): Operation Complete Byte

2) 240 (F0h): Calibration completes

254 (FEh): Operation complete with some conditions[647]
224 (E0h): Communication Error : Cell Master was unable to communicate with InstaCal module
238 (EEh): Field InstaCal sequence was unable to complete

***Read InstaCal Module ASCII Serial Number* – Control Byte #124 (7Ch)**

Description: Returns the InstaCal Module serial number in ASCII.

Bytes to Follow: 1 byte
1) Serial number storage location (01h=main serial, 02h=secondary)

Site Master Returns: 8 bytes
1-8) Serial Number, in ASCII

***Set Site Master Marker (Peak/Valley)* – Control Byte #129 (81h)**

Description: Sets an individual marker in current measurement mode to either peak (maximum) signal or valley (minimum) signal.

Bytes to Follow: 2 bytes
1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
2) Marker Line Search Status (01h = Peak , 00h = Valley)

Site Master Returns: 3 bytes (1 byte if an error occurs)
1) Marker Position (Higher byte)[648]
2) Marker Position (Lower byte)
3) 255 (FFh) Operation Complete Byte

OR

1) 224 (E0h) Parameter Error : Invalid marker or marker search status
   238 (EEh) Time Out Error

***Set / Reset Spectrum Analyzer External Reference* – Control Byte #133 (85h)**

Description: Sets the external reference frequency for the spectrum analyzer in increments of 1 MHz from 2 – 20 MHz. The frequencies are sent in Hz.

Bytes to Follow: 1 byte if turning the reference OFF, 5 bytes if turning the reference ON

Turn OFF the external reference:
1) 00h - Turn OFF the frequency reference

OR

Turn ON the external reference (the reference frequency is also sent):
1) 01h - Turn ON the frequency reference
2) External Reference Frequency (in Hz) (Highest byte)
3) External Reference Frequency (in Hz)

---

[647] Attached instacal module's serial number is different from the one whose characterization data is in the instrument's memory. It's recommended to issue instacal module characterization command byte #242 (F2h).
[648] The marker position is sent as a data point on the display. Equivalent Frequency = (position * span / (# data points – 1)) + start frequency

4) External Reference Frequency (in Hz)
5) External Reference Frequency (in Hz) (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

Check Spectrum Analyzer External Reference – Control Byte #134 (86h)

Description: Checks to see if Spectrum Analyzer external reference is present. If it is, it then checks to see if it is at the correct frequency for PLL locking.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte
On Success:
1) 00h – Reference present and at the correct frequency (PLL functioning)
   01h – Reference is not present
   02h – Reference is present, but internal PLL and external frequency do not match up.

OR

On Error:
1) 224 (E0h) Parameter Error – Not in External reference mode
   238 (EEh) Time-out Error.

Set SA Preamp State (On/Off/Auto) – Control Byte #136 (88h)

Description: Sets the state of Spectrum Analyzer preamplifier.

Setting the preamp state to ON or OFF sets the preamp coupling to manual. That is, the preamplifier state is controlled independently of all other parameters.

Setting the preamp state to AUTO couples the preamp state to the reference level and the attenuation. If the attenuation is automatically coupled to the reference level, the preamp will turn on when the reference level is set less than -26 dBm. If the attenuation is manually coupled to the reference level, the preamp will turn on when the value of (attenuation – reference level) >= 51.

Bytes to Follow: 1 byte
1) Mode (00h = Off, 01h = On, 02h = Auto)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid state
   238 (EEh) Time Out Error

Set Spectrum Analyzer Units – Control Byte #140 (8Ch)

Description: Sets the scale type (logarithmic or linear) and the units.

Linear units can be:
01h = Volts
02h = Watts

Logarithmic units can be:
03h = dBm
04h = dBV
05h = dBmV
06h = dBµV

Bytes to Follow: 2 bytes
1) Scale Type (00h = Linear, 01h = Logarithmic)
2) Units

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time-out Error

Set Spectrum Analyzer Resolution Bandwidth – Control Byte #141 (8Dh)

This command is new to the S33xD. Use it instead of Control Byte #106 to access the new RBWs.

Description: Sets the resolution BW frequency for the Spectrum Analyzer.

Bytes to Follow: 4 bytes
1) Resolution Bandwidth (frequency in Hz) (Highest byte)
2) Resolution Bandwidth (frequency in Hz)
3) Resolution Bandwidth (frequency in Hz)
4) Resolution Bandwidth (frequency in Hz) (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid RBW
238 (EEh) Time Out Error

Set Spectrum Analyzer Video Bandwidth – Control Byte #142 (8Eh)

This command is new to the S33xD. Use it instead of Control Byte #107 to access the new VBWs.

Description: Sets the video BW frequency for the Spectrum Analyzer.

Bytes to Follow: 4 bytes
1) Video Bandwidth (frequency in Hz) (Highest byte)
2) Video Bandwidth (frequency in Hz)
3) Video Bandwidth (frequency in Hz)
4) Video Bandwidth (frequency in Hz) (Lowest byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid VBW
238 (EEh) Time Out Error

Set Spectrum Analyzer Attenuation – Control Byte #143 (8Fh)

This command is new to the S33xD. Use it instead of Control Byte #111 to access the new attenuations.

Description: Sets the attenuation of the Spectrum Analyzer. Send a byte-to-follow value of 255 (FFh) to enable dynamic attenuation.

Automatic control couples the attenuation to the reference level. Dynamic control let the instrument sets appropriate attenuation on each sweep based on the total power coming into the RF-in port. Note that setting the attenuation using this command automatically sets the attenuation coupling to "MANUAL", thereby allowing it to be defined independently of the reference level.

Bytes to Follow: 1 byte

1) Attenuation (0 – 51)
   Or
   255 (for dynamic attenuation)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid attenuation
   238 (EEh) Time Out Error

Set AM/FM Demodulation – Control Byte #145 (91h)

Description: Sets the AM/FM/SSB Demodulation state. This command is also used to set the type of Modulation, volume, Demodulation Frequency, BFO Adjust (SSB only) and the Demodulation time. On turning demodulation ON, after exiting remote, at the end of every sweep, demodulation is performed at the Demodulation frequency for a period of time specified in the Demod Time.

Bytes to Follow: 16 bytes

1) Set AM/FM/SSB Demod On/Off[649]
2) Demodulation Type[650]
3) Speaker Volume (Higher byte)[651]
4) Speaker Volume (Lower byte)
5) Demodulation Time[652] (Highest byte)
6) Demodulation Time
7) Demodulation Time
8) Demodulation Time (Lowest byte)
9) Demodulation Frequency[653] (Highest byte)
10) Demodulation Frequency
11) Demodulation Frequency
12) Demodulation Frequency (Lowest byte)
13) SSB BFO Adjust[654] (Highest byte)
14) SSB BFO Adjust
15) SSB BFO Adjust
16) SSB BFO Adjust (Lowest byte)

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   238 (EEh) Time Out Error

---

[649] 00h = Off, 01h = On
[650] 00h = FM Wideband, 01h = FM Narrowband, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[651] Speaker Volume is from 0 to 100 in steps of 10
[652] Demodulation time in milliseconds from 100 millisec to 500 seconds
[653] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[654] BFO Valid Values are -10 kHz to +10 kHz. Send value as BFO(in Hz) + 10,000. For Example -10 kHz would be sent as 0, 0 would be sent as 10000 and +10 kHz would be 20000

***Set Baud Rate* – Control Byte #197 (C5h)**

Description: Set baud rate for this session. An invalid setting returns the baud rate to 9600.

Bytes to Follow: 1 byte

1) Baud Rate Index
   - 00h = 9600 baud
   - 01h = 19200 baud
   - 02h = 38400 baud
   - 03h = 56000 baud
   - 04h = 115200 baud

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid baud rate index
   238 (EEh) Time Out Error

***Set Language* – Control Byte #198 (C6h)**

Description: Set the Site Master display language.

Bytes to Follow: 1 byte

1) Language Index
   - 00h = English
   - 01h = French
   - 02h = German
   - 03h = Spanish
   - 04h = Chinese
   - 05h = Japanese

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid language index
   238 (EEh) Time Out Error

***Query Time* – Control Byte #208 (D0h)**

Description: Queries the Site Master for the current time in ASCII format.

Bytes to Follow: 0 bytes

Site Master Returns: 8 bytes (HH:MM:SS)

1) Hour (Higher byte)
2) Hour (Lower byte)
3) :
4) Minute (Higher byte)
5) Minute (Lower byte)
6) :
7) Second (Higher byte)
8) Second (Lower byte)

***Read Main Serial Number* – Control Byte #221 (DDh)**

Description: Returns the Main (External) Serial Number as four bytes. This command remains for backward

compatibility.

A better command to use would be "Read ASCII Serial Number" #225 (E1h) which returns the serial number in ASCII format.

Bytes to Follow: 0 bytes

Site Master Returns: 4 bytes
1) Main Serial Number (Highest byte)
2) Main Serial Number
3) Main Serial Number
4) Main Serial Number (Lowest byte)

***Read ASCII Serial Number* – Control Byte #225 (E1h)**

Description: Reads and returns the Site Master serial number as 8 ASCII bytes.

Bytes to Follow: 1 byte
1) Serial number storage location
   01h = Main (External) Serial Number
   02h = Secondary (Motherboard) Serial Number
   03h = T1/E1 Serial Number

Site Master Returns: 8 bytes
1-8) Serial Number (in ASCII)

***GPS Power* – Control Byte #237 (EDh)**

Description: Turn On/Off power of GPS module.

Bytes to Follow: 1 bytes
Power Switch (1=ON, others=OFF)

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

***Read GPS Position* – Control Byte #238 (EEh)**

Description: Read current GPS position data: Latitude, longitude, and Altitude.

Bytes to Follow: 0 byte
Cell Master Returns: 13 byte (if Ok)
1-2) Number of satellites in use (< 3 if not locked)
3-6) GPS Position – Latitude (long integer)[655] (=-1 if not valid)
7-10) GPS Position – Longitude (long integer) (= -1 if not valid)
11-12) GPS Position – Altitude (short integer) (=-30000 if not valid)
13) 255 (FFh) Operation Complete Byte

Error code : 1 byte

[655] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

224 (E0h) Parameter Error
238 (EEh) Time Out Error

***Automatic Cal Disable* – Control Byte #241 (F1h)**

Description: Disable automatic calibration.

Bytes to Follow: 1 byte
1: to disable automatic calibration
0: to enable automatic calibration

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid Parameter
238 (Eeh) Time-out Error

***Instacal Module Characterization* – Control Byte #242 (F2h)**

Description: This command can either be a query or a request depending on the argument (parameter). If the argument is 1 (01h), then this is a request to load the attached instacal module characterization. This needs to be done only once whenever there is a change in the module being used to calibrate. It makes future calibration using the same module a lot quicker. If the argument is 0 (00h), then this is a query asking if the attached instcal module's characterization had been recorded in the instrument's memory.

Bytes to Follow: 1 byte
0 (00h): To ask if the attached instacal module's characterization is in the instrument's memory
1 (01h): To record the attached instacal module's characterization into the instrument's memory

Cell Master Returns: 1 byte[656]
0 (00h): Attached instacal module's characterization is in the instrument's memory OR attempt to record the attached instacal's characterization into the instrument's memory succeeded.
1 (01h): Attached instacal module's characterization is not in the instrument's memory OR attempt to record the attached instacal's characterization into the instrument's memory failed.
224 (E0h): Parameter error - invalid parameter
238 (EEh): Time-out error
254 (FEh): Cannot detect an instacal module from the RF out port.

***Recall Sweep Trace* – Control Byte #243 (F3h)**

Description: This command is similar to another recall sweep trace with control byte #33 (21h). The only different between this command and command #33 (21h) is that this command requires 2 bytes to follow whereas command #33 (21h) requires 1 byte. This makes it possible to recall traces whose indices are bigger than 255, which is not possible with command #33 (21h).

Bytes to Follow: 2 bytes
0 = Last sweep trace before entering remote mode (sweep trace in RAM)
1- 300 = Specific saved sweep number (stored sweeps in Flash memory)

1) Trace Index (Higher Byte)
2) Trace Index (Lower Byte)

[656] If there are 2 possible interpretations to the return byte, then the first interpretation is intended for the query type and the second one is intended for the request type.

Cell Master Returns:

Exactly like command #33 (21h), so please refer to that section.

***Set Site Master VNA Extended Frequency* – Control Byte #244 (F4h)**

Description: Sets the Site Master frequency range. Start and stop frequencies are given in terms of 10-Hz steps. (e.g. 5000.3 MHz would be sent as 500030000 = 500,030,000 (10-Hz).)

Valid range is 25 MHz – 4000 MHz.
Low end is extended to 2 MHz with option 2; and high end is extended to 6000 MHz with option 16.

See control byte #29 (1Dh) response bytes 28 to 35 for current Site Master start and stop frequencies.

This command handles frequency up to 6 GHz. However, it must be entered in 10-Hz steps.

Bytes to Follow: 8 bytes

9) Start Frequency (Highest byte)
10) Start Frequency
11) Start Frequency
12) Start Frequency (Lowest byte)
13) Stop Frequency (Highest byte)
14) Stop Frequency
15) Stop Frequency
16) Stop Frequency (Lowest byte)

Site Master Returns: 1 byte

2) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid frequency range
   238 (EEh) Time-out Error

***Exit Remote Mode* – Control Byte #255 (FFh)**

Description: Site Master exits remote mode.

The computer sends the Exit Remote command #255 (FFh) to the Site Master. Site Master returns a confirm flag (FFh). The Site Master resumes sweeping, either continuously or singly.

You may also press the "ESCAPE" key on the Site Master key pad to exit from remote mode (given that the serial communication is still in sync). In this case, the Site Master does not return a confirm byte to the serial port.

When exiting remote mode, system parameters changed during remote mode are used immediately.

System parameters changed during remote mode are not written to the non-volatile EEPROM.

You may want to save the change to the run-time setup (saved setup location 0, which holds the power-on setup) or one of the saved setups for the current measurement mode. See control byte #18 (12h) for details.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete

***Set T1 Transmission Level* – Control Word (A001h)**

This control byte is available with Option 50 only.

Description: Sets the transmission level of T1 measurement mode.

Bytes to Follow: 1 byte

1) Transmission Level
   - 00h: 0 dB
   - 01h: -7.5 dB
   - 02h: -15 dB
   - 03h: -22 dB

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid transmission level
   238 (EEh) Time Out Error

***Set T1/E1 Clock Source* – Control Word (A002h)**

This control byte is available with Option 50 only.

Description: Sets the Clock Source of T1/E1 measurement mode.

Bytes to Follow: 1 byte

1) Clock Source
   - 00h: Internal
   - 01h: External

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid clock source
   238 (EEh) Time Out Error

***Set T1/E1 Pattern* – Control Word (A003h)**

This control byte is available with Option 50 only.

Description: Sets the data pattern of T1/E1 measurement mode.

Bytes to Follow: 2 bytes

1) Data Pattern
   - 00h: AUTO_DETECT
   - 01h: PRBS_9
   - 02h: PRBS_11
   - 03h: PRBS_15
   - 04h: PRBS_20 (O.151)
   - 05h: PRBS_20 (O.153)
   - 06h: PRBS_23
   - 07h: QRSS
   - 08h: ONE_IN_8
   - 09h: TWO_IN_8
   - 0Ah THREE_IN_24
   - 0Bh: ALL_ONES

0Ch: ALL_ZEROS
0Dh: T1_DALY
0Eh: BLUE_ALARM
0Fh: YELLOW_ALARM
10h: USER_DEFINED

2) Inverted Pattern Option (01h: Inverted; 00h: Non-inverted)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid pattern index
   238 (EEh) Time Out Error

***Set T1/E1 Error Insert Type/Value* – Control Word (A004h)**

This control byte is available with Option 50 only.

Description: Sets the Insertion Error type and the number of errors.

Bytes to Follow: 5 bytes

1) Error Type
   00h: Bit
   01h: Bert
   02h: BPV
   03h: Framing
2) Number of Errors (Highest byte)
3) Number of Errors
4) Number of Errors
5) Number of Errors (Lowest byte)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid error type or value
   238 (EEh) Time Out Error

***Set T1/E1 Framing Mode* – Control Word (A005h)**

This control byte is available with Option 50 only.

Description: Sets the Framing Mode of T1/E1 measurement.

Bytes to Follow: 1 byte

1) Framing Mode
   00h: Auto

   (T1 Tester Only)
   01h: D4 SF
   02h: ESF

   (E1 Tester Only)
   03h: PCM30
   04h: PCM30 CRC
   05h: PCM31
   06h: PCM31 CRC

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid framing mode

238 (EEh) Time Out Error

Start and Stop T1/E1 Measurement – Control Word (A006h)

This control byte is available with Option 50 only.

Description: This command toggles the Run/Stop state of the T1/E1 measurement. That is, if the command is sent while the measurement is running, the command stops the measurement. If the command is sent when the measurement is stopped, the command starts the measurement.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time Out Error

Insert Error for T1/E1 Measurement – Control Word (A007h)

This control byte is available with Option 50 only.

Description: This command inserts the error defined into the data flow.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   238 (EEh) Time Out Error

Get T1/E1 Pattern – Control Word (A008h)

This control byte is available with Option 50 only.

Description: Get the current T1/E1 pattern.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) T1 Pattern

OR

1) 238 (EEh) Time Out Error

Get T1/E1 Frame Sync Status – Control Word (A009h)

This control byte is available with Option 50 only.

Description: Get the frame sync status of T1 /E1.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) Frame Sync Status (00h: Framed; 01h: Unframed)

OR

1) 238 (EEh) Time Out Error

Get T1/E1 Pattern Sync Status – Control Word (A00Ah)

This control byte is available with Option 50 only.

Description: Get the pattern sync status of T1/ E1.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) Pattern Sync Status (00h: In-sync; 01h: Out-of-sync)

OR

1) 238 (EEh) Time Out Error

Get T1/E1 Carrier Status – Control Word (A00Bh)

This control byte is available with Option 50 only.

Description: Get the carrier status of T1/E1.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) Carrier Status (00h: Carrier present; 01h: No carrier)

OR

1) 238 (EEh) Time Out Error

Get T1/E1 Error Type and Number – Control Word (A00Ch)

This control byte is available with Option 50 only.

Description: Get the error type and number of T1/E1.

Bytes to Follow: 0 bytes

Site Master Returns: 16 bytes in T1 mode, 18 bytes in E1 mode, 1 byte on error

1) Frame Loss (Higher byte)
2) Frame Loss (Lower byte)
3) Bit Errors (Highest byte)
4) Bit Errors
5) Bit Errors
6) Bit Errors (Lowest byte)
7) BER (Higher byte)
8) BER (Lower byte)
9) BPV (Higher byte)
10) BPV (Lower byte)
11) CRC (Higher byte)
12) CRC (Lower byte)

T1:

13) Errored Seconds (Highest byte)

14) Errored Seconds
15) Errored Seconds
16) Errored Seconds (Lowest byte)

E1:
13) E Bits (Higher byte)
14) E Bits (Lower byte)
15) Errored Seconds (Highest byte)
16) Errored Seconds
17) Errored Seconds
18) Errored Seconds (Lowest byte)

OR

1) 238 (EEh) Time Out Error

Set T1/E1 Line Coding Options – Control Word (A00Dh)

This control byte is available with Option 50 only.

Description: Sets the line coding options of T1/E1 measurement mode.

Bytes to Follow: 1 byte
1) Line Coding
   00h: B8ZS (For T1 Only)
   01h: AMI
   02h: HDB3 (For E1 Only)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid line coding option
   238 (EEh) Time Out Error

Set E1 Impedance Options – Control Word (A00Eh)

This control byte is available with Option 50 only.

Description: Sets the impedance for the E1 mode. Note that impedance is set separately for BERT and Vpp measurements.

Bytes to Follow: 2 bytes
1) E1 Measurement (00h: BERT, 01h: Vpp)
2) Impedance
   00h: 75 Ω
   01h: 120Ω

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid impedance setting
   238 (EEh) Time Out Error

Read T1/E1 Volts Peak-to-Peak – Control Word (A00Fh)

This control byte is available with Option 50 only.

Description: Initiates the Vpp measurement on the T1 board and returns the result.

Vpp is sent as (Vpp * 10).

Bytes to Follow: 0 bytes

Site Master Returns: 3 bytes

1) Volts peak-to-peak (Higher byte)
2) Volts peak-to-peak (Lower byte)
3) Status Byte
   255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

Set T1/E1 Receive Input Configuration Options – Control Word (A013h)

This control byte is available with Option 50 only.

Description: Sets the Rx Input Configuration for the T1/E1 modes.

Bytes to Follow: 2 bytes

1) T1/E1 Measurement (00h: BERT, 01h: Vpp)
2) Rx Input Config
   00h: Terminate
   01h: Bridged
   02h: Monitor +20 dB (BERT only)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid measurement or configuration
   238 (EEh) Time Out Error

Set T1/E1 Measurement Duration – Control Word (A014h)

This control byte is available with Option 50 only.

Description: Sets the measurement duration for the current mode (T1 or E1).

Bytes to Follow: 1 byte

1) Measurement Duration Index
   00h: Manual
   01h: 3 minutes
   02h: 15 minutes
   03h: 30 minutes
   04h: 1 hour
   05h: 3 hours
   06h: 6 hours
   07h: 12 hours
   08h: 1 day
   09h: 2 days

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid duration or not in T1 or E1 mode

238 (EEh) Time Out Error

Set T1/E1 Data Logging – Control Word (A015h)

This control byte is available with Option 50 only.

Description: Enables and disables data logging for T1/E1 modes. The ability to log data depends on the amount of available memory..

Bytes to Follow: 1 byte

1) Data Logging Status
   00h: Off
   01h: On

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid status or not enough memory
   238 (EEh) Time Out Error

Read T1/E1 dBdsx – Control Word (A016h)

This control byte is available with Option 50 only.

Description: Initiates a voltage measurement on the T1 board and returns the result in dBdsx. The resolution is 0.1 dB and is offset by 350 so that only positive values are returned. For example, -5.0 dB will be reported as 300. Results less than –20 dB are not accurate to 0.1 dB and should be divided by 10.

Bytes to Follow: 2 bytes

1) dBdsx (Higher byte)
2) dBdsx (Lower byte)

Site Master Returns: 1 byte

1) Status Byte
   255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

Read T1/E1 Frequency – Control Word (A017h)

This control byte is available with Option 50 only.

Description: Reports the last T1/E1 frequency measurement result in Hz if available. The DSP CPLD U80 must be version 7 or higher and the T1E1 board version number must be 1 or higher for this measurement. The Cell Master must be configured for a BER measurement and a BER measurement must be running before this command is executed. The firmware must version V1.88 or higher.

Bytes to Follow: 0 bytes

Site Master Returns: 4 bytes

1) Frequency (Highest byte)
2) Frequency
3) Frequency
4) Frequency (Lowest byte)

***Read T1/E1 Frequency Cal* – Control Word (A018h)**

This control byte is available with Option 50 only.

Description: Reports the current T1/E1 frequency calibration setting. The value is in Hz offset from 0 by 100, with a range of 0 to 200 Hz (equivalent to +/- 100 Hz).

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) Frequency Calibration Setting in Hz

***Set T1/E1 Frequency Cal* – Control Word (A019h)**

This control byte is available with Option 50 only.

Description: Sets the T1/E1 frequency calibration value. The value is in Hz offset from 0 by 100, with a range of 0 to 200 Hz (equivalent to +/- 100 Hz).

Bytes to Follow: 1 byte

1) Frequency Calibration Setting in Hz

Site Master Returns: 1 byte

1) Status Byte
   255 (FFh) Operation Complete Byte

***Configure DS0/E0 Channel Tests* – Control Word (A01Ah)**

This control byte is available with Option 50 only.

Description: Configures DS0/E0 channel access

Bytes to Follow: 3 bytes

1) Channel insert ON/OFF. 1 for ON, 0 for OFF.
2) Channel number. 1 – 24 for DS1, 1- 32 for E1
3) Audio monitor volume in percent, 0 – 100%

Cell Master Returns: 1 byte

Status Byte

255 (FFh) Operation Complete Byte
238 (EEh) Time-out Error

***Read DS0/E0 Level and Frequency* – Control Word (A01Bh)**

This control byte is available with Option 50 only.

Description: Reports the level and frequency of the received signal on the selected DS0/E0 channel. The range of the level measurement is –40.0 to +3.0 dBm. The result is reported with 0.1 dB resolution, offset by 401. A report of 401 corresponds to 0.0 dBm, a report of 0 is under range and a report of 432 is over range. The frequency is reported in Hz.

Bytes to Follow: 0 bytes

Cell Master Returns: 4 bytes

1) Level high byte
2) Level low byte

3) Frequency high byte
4) Frequency low byte

Set DS0/E0 Level and Frequency – Control Word (A01Ch)

This control byte is available with Option 50 only.

Description: Sets the level and frequency of the sinusoidal signal to transmit on the selected channel. The range of the level setting is 0 to –30 dBm. The level setting is offset by 30 where 30 corresponds to 0 dBm and 0 to –30 dBm. The frequency is in Hz with a range of 100 to 3000 Hz.

Bytes to Follow: 3 bytes
1) Level
2) Frequency high byte
3) Frequency low byte

Cell Master Returns: 1 byte
Status Byte
255 (FFh) Operation Complete Byte
238 (EEh) Time-out Error

Select SPA/Power Meter Signal Standard – Control Word (A103h)

Description: Selects a Signal Standard. Use this command for both Spectrum Analyzer and Power Meter modes.

Bytes to Follow: 1 byte
1) Signal Standard – See the section "Signal Standards" for a list of standards and their indices.

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid signal standard
238 (EEh) Time Out Error

Select SPA/Power Meter Channel – Control Word (A104h)

Description: Selects a channel within the range of the currently selected signal standard. Use this command for both Spectrum Analyzer and Power Meter modes.

See the section "Signal Standards" for a list of valid channels for the selected channel.

Bytes to Follow: 2 bytes
1) Channel (Higher byte)
2) Channel (Lower byte)

Site Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid channel
238 (EEh) Time Out Error

Read External Module Name – Control Word (A201h)

This command is available only with option 6.

Description: Returns the name of the attached frequency converter module (option 6).

For example, module name “FCN4760” will be received as:
c,46,43,4e,34,37,36,30,0,0,0,0,0,ff

Bytes to Follow: 0 bytes

Site Master Returns: 14 bytes (success) OR 1 byte (failure)
1) Length of Name (12)
2-13) Module Name
14) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

OR

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Read External Module Serial Number – Control Word (A202h)

This command is available only with option 6.

Description: Sets the serial number of the attached frequency converter module (option 6).

For example, serial number 12345678 will be received as:
8,1,2,3,4,5,6,7,8,ff

Bytes to Follow: 0 bytes

Site Master Returns: 10 bytes
1) Length of Serial Number (8)
2-9) Serial Number
10) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

OR

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Read External Module Frequency Range – Control Word (A203h)

This command is available only with option 6.

Description: Sets the frequency range of the attached frequency converter module (option 6). Frequency values are scaled by the scale factor value.

For example, the frequency range of the FCN4760 is as follows:
Scale factor: 10
Input Start Frequency: 4700 MHz (scaled, this number is 470 MHz)
Input End Frequency: 6000 MHz (scaled, this number is 600 MHz)
Output Start Frequency: 450 MHz (scaled, this number is 45 MHz)
Output End Frequency: 1750 MHz (scaled, this number is 600 MHz)
So the response will look like:
12,0,a,1c,3,a1,80,23,c3,46,0,2,ae,a5,40,a,6e,49,c0,ff

Bytes to Follow: 0 bytes

Site Master Returns: 20 bytes (success) OR 1 byte (failure)

1) Length of Frequency Data (18)
2-3) Scale Factor (in Hz)
4-7) Input Start Frequency (scaled by Scale Factor)
8-11) Input End Frequency (scaled by Scale Factor)
12-15) Output Start Frequency (scaled by Scale Factor)
16-19) Output End Frequency (scaled by Scale Factor)
20) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

OR

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Read Module Fail Counter – Control Word (A204h)

This command is available only with option 6.

Description: Returns the value of the module lock fail counter.

Bytes to Follow: 0 bytes

Site Master Returns: 3 bytes (success) OR 1 byte (failure)

1) Fail Counter (Higher byte)
2) Fail Counter (Lower byte)
3) 255 (FFh) Operation Complete Byte

OR

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Clear Module Fail Counter – Control Word (A205h)

This command is available only with option 6.

Description: Sets the module lock fail counter to 0.

Bytes to Follow: 0 bytes

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Perform Transmission Mode Calibration – Control Word (A301h)

This command is available only with option 21.

Description: Perform Transmission Mode Calibration.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error: Invalid channel
238 (EEh) Time Out Error

Turn OFF Transmission Mode Calibration – Control Word (A302h)

This command is available only with option 21.

Description: Turn OFF Transmission Mode Calibration

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

Get Signal Standard Name – Control Word (A501h)

Description: Get the ASCII signal standard corresponding to a specified Index. This command can be used in any measurement mode.
Bytes to follow: 2
1) Index (Highest Byte)
2) Index (Lowest Byte)
Cell Master Returns: 20 bytes
1 – 20) Standard Name in ASCII

Set Signal Standard Link Direction – Control Word (A502h)

Description: Set the link direction of current selected signal standard. This command can be used in any measurement mode.
Bytes to follow: 1 byte
1) Type[657]
Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid channel
238 (EEh) Time Out Error

Perform Noise Diode Cal – Control Word (A505h)

Description: Performs noise diode calibration on SPA board
Bytes to follow: 0

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid channel
238 (EEh) Time Out Error

Set Bias T Voltage – Control Word (A506h)

[657] 1 = downlink, 2 = uplink, 3 = up and downlink

Description: Motherboards beginning with 64968 have a programmable Bias T. This command sets the Bias T voltage between 12 and 24 volts.
Bytes to follow: 1
1) Bias T Voltage

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid channel
238 (EEh) Time Out Error

Select Function in IA Measurement Mode – Control Word (A700h)

This command is available only with option 25.

Description: Selects measurement function in Interference Analysis mode.

Bytes to Follow: 1 bytes
1) Function ID (0:Spectrum; 1:Spectrogram; 2: Signal strength; 3: RSSI; 4: Signal ID)

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Set Sweep Interval – Control Word (A721h)

This command is available only with option 25.

Description: Sets the sweep interval in spectrogram mode.

Bytes to Follow: 2 bytes
a. Sweep interval in seconds (Highest byte)
b. Sweep interval in seconds (Lowest byte)

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Set Time Span of Measurement – Control Word (A722h)

This command is available only with option 25.

Description: Sets the time span of spectrogram measurement. Maximum time span is 72 hours (4320 minutes) when "Auto Save" is turned on. Minimum time span is 0 which means the fastest sweep time of current setting is used.

Bytes to Follow: 2 bytes
1) Time span in minutes (MSB)
2) Time span in minutes (LSB)

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Turn On/Off Auto Save – Control Word (A723h)

This command is available only with option 25.

Description: Turns On or Off Auto Save switch of spectrogram mode. When Auto Save is turned on, the first 5 screens of records are saved automatically into 5 memory slots. Once all 5 memory slots have been occupied, Auto Save is going to be turned off.

Bytes to Follow: 1 bytes
On/Off Switch (0:Off; 1:On)

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Get Trace Name – Control Word (A724h)

This command is available only with option 25.

Description: Get the Trace names saved in five spectrogram memory slots. The name is composed with Time & Date when the trace is saved. If the memory slot is empty, the date field is set with "--/--/----" and the time field is set with "--:--:--".

Bytes to Follow: 0 bytes

Cell Master Returns:
When control word is received correctly: 101 bytes
1-2) Index of trace (from 0 to 4)
3-12) Date of save in ASCII string, format: "--/--/----"
13-20) Time of save in ASCII string, format: "--:--:--"
21-100) Repeat the information of 1) to 20) four times
101) FFh
When error occurs: 1 byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Recall Trace – Control Word (A725h)

This command is available only with option 25.

Description: Recall a spectrogram trace by sending the trace index (0-4) of the memory slots.

Bytes to Follow: 1 bytes
1) Index of memory slots (0-4)

Cell Master Returns:
When control word is received correctly: 32448 bytes
1-10) Date of save (ASCII, format: "--/--/----")
11-18) Time of save (ASCII , format: "--:--:--")
19-22) Center Frequency (Integer – MSB to LSB)
23-26) Span (Integer – MSB to LSB)
27-30) RBW (Integer – MSB to LSB)
31-34) VBW (Integer – MSB to LSB)
35-38) Reference level (Integer – MSB to LSB)

39-42) Scale (Integer – MSB to LSB)
43-46) Time Span (Integer – MSB to LSB)
47-48) Sweep Interval (Integer – MSB to LSB)
49-52) GPS Position – Latitude (long integer)[658]
53-56) GPS Position – Longitude (long integer)
57-58) GPS Position – Altitude (short integer)
59-32458) 80 records of spectrogram data. Each record has the following format:
1-401) Color indices of 401 sweep data points, The formula of color index is as following:
Color Index = (Ref Level - SaMeasData) * 255 / (Division * 10)
402-405) Time Stamp of the record being generated.
Status byte: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Remote Self Test – Control Word (AA15h)

This control byte is for **INTERNAL** use only and should not be distributed.

Description: Trigger the equivalent of a "key press" selftest.

Note: The response bytes will not all be returned immediately. The first 12 will be returned, then there will be a slight delay before the next 14 are returned, then a final delay while the T1/E1 selftest is performed and the final 12 bytes are returned.

Bytes to Follow: 0 bytes

Site Master Returns:

S331D (No Options/Option 3): 25 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)

[658] Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
26) SPA LO Test - Failed data point #
27) SPA LO Test - Failed LO #
28) End of Data (FFh)

S331D + Option 29 or S332D (w/o Option 6): 28 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)
21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
26) SPA LO Test - Failed data point #
27) SPA LO Test - Failed LO #
28) End of Data (FFh)

S332D + Option 6: 33 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID

16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)
21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
26) SPA LO Test - Failed data point #
27) SPA LO Test - Failed LO #
28) Module PLD Version
29) Module Attached
30) Module Lock (01h = Locked, 00h = Not Locked)
31) Module Lock Fail Counter (Higher byte)
32) Module Lock Fail Counter (Lower byte)
33) End of Data (FFh)

S331D + Option 50: 36 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)
21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) Status (01h: Pass, 00h: Fail, FFh: T1/E1 board not installed)
26) Carrier Status (01h: carrier present, 00h: No carrier)
27) Frame Sync Status (01h: in frame sync, 00h: Not in frame sync)
28) QRSS pattern sync status (01h: Pattern sync, 00h: Not in sync)
29) QRSS bit error count (01h: Bit error found, 00h: No bit error)
30) T1 – Daly pattern sync status (01h: Pattern sync, 00h: Not in pattern sync)
31) 0 dB CSU Tx Level Check (00h: Pass (> - 2.5 dB), XXh: Value reported by DS2155)
32) -7.5 dB CSU Tx Level Check (00h: Pass (-5.0 to –12.5 dB), XXh: Value reported by DS2155)
33) -15 dB CSU Tx Level Check (00h: Pass (-12.5 to –20.0 dB), XXh: Value reported by DS2155)
34) -22.5 dB CSU Tx Level Check (00h: Pass (-20.0 to –30.0 dB), XXh: Value reported by DS2155)

35) Vpp measurement of 0 dB signal in 1/10ths of a Volt (e.g. 124 = 12.4 Volts)
36) End of Data (FFh)

Parameter Definitions

Parameter	# of bytes	Step	Example / Description
Frequency	**4 bytes unsigned**	**1 Hz**	**1000.3 MHz = 1000300000**
Frequency	**4 bytes unsigned**	**10-Hz**	**1000.3 MHz = 100030000**
Scale (RL, CL)	**2 bytes unsigned**	**1 / 1000 dB**	**51.3 dB = 51300**
(SWR)	**2 bytes unsigned**	**1 / 1000 (ratio)**	**65.53 = 65530**
Limit (RL, CL)	**2 bytes unsigned**	**1 / 1000 dB**	**51.3 dB = 51300**
(SWR)	**2 bytes unsigned**	**1 / 1000 (ratio)**	**65.53 = 65530**
Markers (Frequency & distance marker)	**2 bytes unsigned**	**1 sweep point**	**Marker Values are given in relative position of the graph. The lowest value is 0, while the highest is (# of data points - 1).**
Distance	**4 bytes unsigned**	**1/100,000 m/ft**	**12.34 m = 1234000**
Relative Propagation Velocity	**4 bytes unsigned**	**1 / 100,000**	**0.837 = 83700**
Cable Loss	**4 bytes unsigned**	**1 / 100,000 dB**	**-0.345 dB/m = 34500**
Gamma	**4 bytes signed**	**1 / 10,000 (ratio)**	**Gamma value is the ratio of magnitude of reflected signal over the magnitude of incident signal.**
Phase	**4 bytes signed**	**1 / 10 degree**	**Phase value is the difference in phase between the incident and reflected signal.**
Power: dBm/dB	**4 bytes signed**	**1 / 1000 dBm** **1 / 1000 dB**	**51.3 dBm = 51300** **10.4 dB = 10400**
Lock Fail Counter	**2 bytes unsigned**	**1 error count**	**234 fails = 234**
Integrator Fail Counter	**2 bytes unsigned**	**1 error count**	**123 fails = 123**

Programming Examples

This section contains several sample functions written in C, (and one in Visual Basic) that can be used as references when programming the Anritsu Handheld Products. These include functions to set up the comm Por omm.nter and exit remote mode and set the reference level of the spectrum analyzer.

Examples in C:

```
/*********************************************************************/
/*    unsigned char EnterRemote(BYTE *ResponseBytes)                 */
/*    Description: This function implements control byte #69, Enter  */
/*                 Remote Mode.  If successful, the unit will be in  */
/*                 remote mode, waiting to accept additional serial  */
/*                 commands.                                         */
/*    Inputs :     ResponseBytes = pointer to an array of bytes at   */
/*                 least 13 elements long (13 bytes are expected in  */
/*                 response to the Enter Remote command).            */
/*    Returns:     SUCCESS if the unit is in remote mode             */
/*                 FAILURE if the command fails                      */
/*                 Response bytes are returned in the variable       */
/*                 ResponseBytes.                                    */
/*********************************************************************/
unsigned char EnterRemote(BYTE *ResponseBytes)
{
      BYTE *SendEnterRemoteCharPointer;   // Data to send
      BYTE SerialCommand;

      SendEnterRemoteCharPointer = &SerialCommand;
      SerialCommand = 69; // 69 is the Enter Remote Mode serial command

      // Write 1 byte of data from SendEnterRemoteCharPointer to the
      // COM Port
      WriteToPort(SendEnterRemoteCharPointer, 1);

      // Read the data returned by the SiteMaster - expecting 13 bytes,
      // give the unit 30 seconds to respond before timing out.
      if(!ReadfromPort(13, ResponseBytes, 30))
      {
            return FAILURE;
      }
      else
      {
            return SUCCESS;
      }
} /* EnterRemote */



/*********************************************************************/
/*    unsigned char SetSPAScale(unsigned long ReferenceLevel,        */
/*                        unsigned long dBScale, BYTE *ResponseBytes)  */
/*    Description: This function implements control byte #101, Set   */
/*                 Spectrum Analyzer Scale.  It sets the spectrum    */
/*                 analyzer reference level and scale (dB/div).      */
/*    Inputs :     RefLevel = reference level value                  */
/*                 dBScale = scale value                             */
```

```
/*                NOTE:  This function assumes the values have       */
/*                already been checked to fall in the valid range    */
/*                and scaled according to the formulas in the        */
/*                Programming Manual.                                */
/*                ResponseBytes = pointer to an array of bytes at    */
/*                least 1 element long (1 byte is expected in        */
/*                response to the Set Spectrum Analyzer Scale        */
/*                command).                                          */
/*    Returns:    SUCCESS if the values are set                      */
/*                FAILURE if the command fails                       */
/*                Response bytes are returned in the variable        */
/*                ResponseBytes.                                     */
/*********************************************************************/
unsigned char SetSPAScale(unsigned long RefLevel,
                          unsigned long dBScale, BYTE *ResponseBytes)
{
      BYTE  *SendScalePointer;      // Data to send
      BYTE  SendBytes[9];
      BYTE  SerialCommand;


      // Serial Command to Set Scale on the SPA.
      SerialCommand = 101;

      // Data pointer.
      SendScalePointer = &SendByte[0];

      // First byte to send is the serial command, #101.
      SendBytes[0] = SerialCommand;

      // Convert the reference level and scale into 8 bytes
      // (4 bytes each) for the SPA.  Put the bytes in the
      // SendBytes variable, starting with byte 1 (leave byte 0
      // as the command byte).
      Get8Bytes(RefLevel, Scale, &SendBytes[1]);

      // Write 9 bytes of data in SendScalePointer to the port.
      WriteToPort(SendScalePointer, 9);

      // Expecting 1 byte back (give the unit 5 seconds to respond):
      // 0xFF = success
      // 0xE0 = parameter failure (invalid value)
      // 0xEE = time-out (insufficient # of bytes received by SPA)
      if(!ReadFromPort(1, ResponseBytes, 5))
      {
            return FAILURE;
      }
      else
      {
            if(*ResponseBytes != 0xFF)
            {
                  return FAILURE;
            }
            else
            {
                  return SUCCESS;
            }
```

```
      }
} /* SetSPAScale */


/*****************************************************************/
/*    unsigned char ExitRemote(BYTE *ResponseBytes)              */
/*    Description: This function implements control byte #255, Exit  */
/*                 Remote Mode.  If successful, the unit will leave   */
/*                 remote mode and resume sweeping.               */
/*    Inputs :     ResponseBytes = pointer to an array of bytes at    */
/*                 least 1 element long (1 byte is expected in        */
/*                 response to the Exit Remote command).          */
/*    Returns:     SUCCESS if the unit exits remote mode          */
/*                 FAILURE if the command fails                   */
/*                 Response bytes are returned in the variable        */
/*                 ResponseBytes.                                 */
/*****************************************************************/
unsigned char ExitRemote(BYTE *ResponseBytes)
{
      BYTE *SendExitRemoteCharPointer;    // Data to send
      BYTE SerialCommand;


      SendExitRemoteCharPointer = &SerialCommand;
      SerialCommand = 255; // 255 is the Exit Remote Serial Command

      // Write 1 byte of data from SendExitRemoteCharPointer to the
      // COM Port
      WriteToPort(SendExitRemoteCharPointer, 1);

      // Expecting 1 byte back (give the unit 5 seconds to respond):
      // 0xFF = success
      if(!ReadFromPort(1, ResponseBytes, 1))
      {
            return FAILURE;
      }
      else
      {
            if(*ResponseBytes != 0xFF)
            {
                  return FAILURE;
            }
            else
            {
                  return SUCCESS;
            }
      }
} /* ExitRemote */


/*****************************************************************/
/*    void Get8Bytes(unsigned long parm1, unsigned long parm2,       */
/*                        BYTE* ByteData )                           */
/*    Description: This function converts the 2 four byte values to  */
/*    8 bytes for transmission to the SiteMaster.  parm1 occupies    */
/*    the first four bytes, parm2 occupies the second 4 bytes.
/*    Inputs:     parm1 – 4 byte unsigned long integer               */
```

```
/*                parm2 - 4 byte unsigned long integer              */
/*    Returns:    SUCCESS if the unit is in remote mode             */
/*                FAILURE if the command fails                      */
/*                The resulting bytes are returned in the           */
/*                memory location pointed to by ByteData.  This     */
/*                location must have at least 8 empty bytes.        */
/*******************************************************************/
void Get8Bytes(unsigned long parm1, unsigned long parm2,
                BYTE* ByteData)
{
      // MSB of 1st parameter
      *ByteData = (BYTE)((parm1 & 0xFF000000)>>24);
      *(ByteData+1) = (BYTE)((parm1 & 0x00FF0000)>>16);
      *(ByteData+2) = (BYTE)((parm1 & 0x0000FF00)>>8);
      // LSB of 1st parameter
      *(ByteData+3) = (BYTE)(parm1 & 0x000000FF);

      // MSB of 2nd parameter
      *(ByteData+4)= (BYTE)((parm2 & 0xFF000000)>>24);
      *(ByteData+5)= (BYTE)((parm2 & 0x00FF0000)>>16);
      *(ByteData+6)= (BYTE)((parm2 & 0x0000FF00)>>8);
      // LSB of 2nd parameter
      *(ByteData+7) = (BYTE)(parm2 & 0x000000FF);
} /* Get8Bytes */


/*******************************************************************//*
      BOOL OpenCommunications(int ComPort, int ComBaud)             */
/*    Description : This function is to Open the communication port  */
/*    and set the port settings                                      */
/*    Inputs :    int - ComPor- entered as a command line argument   */
/*                int - ComBau- The Baud rate for Communication      */
/*    Returns:    SUCCESS - If the-Communication link was established*/
/*                FAIL - IF the-e was an error opening the COM Port  */
/*******************************************************************/
BOOL OpenCommunications(int ComPort, int ComBaud)
{
      DCB      CommSettings;  // Structure with COM Port settings
      LPCTSTR ComPortNumber;  // Pointer to the COM port number
      BOOL PortReady;         // Return val after setting the COM Port
      COMMTIMEOUTS timeout;   // Structure with Time out values


      switch (ComPort)
      {
            case '1':
                  ComPortNumber = "COM1";
            break;
            case '2':
                  ComPortNumber = "COM2";
            break;
            case '3':
                  ComPortNumber = "COM3";
            break;
            case '4':
                  ComPortNumber = "COM4";
            break;
```

```
      default:
            CloseHandle(ComHandle);
            fclose(fp);
            exit(0);
      break;
}

/* Creating a File to Open a COM Port*/
ComHandle = CreateFile( ComPortNumber,
                                    GENERIC_READ | GENERIC_WRITE,
                                    0, // exclusive access
                                    NULL, // no security
                                    OPEN_EXISTING,
                                    0, // no overlapped I/O
                                    NULL); // null template

/* Set up the COM Ports Input and Output Buffer
Syntax -
BOOL-SetupComm(
HANDLE hFile,     // handle to communications device
DWORD dwInQueue,  // size of input buffer
DWORD dwOutQueue  // size of output buffer
);
*/
PortReady = SetupComm(ComHandle, 5000, 5000);

/* Open the existing COM Settings
Syntax -
BOOL-GetCommState(
            HANDLE hFile,     // handle to communications device
            LPDCB lpDCB       // pointer to device-control block
                              //  structure
      );
*/
PortReady = GetCommState(ComHandle, &CommSettings);

/*Check to see if it was successful*/
if(!PortReady)
{
      CloseHandle(ComHandle);
      fclose(fp);
      exit(0);
}

/* This is used to update the CommSettings Structure Variables*/
// Setting the Baud Rate
switch (ComBaud)
{
      case '1':
            CommSettings.BaudRate = CBR_9600;   // rate - 9600
      break;
      case '2':
            CommSettings.BaudRate = CBR_19200;  // rate - 19200
      break;
      case '3':
            CommSettings.BaudRate = CBR_38400;  // rate - 38400
      break;
```

```
            case '4':
                  CommSettings.BaudRate = CBR_56000;  // rate - 56000
            break;
            case '5':
                  CommSettings.BaudRate = CBR_115200; // rate - 115200-
            break;
            default:
                  CommSettings.BaudRate = CBR_9600;   //Default - 9600
            break;
      }

      // disable null stripping
      CommSettings.fNull = FALSE;
      // RTS flow control
      CommSettings.fRtsControl = RTS_CONTROL_ENABLE;
      // XON/XOFF in flow control
      CommSettings.fInX = FALSE;
      // XON/XOFF out flow control
      CommSettings.fOutX = FALSE;
      // DTR flow control type
      CommSettings.fDtrControl  = DTR_CONTROL_ENABLE;
      // number of bits/byte, 4-8
      CommSettings.ByteSize = 8;
      // 0-4=no,odd,even,mark,space
      CommSettings.Parity = NOPARITY;
      // 0,1,2 = 1, 1.5, 2
      CommSettings.StopBits = ONESTOPBIT;

      /* Setting the COM State with the changed parameters
      Syntax -
        BO-L SetCommState(
            HANDLE hFile,  // handle to communications device
            LPDCB lpDCB    // pointer to device-control block structure
      );
      */

      PortReady = SetCommState (ComHandle, &CommSettings);

      /* Setting the parameters for the timeouts.
      NOTE: Without Timeout Settings, Reading the COM Port will not work
properly*/

      // This gives the Timeout value for each bytes received
      timeout.ReadIntervalTimeout = MAXDWORD;
      timeout.ReadTotalTimeoutConstant = 0;
      timeout.ReadTotalTimeoutMultiplier = 0;

      /* Sets the communication timeouts
      Syntax -
            BOO- SetCommTimeouts(
              HANDLE hFile,                  // handle to comm dev□omm.
LPCOMMTIMEOUTS lpCommTimeouts  /* pointer to comm tim□omm.t structure */
            );
      */
      SetCommTimeouts(ComHandle, &timeout);

      if(PortReady)
```

```
      {
            return SUCCESS;
      }
      else
      {
            CloseHandle(ComHandle);
            fclose(fp);
            return FAIL;
            exit(0);
      }

}
```

Example in Visual Basic

```
Private Sub cmdSetBaudRateSM_Click()
    Dim ChangeBaudSerialCmd As Integer
    Dim BaudRate As Integer
    Dim strInputBuf As Variant
    Dim PreviousSettings As String

    PreviousSettings = commCtrl.Settings

    'Check that we're in remote and have selected a baud rate
    If CheckInitialConditions(True, False, True) = False Then
        GoTo SetSMBaud_err_handler
    End If

    ChangeBaudSerialCmd = 197       'Setting Baud rate Serial Command
    BaudRate = GetBaudSerialCmd     'Get the Serial cmd for the specific
                                    'baud rate
    commCtrl.Output = Chr$(ChangeBaudSerialCmd) + Chr$(BaudRate)  'Sending
                                                                  'the data

    Delay (300)

    'Change the Baud setting for the application also
    If BaudRate = 0 Then
        commCtrl.Settings = "9600,n,8,1"
    ElseIf BaudRate = 1 Then
        commCtrl.Settings = "19200,n,8,1"
    ElseIf BaudRate = 2 Then
        commCtrl.Settings = "38400,n,8,1"
    ElseIf BaudRate = 3 Then
        commCtrl.Settings = "56000,n,8,1"
    ElseIf BaudRate = 4 Then
        commCtrl.Settings = "115200,n,8,1"
    Else
        'Box will fail, set back to 9600.
        commCtrl.Settings = "9600,n,8,1"
    End If

    Delay (1000)
    strInputBuf = CStr(commCtrl.Input)
    strInputBuf = Mid(strInputBuf, 1, 1)
    If strInputBuf = "" Then
```

```
        MsgBox "Invalid Baud Rate - NO STRING"
        GoTo SetSMBaud_err_handler
    End If

    If Asc(strInputBuf) = 255 Then
        MsgBox "Set Baud Rate Succesfully"
    ElseIf Asc(strInputBuf) = 238 Then
        MsgBox "SiteMaster Timed out"
        GoTo SetSMBaud_err_handler

    ElseIf Asc(strInputBuf) = 224 Then
        MsgBox "Invalid Baud Rate - ERR 22-"
        GoTo SetSMBaud_err_handler
    Else
        MsgBox "Invalid Baud Rate - ERR " + CStr(Asc(strInputBuf))
        GoTo SetSMBaud_err_handler

    End If

    Exit Sub
SetSMBaud_err_handler:
    commCtrl.Settings = PreviousSettings
End Sub
```

Signal Standards

Index	Standard	Valid Channels
01h	AMPS / EIA 553	1-799, 990-1023
04h	C-450 (P)	1-800
05h	C-450 (SA)	1-247
06h	CDMA China 1	0-1000, 1329-2047
09h	CDMA China 2	0-1000, 1329-2047
0Ch	CDMA Japan	1-799, 801-1039, 1041-1199
10h	CDMA Korea PCS	1-598
11h	CDMA US Cellular	1-799, 990-1023
14h	CDMA US PCS	1-1199
15h	CDMA2000 Class 0 Korea Cellular	1-799, 990-1023
18h	CDMA2000 Class 0 N.A. Cellular	1-799, 990-1023
1Bh	CDMA2000 Class 1 N.A. PCS	0-1199
1Ch	CDMA2000 Class 2 (TACS Band)	0-1000, 1329-2047
1Fh	CDMA2000 Class 3 (JTAGS Band)	1-1039, 1041-1199
22h	CDMA2000 Class 4 Korea PCS	0-599
23h	CDMA2000 Class 5 (NMT-450-20 kHz)	1039-1473, 1792-2016
26h	CDMA2000 Class 5 (NMT-450-25 kHz)	1-300, 539-871
29h	CDMA2000 Class 6 IMT-2000	0-1199
2Ah	CDMA2000 Class 7 N.A. 700 MHz Cellular	0-359
2Bh	DCS 1800	512-885
2Ch	ETACS	0-1000, 1329-2047
2Fh	GSM 450	259-293
30h	GSM 480	306-340
31h	GSM 850	128-251
32h	GSM 900	0-124, 975-1023
35h	P-GSM 900	1-124
36h	E-GSM 900	0-124, 975-1023
39h	R-GSM 900	0-124, 955-1023
3Ch	GSM 1800	512-885
3Dh	GSM 1900	512-810
3Eh	MATS-E	1-1000
3Fh	N-AMPS / IS-88L	1-799, 990-1023
42h	N-AMPS / IS-88M	1-799, 990-1023
45h	N-AMPS / IS-88U	1-1023
46h	NADC IS136 Cellular	1-1023
47h	NADC IS136 PCS	1-1999
48h	NMT-411-25kHz	539-871
49h	NMT-450-20kHz	1039-1473
4Ah	NMT-450-25kHz	1-300
4Bh	NMT-470-20kHz	1792-2016
4Ch	NMT-900	1-1000
4Dh	NMT-900 (Offset)	1025-2023
4Eh	NTACS	1-799, 800-1039, 1040-1199
52h	PCS 1900	512-810
53h	PDC 800 Analog	0-799

54h	PDC 1500 (JDC)	0-960
55h	PHS	1-77
56h	SMR 800 -12.5 kHz	1-1199
57h	SMR 800 - 25 kHz	1-600
58h	SMR 1500	1-479
59h	TACS	1-1000
5Ah	802.11a	34-64, 149-161
5Dh	802.11b	1-14
60h	802.11 FH	2-95
61h	802.11 DS	1-14
62h	802.11g	1-14
65h	Tetra 380-390 MHz Uplink	3600-4000
66h	Tetra 390-400 MHz Downlink	3600-4000
67h	Tetra 410-420 MHz Uplink	800-1200
68h	Tetra 420-430 MHz Downlink	800-1200
69h	Tetra 450-460 MHz Uplink	2400-2800
6Ah	Tetra 460-470 MHz Downlink	2400-2800
6Bh	Tetra 805-825 MHz Uplink	2000-2800
6Ch	Tetra 850-870 MHz Downlink	2000-2800
6Dh	Tetra 870-876 MHz Uplink	600-840
6Eh	Tetra 915-921 MHz Downlink	600-840
6Fh	700 MHz 6.25 kHz 764-806 MHz 1-1920	1-480, 481-960, 961-1440, 1441-1920
74h	700 MHz 50 kHz 767-803 MHz 1-240	1-120