

Anritsu

Site Master™
S113B, S114B
S331B, S332B
Antenna, Cable and
Spectrum Analyzer

Programming Manual



**Hand-Held Tester For Antennas, Transmission
Lines And Other RF Components**

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Index

How To Use This Manual	1
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Programming Manual Organization	1
--	---

Programming Overview

General Description	2
Cabling	2
Serial Communication Parameters	2
Communications Error Checking	2
Parameter Validation	2
Entering Remote Mode	3
Exiting Remote Mode	3
Lifetime of Changes to Site Master Operating Parameters	3
Write Cycle Limitation of EEPROM	3

Functional Description

Initialize

Enter remote mode	4
Enter remote mode immediately	4

Configure

System

Fixed CW mode control	4
LCD backlight	4
Watch dog timer	4
Serial port echo	4
Single sweep	4
Printer type	4
Trace Math	4
Automatically save runtime setup	4

Measurement

Measurement mode select	5
Measurement unit	5
Calibration on/off	5

Power Monitor

Get Power levels	5
Power Monitor Units of measure	5
Relative Mode	5
Offset Mode	5
Zero Mode	5

Frequency

Start frequency	5
Stop frequency	5
Data points	5

Distance	
Start distance	5
Stop distance	5
Relative propagation velocity	5
Cable loss	5
DTF Windowing	6
Display	
Display mode	6
Scale start	6
Scale stop	6
Markers	
On/Off	6
Delta Status On/Off	6
Value	6
Limits	
On/Off	6
Beep	6
Value	6
<u>Utility</u>	
Time set	6
Date set	6
Reference number set	6
<u>Action</u>	
Trigger sweep	6
Save system setup	6
Recall system setup	7
Save sweep	7
Query trace names	7
Delete sweep trace	7
<u>Data</u>	
Recall sweep	7
<u>Calibration</u>	
Calibrate	7
<u>Configure Spectrum Analyzer</u>	
Set Frequency	7
Set Center Frequency and Span	7
Set Scale	7
Set Markers	7
Set Limits	7
Measure OCC BW % of Power	7
Measure OCC BW dB Down	7
Set Max Hold	7
Set Resolution BW Frequency	7

Set Video BW Frequency	7
Set Sweep Mode	7
Set Marker to Peak	7
Set Marker to Center	7
 Configure Custom Cable Table	
Write to Table	8
Read from Table	8
 Status	
Query system status	8
Self-test Trigger	8
Read failure counters	8
Clear failure counters	8
 Close	
Exit remote mode	8

Control Byte Descriptions

Control byte summary	9
Control byte 1 Setup system	12
Control byte 2 Set Site Master frequency	12
Control byte 3 Select measurement mode	13
Control byte 4 Set Site Master scale	13
Control byte 5 Set Site Master marker	14
Control byte 6 Set Site Master limit	15
Control byte 7 Set DTF parameters	15
Control byte 8 Set time/date	16
Control byte 9 Set reference number	17
Control byte 10 Serial port echo on/off	17
Control byte 11 Single sweep mode on/off	17
Control byte 12 Watch dog timer on/off	18
Control byte 13 Sequence Site Master calibration	18
Control byte 14 Set Site Master data points	19
Control byte 16 Store sweep trace	19
Control byte 17 Recall sweep trace	19
Control byte 18 Save system setup	24
Control byte 19 Recall system setup	24
Control byte 20 Query system status	24
Control byte 21 Trigger self-test	28
Control byte 22 Read fail counters	29
Control byte 23 Clear fail counters	29
Control byte 24 Query trace names	29
Control byte 25 Delete sweep trace	30
Control byte 30 Select printer type	30
Control byte 31 Select DTF windowing	30
Control byte 32 Set trace math	31
Control byte 39 Query power level	31
Control byte 40 Set power monitor unit	32

Control byte 41	Relative mode on/off	32
Control byte 42	Offset mode on/off	32
Control byte 43	Zero mode on/off	33
Control byte 48	Trigger sweep	33
Control byte 50	Check battery status	33
Control byte 64	Automatically save runtime setup	34
Control byte 69	Enter remote mode	34
Control byte 70	Enter remote mode immediately	34
Control byte 80	Write custom cable	35
Control byte 81	Recall custom cable	35
Control byte 96	Measure OCC BW % of Power	36
Control byte 97	Measure OCC BW dB Down	36
Control byte 99	Set Spectrum Analyzer Frequency	36
Control byte 100	Set Spectrum Analyzer Center Freq/Span	37
Control byte 101	Set Spectrum Analyzer Scale	37
Control byte 102	Set Spectrum Analyzer Marker	38
Control byte 103	Set Spectrum Analyzer Limit	38
Control byte 105	Set Spectrum Analyzer Max Hold	39
Control byte 106	Set Spectrum Analyzer Resolution BW Freq	39
Control byte 107	Set Spectrum Analyzer Video BW Freq	39
Control byte 108	Set Spectrum Analyzer Sweep Mode	40
Control byte 109	Set Spectrum Analyzer Marker to Peak	40
Control byte 110	Set Spectrum Analyzer Marker to Center	40
Control byte 255	Exit remote mode	41
Parameter definitions		42

How to Use this Manual

If you want to find out
general concepts for programming the Site Master,
go to the Programming Overview.

If you want to find out
how to **perform a task**,
go to the Functional Description.

If you want to find out
what the **syntax of a control byte** is,
go to the Control Byte Description.

Programming Manual Organization

Programming Overview

This section contains general information about programming the Site Master. It is an introduction and helps you get started.

Functional Descriptions

This section includes a complete list of tasks you can control via the serial port. These are high level descriptions. Each task refers you to the appropriate individual control byte for details.

Control Byte Descriptions

This section contains detailed explanations for each of the control bytes.

Programming Overview

This programming manual is written exclusively for the Anritsu Site Master Models S113B, S114B, S331B, and S332B with firmware Version 1.42 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 can send control bytes and associated data to the Site Master via the serial port. 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 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.

Serial Communication Parameters

The Site Master communicates at a baud rate of 9600. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used.

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 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 it receives the byte. Note that this means the data stored for the current sweep may be incomplete.

Once you receive the response string from Site Master, you're 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.

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 ten saved setups. See control byte #18 (12h) for details.

Write Cycle Limitation of EEPROM

The EEPROM, used to store setups, 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.

Functional Description

INITIALIZE

Enter remote mode - see control byte #69 (45h)

Site Master must be in remote mode for further control byte command sequences to be accepted. Remember to wait until Site Master responds before issuing further control byte sequences.

Enter remote mode immediately - see control byte #70 (46h)

CONFIGURE SYSTEM

Fixed CW mode control - see control byte #1 (01h)

Site Master “dithers” the CW signal for improved immunity to interfering signals. Turning on the fixed CW signal bit “cleans up” the output spectrum by disabling the dithering. The drawback is decreased immunity to interfering signals.

LCD backlight -see control byte #1 (01h)

LCD backlight helps in adverse lighting conditions.

Watch dog timer - see control byte #12 (0Ch)

Used to guard against interrupted data transfers to the Site Master.

Serial port echo - see control byte #10 (0Ah)

Use this to synchronize the Site Master sweep and computer requests for current trace data. This feature is especially useful for synchronizing distance to fault sweeps.

Site Master goes into single sweep mode. It sends the sweep complete byte #192 (C0h) after the completion of each sweep. You must send the sweep trigger byte #48(30h) for the Site Master to perform another sweep. Retrieve the trace data using control byte #17 (11h).

Single sweep - see control byte #11 (0Bh)

This puts the Site Master into single sweep mode. Normally the Site Master sweeps continually. Once in the single sweep mode, send the sweep trigger byte #48 (30h) to cause Site Master to perform another sweep.

Printer type - see control byte #30 (1Eh)

Printer type is selectable.

Trace Math - see control byte #32 (20h)

Automatically Save Runtime Setup - see control byte #64 (40h)

CONFIGURE MEASUREMENT

Measurement mode select - see control byte #3 (03h)

Measurement mode selectable as Site Master in frequency or distance domain, power monitor mode, or spectrum analyzer mode.

Measurement unit - see control byte #1 (01h)

The Site Master uses Metric or English units.

Calibration on/off - see control byte #1 (01h)

Calibration corrects for test port uniqueness. It should always be used to ensure accurate readings.

CONFIGURE POWER MONITOR

The power monitor is available as an option.

Get Power levels - see control byte #39 (27h)

Querying the Site Master gives the raw and corrected power levels plus information about the configuration.

Power Monitor Units of measure - see control byte #40 (28h)

Relative Mode - see control byte #41 (29h)

Offset Mode - see control byte #42 (2Ah)

Zero Mode - see control byte #43 (2Bh)

CONFIGURE FREQUENCY

Start frequency - see control byte #2 (02h)

Stop frequency - see control byte #2 (02h)

Data points - see control byte #14 (0Eh)

CONFIGURE DISTANCE

Start distance - see control byte #7 (07h)

Stop distance - see control byte #7 (07h)

Relative propagation velocity - see control byte #7 (07h)

This affects the distance to fault calculations.

Cable loss - see control byte #7 (07h)

This affects the measurement magnitude.

DTF Windowing - see control byte #31 (1Fh)

Allows selection of a window to lessen the side lobes.

CONFIGURE DISPLAY

Display mode - see control byte #3 (03h)

Selectable among SWR, return loss, cable insertion loss, transmission loss, transmission gain, power monitor, and spectrum analyzer.

Scale start - see control byte #4 (04h)

Scale stop - see control byte #4 (04h)

CONFIGURE MARKERS

Marker (on/off) - see control byte #5 (05h)

Marker Delta Status (on/off) - see control byte #5 (05h)

Marker value - see control byte #5 (05h)

CONFIGURE LIMITS

Limit (on/off) - see control byte #6 (06h)

Limit beep (on/off) - see control byte #6 (06h)

Limit value - see control byte #6 (06h)

UTILITY

ASCII text strings, which are stored with each sweep, help identify the stored traces. Use these control bytes to modify the strings before storing the trace.

Time set - see control byte #8 (08h)

Date set - see control byte #8 (08h)

Reference number set - see control byte #9 (09h)

ACTION

Trigger sweep - see control byte #48 (30h)

Both serial port echo and single sweep modes use this byte to trigger a Site Master sweep. If the Site Master is not in one of those modes, this byte is ignored.

Save system setup - see control byte #18 (12h)

Recall system setup - see control byte #19 (13h)

Save sweep - see control byte #16 (10h)

Query trace names - see control byte #24 (18h)

Delete sweep trace - see control byte #25 (19h)

DATA

Recall sweep - see control byte #17 (11h)

Use this control byte to obtain stored traces or the current measurement data from the Site Master. All traces and modes use the same trace data format.

CALIBRATION

Calibrate - see control byte #13 (0Dh)

Computer sequencing of the open-short-load calibration is possible.

CONFIGURE SPECTRUM ANALYZER

Set Frequency - see control byte #99 (63h)

Set Center Frequency and Span - see control byte #100 (64h)

Set Scale - see control byte #101 (65h)

Set Markers - see control byte #102 (66h)

Set Limits - see control byte #103 (67h)

Measure OCC BW % of Power - see control byte #96 (60h)

Measure OCC BW dB Down - see control byte #99 (63h)

Set Max Hold - see control byte #105 (69h)

Set Resolution BW Frequency - see control byte #106 (6Ah)

Set Video BW Frequency - see control byte #107 (6Bh)

Set Sweep Mode - see control byte #108 (6Ch)

Set Marker to Peak - see control byte #109 (6Dh)

Set Marker to Center - see control byte #110 (6Eh)

CONFIGURE CUSTOM CABLE TABLE

Write to Table - see control byte #80 (50h)

Read from Table - see control byte #81 (51h)

STATUS

Query system status - see control byte #20 (14h)

The system status contains virtually all information about the current Site Master system state. It is a powerful and complete “snapshot” of the system.

Some control bytes affect multiple system parameters (such as distance to fault parameters). Use the response from this control byte for preserving any of the system parameters you wish to remain unchanged.

Self-test Trigger - see control byte #21 (15h)

Upon receiving this control byte the Site Master runs self-test. After completion of the self-test, the Site Master sends the results via the serial port.

Read failure counters -see control byte #22 (16h)

In order to provide absolute confidence about the validity of a measurement, internal counters monitor the analog integrator and phase lock loops for error conditions. If an error occurs, it is logged. These counters perform the same function as the icons on the front panel.

Clear failure counters - see control byte #23 (17h)

Use this control byte to reset the failure counters.

CLOSE

Exit remote mode - see control byte #255 (FFh)

Ends communication with the Site Master. “Exiting remote mode” returns the Site Master to normal operation.

Control Byte Summary

Control Byte Summary (1 of 3)

Control Byte #	Name	Description	Watch-dog Timer
1 (01h)	Setup system	System status flags and switches	Yes
2 (02h)	Set frequency	Sets Site Master frequency range	Yes
3 (03h)	Select measurement mode	Measurement domain and measurement mode	Yes
4 (04h)	Set scale	Sets Site Master scale values	Yes
5 (05h)	Set marker	Set position and on/off status of a Site Master marker	Yes
6 (06h)	Set limit	Set position and on/off status of a Site Master limit line	Yes
7 (07h)	Set DTF parameters	Sets Distance to Fault parameters	Yes
8 (08h)	Set time/date	Sets Time and date for a sweep trace	Yes
9 (09h)	Set reference number	Sets reference number for a sweep trace	Yes
10 (0Ah)	Serial port echo On/Off	Allows synchronization of the Site Master and request from computer for sweep trace	Yes
11 (0Bh)	Single sweep On/Off	Enable or disable the single sweep mode	Yes
12 (0Ch)	Watch-dog timer On/Off	Enable or disable the watch-dog timer	—
13 (0Dh)	Sequence Site Master calibration	Trigger a calibration step	Yes
14 (0Eh)	Set Site Master data points	Sets number of measurement data points for Site Master mode	Yes
16 (10h)	Store sweep trace	Save current trace data to EEPROM	Yes
17 (11h)	Recall sweep trace	Site Master sends sweep data	Yes
18 (12h)	Save system setup	Save system setup parameters to EEPROM	Yes
19 (13h)	Recall system setup	Recall system setup parameters from EEPROM	Yes
20 (14h)	Query system status	Get the current system settings	—
21 (15h)	Trigger self-test	Trigger a self test	—
22 (16h)	Read fail counters	Same as icons on front panel	—
23 (17h)	Clear fail counters	Reset the fail counters	—
24 (18h)	Query trace names	Returns list of all saved traces	—
25 (19h)	Delete sweep trace	Delete single or all stored sweep traces	Yes
30 (1Eh)	Select printer type	Select printer type	Yes
31 (1Fh)	Select DTF Windowing	Select DTF Windowing Methods	Yes
32 (20h)	Set Trace Math	Select Trace Math operation	—

Control Byte Summary (2 of 3)

Control Byte #	Name	Description	Watch-dog Timer
39 (27h)	Query Power Level	Return Power Level at Detector Port	—
40 (28h)	Set Power Unit	Set Power Monitor displaying unit	Yes
41 (29h)	Set Relative Mode	Enable or disable Power Monitor Relative Mode	Yes
42 (2Ah)	Set Offset Mode	Set/Reset Power Level offset	Yes
43 (2Bh)	Set Zero Mode	Set/Reset Power Level zeroing mode	Yes
48 (30h)	Trigger sweep	Starts the next sweep	—
50 (32h)	Check Battery Status	Return smart battery status	—
64 (40h)	Auto Save Runtime Setup	Automatically save the runtime setup when exiting remote mode	—
69 (45h)	Enter remote mode	Enters remote mode at the end of the sweep and returns model number and firmware version	—
70 (46h)	Enter remote mode immediately	Enters remote mode immediately and returns model number and firmware version	—
80 (50h)	Write Custom Cable	Input Custom Cable data to Site Master	—
81 (51h)	Recall Custom Cable	Recall Custom Cable data from Site Master	—
96 (60h)	Measure OCC BW % of Power	Measure OCC BW with % of Power method	Yes
97 (61h)	Measure OCC BW dB Down	Measure OCC BW with dB down method	Yes
99 (63h)	Set Spectrum Analyzer Frequency	Sets the Spectrum Analyzer frequency range	Yes
100 (64h)	Set Spectrum Analyzer Center Freq./Span	Sets the Spectrum Analyzer center frequency and frequency span	Yes
101 (65h)	Set Spectrum Analyzer Scale	Sets the Spectrum Analyzer scale value	Yes
102 (66h)	Set Spectrum Analyzer Marker	Set position and on/off status of a Spectrum Analyzer marker	Yes
103 (67h)	Set Spectrum Analyzer Limit	Set position and on/off status of Spectrum Analyzer limit line	Yes
105 (69h)	Set Spectrum Analyzer Max Hold	Enable or disable the Spectrum Analyzer Max Hold	Yes
106 (6Ah)	Set Spectrum Analyzer Resolution Bandwidth Freq	Sets the Spectrum Analyzer resolution BW frequency	Yes
107 (6Bh)	Set Spectrum Analyzer Video Bandwidth Freq	Sets the Spectrum Analyzer video BW frequency	Yes

Control Byte Summary (3 of 3)

Control Byte #	Name	Description	Watch-dog Timer
108 (6Ch)	Set Spectrum Analyzer Sweep Mode	Sets the Spectrum Analyzer sweep mode	Yes
109 (6Dh)	Set Spectrum Analyzer Marker to Peak	Sets specified marker to peak value of the sweep	Yes
110 (6Eh)	Set Spectrum Analyzer Marker to Center	Sets the center frequency equal to the frequency of the specified marker	Yes
255 (FFh)	Exit remote mode	End serial communications	—

Control Byte Descriptions

Setup system - Control byte #1 (01h)

Description: Sets system status flags and switches. The Site Master acts on the entire byte. You must account for the state of each of the bits. For example, if you wanted to turn the LCD backlight on without disturbing the other switches you would do the following: query the Site Master with control byte #20. You would mask in the LCD status with the data from response byte #41 and send this to the Site Master after control byte #1.

See control byte #20 (14h) response byte 159 for current Site Master configuration. It is important to set the Metric/English flag to the proper value before sending distance information.

Bytes to Follow: 1 byte

1) Status byte (bit data)

(LSB) bit 0 : Fixed CW mode On/Off

bit 1 : Currently Unused

bit 2 : LCD Back Light On/Off

bit 3 : Measurement Unit Metric/English (0 = English, 1 = Metric)

bit 4 : Cal On/Off

bit 5-7 : Currently Unused

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid Printer Selection or unsuccessful attempt to turn calibration on.
238 (EEh) Time-out Error

Notes: Cal can be turned on ONLY if a complete calibration has been performed at the current start and stop frequencies.

Bit Value: 0 = Off
1 = On

Set Site Master frequency - Control byte #2 (02h)

Description: Sets the Site Master frequency range.

See control byte #20 (14h) response bytes 4-11 for current Site Master configuration.

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

Notes: Start and stop frequencies are given in terms of 1 Hz steps.
(e.g. 100.3 MHz would be sent as 100030000 = 1,000,300,000 Hz)

Select Measurement mode - Control Byte #3 (03h)

Description: Sets measurement domain and display graph type. You must have a valid calibration (current frequencies and calibration frequencies being the same) to switch to the Distance domain.

See control byte #20 (14h) response byte 1 (01h) for current Site Master domain.

Bytes to Follow: 1 byte

- 1) Measurement Mode
 - 00h = RL Frequency
 - 01h = SWR Frequency
 - 02h = Cable Loss Frequency
 - 10h = RL Distance
 - 11h = SWR Distance
 - 20h = Transmission Mode
 - 30h = Spectrum Analyzer Mode
 - 40h = Power Monitor Mode

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid domain or graph type or combination
238 (EEh) Time-out Error

Set Site Master scale - Control byte #4 (04h)

Description: Sets the Site Master graph boundaries.

The scale settings require knowing the graph type for proper configuration. For example, the scale start in return loss is the top of the graph while scale start is the bottom of the graph for SWR. Think of the scale start as being the smallest value on the graph.

See control byte #20 (14h) response bytes 12 to 19 for current Site Master scaling.

Bytes to Follow: 8 bytes

- 1) Scale Top (highest byte)
- 2) Scale Top
- 3) Scale Top
- 4) Scale Top (lowest byte)
- 5) Scale Bottom (highest byte)
- 6) Scale Bottom
- 7) Scale Bottom
- 8) Scale Bottom (lowest byte)

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

Notes:

Return Loss & Cable Loss: Scaling is in **thousandths** of a dB
Maximum value sent is 54000 which represents 54.00 dB
Minimum value sent is 0 which represent 0.00 dB
Scale Start Value is the top of the graph
Scale Stop Value is the bottom of the graph

SWR: Scaling is in **thousandths** (of ratio)
Maximum value sent is 65535 which represents 65.53
Minimum value sent is 1000 which represents 1.00
Scale Start Value is the bottom of the graph
Scale Stop Value is the top of the graph

Gain/Insertion Loss: Scaling is in **hundredths** (of dB)
Maximum value sent is 22000 which represents -120.0 dB
Minimum value sent is 0 which represents 100.0 dB
Scale Start Value is the bottom of the graph
Scale Stop Value is the top of the graph

Set Site Master marker - Control byte #5 (05h)

Description: Sets an individual Site Master marker.

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 129 at the stop frequency (or distance). The On/Off Status of a Marker can be toggled using this control byte.

In order to set frequency markers, you must be in the frequency domain. Likewise, if you want to set distance markers, you must be in the distance domain. Marker position is independently remembered for distance and frequency domains.

See control byte #20 (14h) response bytes 20 to 27 for current frequency markers. See control byte #20 (14h) response bytes 40 to 47 for current distance markers. See control byte #20 (14h) response byte 40 (28h) 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)
- 2) Marker Line On/~Off (01h = On, 00h = Off)
- 3) Marker Delta On/~Off (01h = On, 00h = Off)
- 4) Marker Value (higher byte)
- 5) Marker Value (lower byte)

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

Note: Delta Marker status is not valid for Marker 1.

Set Site Master limit - Control byte #6 (06h)

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

Currently, Site Master supports one limit line so the limit number is always 1. If the limit beep is turned on, the Site Master beeps any time the trace is above the limit line on the display. You can use return loss graphs to “catch” a bad match. SWR graph limit beeps only when the match gets good.

See control byte #20 (14h) response byte 155 for current Site Master configuration.

Bytes to Follow: 7 bytes:

- 1) Limit Number (for units with multiple limits, 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: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid limit, limit status, or limit value
238 (EEh) Time-out Error

Notes: **Limit Value** depends on the current display mode selected.

Return Loss & Cable Loss:	Limit is in thousandths of a dB Maximum value sent is 54000 which represents 54.00 dB Minimum value sent is 0 which represents 0.0 dB
SWR:	Limit is in thousandths (of ratio) Maximum value sent is 65530 which represents 65.53 Minimum value sent is 1000 which represents 1.00
Gain/Insertion Loss:	Limit is in hundredths (of dB) Maximum value sent is 22000 which represents -120.0 dB Minimum value sent is 0 which represents 100.0 dB

Set DTF parameters - 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 operations manual for a detailed explanation of the factors influencing proper selection of DTF parameters.

See control byte #20 (14h) response bytes 32 to 39 and 48 to 55 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: 255 (FFh) Operation Complete Byte
 224 (E0h) Parameter Error : Parameter(s) out of range
 238 (EEh) Time-out Error

Notes: **Start & Stop Distances** are 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)

Set time/date - Control Byte #8 (08h)

Description: Sets the real-time clock.

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

Bytes to Follow: 7 bytes

- 1) Hour
- 2) Minute
- 3) Month
- 4) Day
- 5) Year (Higher Byte)
- 6) Year (Lower Byte)
- 7) Daylight Savings (ON/~OFF)

Site Master Returns: 255 (FFh) Operation Complete Byte
 238 (EEh) Time-out Error

Set reference number - Control Byte #9 (09h)

Description: Stores a Reference Number with the sweep trace. You determine the format.

Current reference number is found in trace 0 response bytes 32 to 54.

Bytes to Follow: 16 bytes (ASCII text string)

Site Master Returns: 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)). Therefore, 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: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid serial port echo status
238 (EEh) Time-out Error

Single sweep mode On/Off - Control Byte #11(0Bh)

Description: Enables or disables the Single Sweep Mode.

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 remote control byte #69 (45h) at the end of each sweep. If present in the buffer, Site Master returns to remote mode (no sweeping, locked keypad).

Bytes to Follow: 1 byte

1) Single Sweep Mode Status

00h = Off

01h = On

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

Watch-dog timer On/Off - Control Byte #12 (0Ch)

Description: Enables or Disables the Watch-dog timer.

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

0 = Off

1 = On

Site Master Returns: 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. Calibration is based on frequency range. Once the frequency range is set, sequence the calibration process using this control byte. Measure each component (OPEN, SHORT, LOAD) then trigger the calculate step. The calculate step uses the measurements obtained and generates the correction factors.

Upon receiving this control byte any old calibration data is lost. The Site Master does the calibration step specified by the second byte. After the measurements, you must trigger the calculation step to complete the calibration.

After receiving the calculation byte, the Site Master checks to see if all three calibration steps are completed. The Site Master calculates the resulting correction factors and sends an Operation Complete Byte #255 (FFh) to the computer. If all three steps are not complete, the Site Master returns an Operation Incomplete Byte #224 (E0h) and no calculation is performed.

Bytes to Follow: 2 bytes

1) Calibration Step to trigger

01h = open

02h = short

03h = load

04h = Calculate Calibration Data

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

Set Site Master data points - Control Byte #14 (0Eh)

Description: Sets the number of measurement data points for the Site Master mode.

Bytes to Follow: 1 byte

- 1) Measurement Data Points
 - 00h = 130 Points
 - 01h = 259 Points
 - 02h = 517 Points

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid Data Point Setting
238 (EEh) Time-out Error

Store sweep trace - Control Byte #16 (10h)

Description: Saves current trace.

Note: Any calibration steps performed in remote mode overwrite the trace data in the memory.

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
-

Recall sweep trace - Control Byte #17 (11h)

Description: Queries the Site Master for sweep trace data.

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 (1130 for a valid sweep)
- 3-4) Reserved bytes

- 5-11) Model Number (7 bytes in ASCII)
- 12-15) Software Version (4 bytes in ASCII)
- 16) Measurement Mode
- 17-20) Time/Date (in Long Integer)
- 21-30) Date in String Format (mm/dd/yyyy)
- 31-38) Time in String Format (hh:mm:ss)
- 39-54) Reference number stamp
- 55-56) # data points

For all "Site Master Mode":

- 57) Start Frequency (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 (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 (higher byte)
- 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) Limit (highest byte)
- 86) Limit
- 87) Limit
- 88) Limit (lowest byte)
- 89) Start Distance (highest byte)
- 90) Start Distance
- 91) Start Distance
- 92) Start Distance (lowest byte)
- 93) Stop Distance (highest byte)
- 94) Stop Distance
- 95) Stop Distance
- 96) Stop Distance (lowest byte)
- 97) Distance Marker 1 (higher byte)
- 98) Distance Marker 1 (lower byte)
- 99) Distance Marker 2 (higher byte)
- 100) Distance Marker 2 (lower byte)

- 101) Distance Marker 3 (higher byte)
- 102) Distance Marker 3 (lower byte)
- 103) Distance Marker 4 (higher byte)
- 104) Distance Marker 4 (lower byte)
- 105) Relative Propagation Velocity (highest byte)
- 106) Relative Propagation Velocity
- 107) Relative Propagation Velocity
- 108) Relative Propagation Velocity (lowest byte)
- 109) Cable Loss (highest byte)
- 110) Cable Loss
- 111) Cable Loss
- 112) Cable Loss (lowest byte)
- 113) Status Byte 1: (0 = Off, 1 = 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 4-7 : Not Used
- 114) Status byte 2 : (0 = Off, 1 = 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 4-7 : Not Used
- 115) Status byte 3 : (0 = Off, 1 = On)
 - (LSB) bit 0 : Limit On/Off
 - bit 1-3 : Currently Unused
 - bit 4 : Cal On/Off
 - bit 5 : Not Used
 - bit 6 : Unit of Measurement (1 = metric, 0 = English)
 - bit 7 : Not Used
- 116) 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
 - bit 2-7: Currently Unused
- 117-126) Reserved Bytes
- 127-1166) Sweep Data (130 points * 8 bytes/point = 1040 bytes)
- 127-2198) (259 points * 8 bytes/point = 2072 bytes)
- 127-4262) (517 points * 8 bytes/point = 4136 bytes)
- 8 bytes for each data point
 - 1. gamma MSB
 - 2. gamma
 - 3. gamma
 - 4. gamma LSB
 - 5. phase MSB
 - 6. phase
 - 7. phase
 - 8. phase LSB

Note: return loss = $-20 \cdot \log(\text{gamma})$
VSWR = $(1+\text{gamma})/(1-\text{gamma})$
phase compares the reflected to the incident (reference)

For Spectrum Analyzer Mode:

- 57) Start Frequency (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 (highest byte)
- 78) Ref Level
- 79) Ref Level
- 80) Ref Level (lowest byte)
- 81) Scale per div (highest byte)
- 82) Scale per div
- 83) Scale per div
- 84) Scale per div (lowest byte)
- 85) Frequency Marker 1 (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) Limit (highest byte)
- 94) Limit
- 95) Limit
- 96) Limit (lowest byte)
- 97) RBW Setting (highest byte)
- 98) RBW Setting
- 99) RBW Setting
- 100) RBW Setting (lowest byte)
- 101) VBW Setting (highest byte)
- 102) VBW Setting
- 103) VBW Setting
- 104) VBW Setting (lowest byte)
- 105) OCC BW Method

- 106) OCC BW % Value (highest byte)
- 107) OCC BW % Value
- 108) OCC BW % Value
- 109) OCC BW % Value (lowest byte)
- 110) OCC BW dBc (highest byte)
- 111) OCC BW dBc
- 112) OCC BW dBc
- 113) OCC BW dBc (lowest byte)
- 114) Attenuation (highest byte)
- 115) Attenuation
- 116) Attenuation
- 117) Attenuation (Lowest byte)
- 118) Status Byte 1: (0 = Off, 1 = 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 4-7 : Not Used
- 119) Status byte 2 : (0 = Off, 1 = 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 4-7 : Not Used
- 120) Status byte 3 : (0 = Off, 1 = On)
 - (LSB) bit 0 : Limit On/Off
 - bit 1-7 : Not Used
- 121-130) Reserved Bytes
- 131-1730) Sweep Data (400 points * 4 bytes/point = 1600 bytes)
 - 4 bytes for each data point
 1. sweep value MSB
 2. sweep value
 3. sweep value
 4. sweep value LSB

For invalid sweeps(empty stored sweep locations): only 11 bytes will return:

- 1-2) Number of following bytes (9 bytes for invalid sweep recall)
- 3-4) Model # (unsigned integer, 0x00 for Site Master)
- 5-11) Extended Model # (7 bytes in ASCII)

Invalid sweep location: 1 byte

224 (E0) : Parameter error : Invalid sweep location

Notes: Please refer to Control Bytes 02h through 0Ah for data formats.

Minimum Frequency Step Size is in Hz

Gamma is in **thousandths** (of ratio)

Phase is in **tenths** of a degree

For Spectrum Analyzer Mode:

dBm value is obtained by: $\text{dBm value} = (\text{sweep value} - 270,000)/1000$

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 System Status Query - Control Byte #20 (14h) 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

Site Master Returns: 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.

The Site Master recalls all parameters described in System Status Query (14h) (except Serial Port Echo Status) from the specified store location. The recalled setup does **not** automatically become the default setup when exiting remote.

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 defaults). See control byte #18 (12h) for details.

Bytes to Follow: 1 byte

- 1) Location to recall system setup parameters from:
0 = Run-time setup
1 - 10 = Saved setups
255 = Default setup

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid store location or no saved setup
238 (EEh) Time-out Error

Query system status - Control Byte #20 (14h)

Description: Queries the Site Master for current system settings.

The current state of the Site Master represents the state after last successful remote control operation.

Please refer to Control bytes 01h through 0Ah for data formats.

Bytes to Follow: 0 bytes

Site Master Returns: 171 bytes
1) Measurement Mode
2) Site Master Mode Data Points (higher byte)

- 3) Site Master Mode Data Points (lower byte)
- 4) Start Frequency (highest byte)
- 5) Start Frequency
- 6) Start Frequency
- 7) Start Frequency (lowest byte)
- 8) Stop Frequency (highest byte)
- 9) Stop Frequency
- 10) Stop Frequency
- 11) Stop Frequency (lowest byte)
- 12) Scale Start (higher byte)
- 13) Scale Start
- 14) Scale Start
- 15) Scale Start (lower byte)
- 16) Scale Stop (higher byte)
- 17) Scale Stop
- 18) Scale Stop
- 19) Scale Stop (lower byte)
- 20) Frequency Marker 1 (higher byte)
- 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) Limit (higher byte)
- 29) Limit
- 30) Limit
- 31) Limit (lower byte)
- 32) Start Distance (highest byte)
- 33) Start Distance
- 34) Start Distance
- 35) Start Distance (lowest byte)
- 36) Stop Distance (highest byte)
- 37) Stop Distance
- 38) Stop Distance
- 39) Stop Distance (lowest byte)
- 40) Distance Marker 1 (higher byte)
- 41) Distance Marker 1 (lower byte)
- 42) Distance Marker 2 (higher byte)
- 43) Distance Marker 2 (lower byte)
- 44) Distance Marker 3 (higher byte)
- 45) Distance Marker 3 (lower byte)
- 46) Distance Marker 4 (higher byte)
- 47) Distance Marker 4 (lower byte)
- 48) Relative Propagation Velocity (highest byte)
- 49) Relative Propagation Velocity
- 50) Relative Propagation Velocity
- 51) Relative Propagation Velocity (lowest byte)
- 52) Cable Loss (highest byte)
- 53) Cable Loss
- 54) Cable Loss
- 55) Cable Loss (lowest byte)
- 56) Spectrum Analyzer Mode Data Points (higher byte)

- 57) Spectrum Analyzer Mode Data Points (lower byte)
- 58) Spectrum Analyzer Start Frequency (highest byte)
- 59) Spectrum Analyzer Start Frequency
- 60) Spectrum Analyzer Start Frequency
- 61) Spectrum Analyzer Start Frequency (lowest byte)
- 62) Spectrum Analyzer Stop Frequency (highest byte)
- 63) Spectrum Analyzer Stop Frequency
- 64) Spectrum Analyzer Stop Frequency
- 65) Spectrum Analyzer Stop Frequency (lowest byte)
- 66) Spectrum Analyzer Center Frequency (highest byte)
- 67) Spectrum Analyzer Center Frequency
- 68) Spectrum Analyzer Center Frequency
- 69) Spectrum Analyzer Center Frequency (lowest byte)
- 70) Spectrum Analyzer Frequency Span (highest byte)
- 71) Spectrum Analyzer Frequency Span
- 72) Spectrum Analyzer Frequency Span
- 73) Spectrum Analyzer Frequency Span (lowest byte)
- 74) Spectrum Analyzer Minimum Frequency Step Size (highest byte)
- 75) Spectrum Analyzer Minimum Frequency Step Size
- 76) Spectrum Analyzer Minimum Frequency Step Size
- 77) Spectrum Analyzer Minimum Frequency Step Size (lowest byte)
- 78) Ref Level (highest byte)
- 79) Ref Level
- 80) Ref Level
- 81) Ref Level (lowest byte)
- 82) Scale per div (highest byte)
- 83) Scale per div
- 84) Scale per div
- 85) Scale per div (lowest byte)
- 86) Spectrum Analyzer Frequency Marker 1 (higher byte)
- 87) Spectrum Analyzer Frequency Marker 1 (lower byte)
- 88) Spectrum Analyzer Frequency Marker 2 (higher byte)
- 89) Spectrum Analyzer Frequency Marker 2 (lower byte)
- 90) Spectrum Analyzer Frequency Marker 3 (higher byte)
- 91) Spectrum Analyzer Frequency Marker 3 (lower byte)
- 92) Spectrum Analyzer Frequency Marker 4 (higher byte)
- 93) Spectrum Analyzer Frequency Marker 4 (lower byte)
- 94) Spectrum Analyzer Limit (highest byte)
- 95) Spectrum Analyzer Limit
- 96) Spectrum Analyzer Limit
- 97) Spectrum Analyzer Limit (lowest byte)
- 98) RBW Setting (highest byte)
- 99) RBW Setting
- 100) RBW Setting
- 101) RBW Setting (lowest byte)
- 102) VBW Setting (highest byte)
- 103) VBW Setting
- 104) VBW Setting
- 105) VBW Setting (lowest byte)
- 106) OCC BW Method
- 107) OCC BW % Value (highest byte)
- 108) OCC BW % Value
- 109) OCC BW % Value
- 110) OCC BW % Value (lowest byte)

- 111) OCC BW dBc (highest byte)
- 112) OCC BW dBc
- 113) OCC BW dBc
- 114) OCC BW dBc (lowest byte)
- 115) Attenuation (highest byte)
- 116) Attenuation
- 117) Attenuation
- 118) Attenuation (lowest byte)
- 119-148) Reserved Bytes
- 149) Status Byte 1: (0 = Off, 1 = 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 4-7 : Not Used
- 150) Status byte 2 : (0 = Off, 1 = 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
 - bit 4-7 : Not Used
- 151) Status Byte 3: Reserved Byte
- 152) Status byte 4 : Reserved Byte
- 153) Status Byte 5: (0 = Off, 1 = On)
 - (LSB) bit 0 : Spectrum Analyzer Marker 1 On/Off
 - bit 1 : Spectrum Analyzer Marker 2 On/Off
 - bit 2 : Spectrum Analyzer Marker 3 On/Off
 - bit 3 : Spectrum Analyzer Marker 4 On/Off
 - bit 4-7 : Not Used
- 154) Status byte 6 : (0 = Off, 1 = On)
 - (LSB) bit 0 : Not Used
 - bit 1 : Spectrum Analyzer Marker 2 Delta On/Off
 - bit 2 : Spectrum Analyzer Marker 3 Delta On/Off
 - bit 3 : Spectrum Analyzer Marker 4 Delta On/Off
 - bit 4-7 : Not Used
- 155) Status byte 7 : (0 = Off, 1 = On)
 - (LSB) bit 0 : Site Master Limit On/Off
 - bit 1-3 : Currently Unused
 - bit 4 : Site Master Cal On/Off
 - bit 5 : Not Used
 - bit 6 : Site Master Limit Beep On/Off
 - bit 7 : Not Used
- 156) Status byte 8 : Reserved Byte
- 157) Status byte 9 : (0 = Off, 1 = On)
 - (LSB) bit 0 : Spectrum Analyzer Limit On/Off
 - bit 1-3 : Currently Unused
 - bit 4 : Not Used
 - bit 5-7 : Not Used
- 158) Status byte 10 :
 - (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
- bit 2-7: Currently Unused
- 159) Status byte 11 :
 - (LSB) bit 0 : Fixed CW Mode On/Off
 - bit 1 : Currently Unused
 - bit 2 : LCD Back Light On/Off
 - bit 3 : Measurement Unit Metric/English (0 = English, 1 = Metric)
 - bit 4-7 : Currently Unused
- 160) Serial Port Echo Status On/~Off (1=On, 0=Off)
- 161) Printer Type
- 162-171) Currently Unused

Note: Bit Value: 0 = Off
1 = On

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: (0 = Fail, 1 = Pass)
 - (LSB) bit 0 : Phase Lock Loop
 - bit 1 : Integrator
 - bit 2 : Battery
 - bit 3 : Temperature
 - bit 4 : EEPROM read/write
 - bit 5- 7 : Not currently used.
- 2) Self-test report: (0 = Fail, 1 = Pass)
 - (LSB) bit 0 : Spectrum Analyzer Lock
 - bit 1- 7 : Spectrum Analyzer Measurement
- 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 °C) or degree Fahrenheit (e.g. 934 = 93.4 °F), depending on the current measurement unit (Metric or English) selected.

Read fail counters - Control Byte #22 (16h)

Description: Reads the value of the Site Master Lock Fail Counter, Site Master Integrator Fail Counter, and the Spectrum Analyzer Lock Fail Counter.

Bytes to Follow: 0 bytes

Site Master Returns: 6 bytes (unsigned integer)

- 1) Site Master Lock Fail counter (higher byte)
- 2) Site Master Lock Fail counter (lower byte)
- 3) Site Master Integrator Fail Counter (higher byte)
- 4) Site Master Integrator Fail Counter (lower byte)
- 5) Spectrum Analyzer Lock Fail counter (higher byte)
- 6) Spectrum Analyzer Lock Fail counter (lower byte)

Clear fail counters - Control Byte #23 (17h)

Description: Resets the Site Master Lock Fail Counter, the Site Master Integrator Fail Counter, and the Spectrum Analyzer Lock Fail Counter.

Bytes to Follow: 0 bytes

Site Master Returns: 225 (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× number of saved traces

1-3) # of saved traces

for each trace:

- 1-2) Trace Index
- 3) Measurement Mode (refer to Control Byte #3)
- 4-21) Date/Time as Unsigned Long Integer
- 26-41) Trace Name (16 bytes)

Delete Sweep Trace - Control Byte #25 (19h)

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

Bytes to Follow: 1 byte

- 0 - Delete all Traces
- X - Delete Single Trace #X

Site Master Returns: 225 (FFh) Operation Complete Byte

Select Printer Type - Control Byte #30 (1Eh)

Description: Select Printer Type

Bytes to Follow: 1 byte

- 0 - No Printer Selected
- 1 - Seiko DPU 411, 414
- 2 - HP Deskjet 340
- 3 - HP Deskjet 500, 500C, 540C
- 4 - HP Deskjet 670C, 672C, 692C
- 5 - HP Deskjet 870Cxi, 890C
- 6 - HP Deskjet 1120C
- 7 - HP Laserjet 6L, 6P, 4000
- 8 - NEC Superscript 760C

Site Master Returns: 225 (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

- 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: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid DTF Windowing Methods
238 (EEh) Time-out Error

Set Trace Math - Control Byte #32 (20h)

Description: Setup trace math operation and trace

Bytes to Follow: 2 bytes

- 1) Trace Math Operation (0 to 5)
 - 00h = Off
 - 01h = Addition
 - 02h = Subtraction

- 2) Trace to Perform Math Operation on (1 to 50)

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

Query Power Level - Control Byte #39 (27h)

Description: Return Power Level at Detector Port

This control byte contains all the information you need to determine just about anything about a power monitor measurement.

Bytes to Follow: 0 byte

Site Master Returns: 21 bytes

- 1) Status Byte
 - (LSB) bit 0 : Unit (0 - Watt/%, 1 - dBm/dBr)
 - bit 2 : Relative Mode On/~Off
 - bit 3 : Offset Mode On/~Off
 - bit 4 : Zero Mode On/~Off
 - bit 5-7: Not currently used.
- 2 - 5) Relative Mode Reference Power Level in dBm
- 6 - 9) Offset Mode Offset in dB
- 10 - 13) Zero Mode Power Level in dBm
- 14 - 17) Absolute Power Level in dBm
- 18 - 21) Power in dBm/dBr

Notes: You can query power level without setting power monitor mode ON.
Absolute Power of -100 indicates a hardware failure (Power monitor mode unavailable or RF Detector not connected)
Power is in **one-thousandth** of dBm
Relative power is in **one-thousandth** of dBr
Offset is in **one-thousandth** of dB

Set Power Monitor Unit - Control Byte #40 (28h)

Description: Set Power Monitor unit to Watts or dBm

Bytes to Follow: 1 byte

00h = Watt (% if in relative mode)

01h = dBm (dBr if in relative mode)

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid power monitor unit
238 (EEh) Time-out Error

Relative Mode On/Off - Control Byte #41 (29h)

Description: Enable or disable Power Monitor Relative Mode

Bytes to Follow: 1 byte

00h = Off

01h = On w/ trigger (use the current power level as a reference power level.)

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

Offset Mode On/Off - Control Byte #42 (2Ah)

Description: Enable or disable Power Monitor Offset Mode

Bytes to Follow: 5 bytes

1) On/~Off (01 = On, 00 = Off)

2-5) Offset Power Level in dB

Site Master Returns: 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.

Zero Mode On/Off - Control Byte #43 (2Bh)

Description: Enable or disable Power Monitor Zeroing Mode.

Bytes to Follow: 1 byte

00h = Off

01h = On w/ trigger(current power level is referenced as -80 dBm.)

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid parameter
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 or serial port echo mode.

Bytes to Follow: 0 bytes

Site Master Returns: Sweep Complete Byte # 192 (C0h)

Note: If the Site Master is *not* in single sweep or serial port echo mode, sending the byte does nothing. This command is for local mode operation. If the Site Master is in remote mode, sending the byte does nothing.

Check Battery Status - Control Byte #50 (32h)

Description: Returns 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)

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 when the unit is turned off. The default is (0), Do Not automatically save the runtime setup.

Bytes to Follow: 1 byte

- 1) Save runtime setup On/Off
 - 0 = Off
 - 1 = On

Site Master Returns: 255 (FFh) Operation Complete
238 (EEh) Time-out Error

Enter remote mode - Control Byte #69 (45h)

Description: Enter remote mode then send model number and firmware version to the computer

Bytes to Follow: 0 bytes

Site Master Returns: 13 bytes

- 1-2) Model # (unsigned integer, 0x00 for Site Master)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version - 4 bytes (ASCII)

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

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.

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

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

Bytes to Follow: 0 bytes

Site Master Returns: 13 bytes

- 1-2) Model # (unsigned integer)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version - 4 bytes (ASCII)

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.

Write Custom Cable - Control Byte #80 (50h)

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

Bytes to Follow: 24 bytes

- 1) Cable List Index
- 2-16) Cable Description (string)
- 17) Propagation Velocity (highest byte)
- 18) Propagation Velocity
- 19) Propagation Velocity
- 20) Propagation Velocity (lowest byte)
- 21) Insertion Loss (highest byte)
- 22) Insertion Loss
- 23) Insertion Loss
- 24) Insertion Loss (lowest byte)

Site Master Returns: 225 (FFh) Operation Complete
224 (E0h) Parameter Error
238 (EEh) Time-out Error

Recall Custom Cable - Control Byte #81 (51h)

Description: Query a cable in the custom cable list.

Bytes to Follow: 1 byte

- 1) Cable list index (1 - 49)

Site Master Returns: 23 bytes

- 1) Upper Bound of Custom Cable Index
- 2-16) Cable Description (string)
- 17) Propagation Velocity (highest byte)
- 18) Propagation Velocity
- 19) Propagation Velocity
- 20) Propagation Velocity (lowest byte)
- 21) Insertion Loss (highest byte)
- 22) Insertion Loss
- 23) Insertion Loss
- 24) Insertion Loss (lowest byte)

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

Description: Measure OCC BW with % of Power method.

Bytes to Follow: 4 bytes

- 1) % of Power (highest byte)
- 2) % of Power
- 3) % of Power
- 4) % of Power (lowest byte)

Site Master Returns: 16 bytes

- 1-4) OCC BW
- 5-8) Measure % of Power
- 9-12) Low Frequency OCC BW
- 13-16) High Frequency OCC BW

Note: In 100th of %, 9123 = 91.23%

Measure OCC BW dB Down - Control Byte #97 (63h)

Description: Measure OCC BW with dB down method.

Bytes to Follow: 4 bytes

- 1) dB down (highest byte)
- 2) dB down
- 3) dB down
- 4) dB down (lowest byte)

Site Master Returns: 16 bytes

- 1-4) OCC BW
- 5-8) Measure dB down
- 9-12) Low Frequency OCC BW
- 13-16) High Frequency OCC BW

Note: In 100th of dB, 1234 = 12.34 dB

Set Spectrum Analyzer Frequency - Control Byte #99 (63h)

Description: Sets the Spectrum Analyzer frequency range.

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

Notes: Start and stop frequencies are given in terms of 1 Hz steps.
 (e.g. 100.3 MHz would be sent as 100030000 = 1,000,300,000 Hz)

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

Description: Sets the Spectrum Analyzer center frequency and frequency span.

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)

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

Notes: Center frequencies and frequency spans are given in terms of 1 Hz steps.
 (e.g. 100.3 MHz would be sent as 100030000 = 1,000,300,000 Hz)

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

Description: Sets the graph boundaries.

Ref Level will be the “top” scale of the graph, and there are a total of 10 divisions, so the bottom scale can be determined by: Ref Level – 10 × 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: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid scale range
238 (EEh) Time-out Error

Notes: Parameters are sent in 1000th of a dB (-12.34 dB = -12340)
Ref Level is sent as: (Ref Level) × 1000 + 270,000 (0 dB = 270,000, 20 dB = 290,000,
-120 dB = 150,000)

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)
- 2) Marker Line On/~Off (01h = On, 00h = Off)
- 3) Marker Delta On/~Off (01h = On, 00h = Off)
- 4) Marker Value (higher byte)
- 5) Marker Value (lower byte)

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

Note: Marker value is between 0 and 399.

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

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

Bytes to Follow: 7 bytes:

- 1) Limit Number (for units with multiple limits, 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: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid limit, limit status, or limit value
238 (EEh) Time-out Error

Notes: Parameters are sent in 1000th of a dB (-12.34 dB = -12340)
Ref Level is sent as: (Ref Level) × 1000 + 270,000 (0 dB = 270,000, 20 dB = 290,000,
-120 dB = 150,000)

Set Spectrum Analyzer Max Hold - Control Byte #105 (69h)

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

Bytes to Follow: 1 byte

00h = Max Hold Off

01h = Max Hold On

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

Set Spectrum Analyzer Resolution Bandwidth Freq - Control Byte #106 (6Ah)

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

Bytes to Follow: 1 byte

00h = 10 kHz resolution BW

01h = 30 kHz resolution BW

02h = 100 kHz resolution BW

03h = 1 MHz resolution BW

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

Set Spectrum Analyzer Video Bandwidth Freq - Control Byte #107 (6Bh)

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

Bytes to Follow: 1 byte

00h = 3 kHz video BW

01h = 10 kHz video BW

02h = 30 kHz video BW

03h = 300 kHz video BW

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

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

Description: Sets the sweep mode for the Spectrum Analyzer.

Bytes to Follow: 1 byte

00h = Single Sweep

01h = Continuous Sweep

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid parameter
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

Marker Number (1 - 4)

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid Marker
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

Marker Number (1 - 4)

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

Exit remote mode - Control Byte #255 (FFh)

Description: Site Master exits remote mode

Bytes to Follow: 0 byte

Site Master Returns: 1 byte
1) Confirm flag FFh

The computer sends a serial stop byte #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 defaults) or one of the nine saved setups(saved setup location 1-9). See control byte #18 (12h) for details.

Parameter Definitions

Parameter	# of Bytes	Step	Example / Description
Frequency	4 bytes unsigned	1 Hz	1000.3 MHz = 1000300000
Scale (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(SPA) (dB/div)	4 bytes unsigned	1 / 1000 dB	8 dB + 8000
(SPA) (ref level)	4 bytes unsigned	1 / 1000 + 270,000	20 dB = 20,000 + 270,000 = 290,000
Limit (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(G/IL)	2 bytes unsigned	1 / 100 dB	100 dB = 0 120 dB = 22000
Markers (Frequency & Distance Marker)	2 bytes unsigned	1 sweep point	Marker values are given in relative position on the graph. The lowest value is 0; the highest value is the number of data points – 1. Spectrum Analyzer maximum is 399.
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 / 1000 (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 Monitor: dBm/dBr	4 bytes signed	1 / 1000 dBm 1 / 1000 dBr	51.3 dBm = 51300 10.4 dBr = 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



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