

Anritsu

Site Master™
S810A, S818A, S820A
Antenna and
Coax/Waveguide Analyzer

Programming Manual



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

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

MS-DOS, Windows, and Windows for Workgroups are registered trademarks of the Microsoft Corporation.

Site Master and **Cable Mate** are trademarks 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.

Index

How To Use This Manual	1
-------------------------------------	---

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
-------------------------	---

Configure

System

Fixed CW mode control	4
Keypad lock	4
LCD backlight	4
Printer type	4
Watch dog timer	4
Serial port echo	4
Single sweep	4
Trace math	4

Measurement

Domain select	5
Measurement unit	5
Calibration on/off	5

Power Monitor

Power Monitor mode	5
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

Distance	
Start distance	5
Stop distance	5
Relative propagation velocity	5
Cable loss	6
Center frequency	6
Waveguide cutoff frequency	6
Waveguide loss	6
DTF Windowing	6
Display	
Display mode	6
Scale start	6
Scale stop	6
Markers and Marker Status	
On/Off	6
Delta Status On/Off	6
Value	6
Peak	6
Valley	6
Info	6
Limits	
On/Off	6
Beep	6
Value	6
<u>Utility</u>	
Time set	7
Date set	7
Reference number set	7
<u>Action</u>	
Sweep trigger	7
Save system setup	7
Recall system setup	7
Save sweep	7
<u>Data</u>	
Recall sweep	7
<u>Calibration</u>	
Calibration method	7
Set OSOSL calibration parameters	7
Set OSL calibration parameters	7
Calibrate	7
Export calibration data	7
Import calibration data	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	11
Control byte 2 Set frequency.	11
Control byte 3 Select domain	12
Control byte 4 Set scale.	12
Control byte 5 Set marker.	13
Control byte 6 Set limit.	14
Control byte 7 Set DTF parameters	14
Control byte 8 Set time/date	15
Control byte 9 Set reference number	16
Control byte 10 Serial port echo on/off	16
Control byte 11 Single sweep mode on/off	16
Control byte 12 Watch dog timer on/off	17
Control byte 13 Sequence calibration.	17
Control byte 14 Export calibration data.	18
Control byte 15 Import calibration data.	19
Control byte 16 Store sweep trace	19
Control byte 17 Recall sweep trace.	19
Control byte 18 Save system setup.	22
Control byte 19 Recall system setup	22
Control byte 20 Query system status	23
Control byte 21 Trigger self-test.	25
Control byte 22 Read fail counters	25
Control byte 23 Clear fail counters.	26
Control byte 24 Get options	26
Control byte 31 Select DTF windowing.	26
Control byte 32 Set trace math	27
Control byte 35 Set OSOSL cal parameters	27
Control byte 36 Set OSL cal parameter	27
Control byte 38 Set power monitor mode	28
Control byte 39 Query power level	28
Control byte 40 Set power monitor unit	29
Control byte 41 Relative mode on/off.	29
Control byte 42 Offset mode on/off	29
Control byte 43 Zero mode on/off	30
Control byte 48 Trigger sweep	30
Control byte 49 Extra setup marker info	30
Control byte 50 Extra sweep marker info	31
Control byte 51 Set marker peak.	31
Control byte 52 Set marker valley.	32

Control byte 69	Enter remote mode	32
Control byte 255	Exit remote mode	33
Parameter definitions	34

Mini - Applications	35
----------------------------------	----

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 Anritsu Site Master series (Model S810A, S818A, and S820A) with firmware Version 6.01 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.

Since the Site Master only checks its serial port buffer after each sweep, you must wait until the Site Master reaches the end of the sweep to get a response. 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.

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 six 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.

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.

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.

Keypad lock - see control byte #1 (01h)

Disabling the keypad prevents accidental changes to system parameters.

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

LCD backlight helps in adverse lighting conditions.

Printer type - see control byte #1 (01h)

Printer type is selectable.

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.

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

CONFIGURE MEASUREMENT

Domain select - see control byte #3 (03h)

The Site Master is either in frequency or distance domain.

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.

Power Monitor mode - see control byte #38 (26h)

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)

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.

Center Frequency - see control byte #7 (07h)

Waveguide Cutoff Frequency - see control byte #7 (07h)

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

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, and cable/waveguide loss.

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

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

CONFIGURE AND GET STATUS OF 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)

Marker Peak - see control byte #51 (33h)

Marker Valley - see control byte #52 (34h)

Marker Info - see control bytes #49 (31h) and #50 (32h)

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

Sweep trigger - 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)

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

Calibration method - see control byte #13 (0Dh)

Allows selection of the OSL (Coax) or OSOSL (Waveguide) calibration method.

Set OSOSL calibration parameters - see control byte #35 (23h)

Set OSL calibration parameters - see control byte #36 (24h)

Calibrate - see control byte #13 (0Dh)

Computer sequencing of the OSL or OSOSL calibration is possible.

Export calibration data - see control byte #14 (0Eh)

Calibration data for the current sweep range is exportable. The exact format and byte ordering must be preserved for measurement integrity.

Import calibration data - see control byte #15 (0Fh)

Previously exported calibration data can be sent back to the Site Master. The Site Master takes each byte and writes it to the EEPROM. Consequently, a 5 ms delay between bytes is necessary to allow the write cycle to complete.

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 2)

Control Byte #	Name	Description	Watch-dog Timer
1 (01h)	Setup system	System status flags and switches	Yes
2 (02h)	Set frequency	Frequency range	Yes
3 (03h)	Select domain	Measurement domain and measurement mode	Yes
4 (04h)	Set scale	Scale values	Yes
5 (05h)	Set marker	Position and on/off status of a marker	Yes
6 (06h)	Set limit	Position and on/off status of a limit line	Yes
7 (07h)	Set DTF parameters	Distance to Fault parameters	Yes
8 (08h)	Set time/date	Time and date for a sweep trace	Yes
9 (09h)	Set reference number	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 calibration	Trigger a calibration step	Yes
14 (0Eh)	Export calibration data	Send calibration data to the computer	—
15 (0Fh)	Import calibration data	Send calibration data to the Site Master	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 to EEPROM	Yes
19 (13h)	Recall system setup	Recall system setup 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)	Get Options	Get list of installed options	—
31 (1Fh)	Select DTF Windowing	Select DTF Windowing Methods	Yes

Control Byte Summary (2 of 2)

Control Byte #	Name	Description	Watch-dog Timer
32 (20h)	Set Trace Math	Set up Trace Math operation	---
35 (23h)	Set OSOSL Cal Parameter	Set OSOSL Cal Parameter	Yes
36 (24h)	Set OSL Cal Parameter	Set OSL Cal Parameter	Yes
38 (26h)	Power Monitor On/Off	Turn Power Monitor Mode On/Off	Yes
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	---
49 (31h)	Extra Setup Marker Info	Get extra information on markers	---
50 (32h)	Extra Sweep Marker Info	Get information on Markers of a saved trace	---
51 (33h)	Set Marker Peak	Set marker of the peak of the current trace	---
52 (34h)	Set Marker Valley	Set marker to the valley of the current trace	---
69 (45h)	Enter remote mode	Returns model number and firmware version	---
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 #61 and send this to the Site Master after control byte #1.

Bytes to Follow: 1 byte

1) Status byte (bit data)

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

bit 1 = Keyboard Lock On/Off

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 : Printer type select

bit: 7 6 5

| | |

0 0 0 - none, no printer selected (system default)

0 0 1 - Seiko DPU-411/414 thermal printer

0 1 0 - HP Deskjet 340 ink jet printer

0 1 1 - 1 1 1 reserved

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 frequency - Control byte #2 (02h)

Description: Sets the Site Master frequency range.

See control byte #20 (14h) response bytes 2 to 9 (2h to 9h) 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 kHz steps.
(e.g. 12.34 GHz would be sent as 12340000 = 12,340,000 kHz)

Select domain - 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. See control byte #20 (14h) response byte 62 (3Eh) bits 2 & 3 for current Site Master display type.

Bytes to Follow: 2 bytes

- 1) Domain
 - 00h : Frequency Domain
 - 01h : Distance Domain
- 2) Graph type
 - 00h : SWR
 - 01h : Return Loss (RL)
 - 02h : Cable Insertion Loss

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 scale - Control byte #4 (04h)

Description: Sets the 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 10 to 13 (0Ah to 0Dh) for current Site Master scaling. Remember to check control byte #20 response byte 62 (3Eh) bits 2 & 3 for the current Site Master display type.

Bytes to Follow: 4 bytes

- 1) Scale Start (higher byte)
- 2) Scale Start (lower byte)
- 3) Scale Stop (higher byte)
- 4) Scale Stop (lower byte)

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

Notes:

Return Loss & Scaling is in **thousandths** of a dB
Cable/Waveguide Maximum value sent is 54000 which represents 54.00 dB
Loss: 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

Set marker - Control byte #5 (05h)

Description: Sets an individual 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 14 to 21 (0Eh to 15h) for current frequency markers. See control byte #20 (14h) response bytes 32 to 39 (20h to 27h) for current distance markers. See control byte #20 (14h) response byte 60 (3Ch) 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 Status 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 limit - Control byte #6 (06h)

Description: Sets the position and On/Off Status of the 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 62 (3Eh) for current Site Master configuration.

Bytes to Follow: 5 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 (higher byte)
- 5) Limit Value (lower 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/Waveguide 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

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 24 to 59 (18h to 36h) for current Site Master configuration.

Bytes to Follow: 28 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)
- 17) Center Frequency (highest byte)
- 18) Center Frequency
- 19) Center Frequency
- 20) Center Frequency (lowest byte)
- 21) Waveguide Cutoff Frequency (highest byte)
- 22) Waveguide Cutoff Frequency
- 23) Waveguide Cutoff Frequency
- 24) Waveguide Cutoff Frequency (lowest byte)
- 25) Waveguide Loss (highest byte)
- 26) Waveguide Loss
- 27) Waveguide Loss
- 28) Waveguide 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 and Waveguide Loss is in **hundred-thousandths** of dB/m or dB/ft (-0.345 dB/m would be sent as 34500)

Center and Waveguide Cutoff Frequencies are given in terms of 1 kHz steps (12.34 GHz would be sent as 12340000 = 12,340,000 kHz)

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). Since the Site Master does not have a real-time clock, you must update the time/date stamp before storing a sweep.

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

Current time setting can be found in trace 0 response bytes 16 to 23 (10h to 17h). Current date setting can be found in trace 0 response bytes 24 to 31 (18h to 1Fh). See control byte #17 (11h).

Bytes to Follow: 16 bytes

- 1-8) Time
- 9-16) Date

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 39 (20h to 27h). See control byte #17 (11h).

Bytes to Follow: 8 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 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. You may perform the OPEN, SHORT, and LOAD calibrations in any order. 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 five 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 five 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 Type
00h - OSL
01h - OSOSL

- 2) Calibration Step to trigger
 for OSL Calibration:
 01h = gain
 02h = open
 03h = short
 04h = load
 05h = Calculate Calibration Data
 for OSOSL (Waveguide) Calibration
 01h = gain
 02h = short 1
 03h = short 2
 04h = load
 05h = 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

Export calibration data - Control Byte #14 (0Eh)

Description: Sends calibration data from the Site Master to the computer.

One of the most powerful features of the Site Master programming ability is export of the Calibration Data to the computer. You can save it to a file, then re-introduce the calibration data at a later time. Multiple frequency ranges can be used without having to recalibrate each time.

Calibration data usually doesn't change much, so calibration can often be used throughout the same day. But be aware that changes in temperature affect the calibration data the most, so if the temperature changes much, re-calibrate. Refer to the operation manual for details on calibration.

Bytes to Follow: 0 byte

Site Master Returns: 2870 bytes

- 1) Calibration Start Frequency (highest byte)
- 2) Calibration Start Frequency
- 3) Calibration Start Frequency
- 4) Calibration Start Frequency (lowest byte)
- 5) Calibration Stop Frequency (highest byte)
- 6) Calibration Stop Frequency
- 7) Calibration Stop Frequency
- 8) Calibration Stop Frequency (lowest byte)
- 9) Calibration Temperature (highest byte)
- 10) Calibration Temperature (lowest byte)
- 11 - 270) Calibration Gain Values (2 bytes for each data point)
- 271 - 2870) Calibration data (20 bytes for each data point)

Note: Site Master has a total of 130 data points. There are three correction terms (E_{DF} , E_{RF} , and E_{sf}) associated with each data point. Each term consists of a real and imaginary part.

Import calibration data - Control Byte #15 (0Fh)

Description: Transfers previously exported calibration data from the computer to the Site Master.

This is the other half of the operation described in control byte #14 (0Eh). Send the stored calibration data back to the Site Master in exactly the same order in which you received it. The Site Master does no error checking on the calibration data.

Warning: The Site Master takes each byte and stores it to EEPROM. You must wait a minimum of 5 milliseconds (this is the only control byte that requires a delay) between bytes to allow the Site Master time to complete this cycle. The EEPROM is guaranteed to allow 100,000 calibrations. Use this control byte with care.

Bytes to Follow: 2870 bytes

- 1) Calibration Start Frequency(highest byte)
- 2) Calibration Start Frequency
- 3) Calibration Start Frequency
- 4) Calibration Start Frequency(lowest byte)
- 5) Calibration Stop Frequency(highest byte)
- 6) Calibration Stop Frequency
- 7) Calibration Stop Frequency
- 8) Calibration Stop Frequency(lowest byte)
- 9) Calibration Temperature (highest byte)
- 10) Calibration Temperature (lowest byte)
- 11 - 270) Calibration Gain Values (2 bytes for each data point)
- 271 - 2870) Calibration data (20 bytes for each data point)

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

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

Description: Saves current trace data (last complete trace data before entering remote) to a specific location.

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

Bytes to Follow: 1 byte

- 1) Store Location 1-70

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

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

Description: Queries the Site Master for sweep trace data.

Expected time for sending one sweep is about 0.6 seconds.

Bytes to Follow: 1 Byte

- 0 - Last sweep trace before entering remote mode (sweep trace in RAM)
- 1- 70 = Specific saved sweep number (stored sweeps in EEPROM)

Site Master Returns: Valid Sweep: 628 bytes

- 1-2) # of following bytes (626 for a valid sweep)
- 3-4) Reserved bytes
- 5-11) Model Number (7 bytes in ASCII)
- 12-15) Software Version (4 bytes ASCII)
- 16-23) Time stamp
- 24-31) Date stamp
- 32-39) Reference number stamp
- 40) Domain (0: Frequency Domain, 1: Distance Domain)
- 41) Start Frequency (highest byte)
- 42) Start Frequency
- 43) Start Frequency
- 44) Start Frequency (lowest byte)
- 45) Stop Frequency (highest byte)
- 46) Stop Frequency
- 47) Stop Frequency
- 48) Stop Frequency (lowest byte)
- 49) Minimum Frequency Step Size (Highest byte)
- 50) Minimum Frequency Step Size
- 51) Minimum Frequency Step Size
- 52) Minimum Frequency Step Size (lowest byte)
- 53) Scale Start (higher byte)
- 54) Scale Start (lower byte)
- 55) Scale Stop (higher byte)
- 56) Scale Stop (lower byte)
- 57) Frequency Marker 1 (higher byte)
- 58) Frequency Marker 1 (lower byte)
- 59) Frequency Marker 2 (higher byte)
- 60) Frequency Marker 2 (lower byte)
- 61) Frequency Marker 3 (higher byte)
- 62) Frequency Marker 3 (lower byte)
- 63) Frequency Marker 4 (higher byte)
- 64) Frequency Marker 4 (lower byte)
- 65) Limit (higher byte)
- 66) Limit (lower byte)
- 67) Start Distance (highest byte)
- 68) Start Distance
- 69) Start Distance
- 70) Start Distance (lowest byte)
- 71) Stop Distance (highest byte)
- 72) Stop Distance
- 73) Stop Distance
- 74) Stop Distance (lowest byte)
- 75) Distance Marker 1 (higher byte)
- 76) Distance Marker 1 (lower byte)
- 77) Distance Marker 2 (higher byte)
- 78) Distance Marker 2 (lower byte)
- 79) Distance Marker 3 (higher byte)

- 80) Distance Marker 3 (lower byte)
- 81) Distance Marker 4 (higher byte)
- 82) Distance Marker 4 (lower byte)
- 83) Relative Propagation Velocity (highest byte)
- 84) Relative Propagation Velocity
- 85) Relative Propagation Velocity
- 86) Relative Propagation Velocity (lowest byte)
- 87) Cable Loss (highest byte)
- 88) Cable Loss
- 89) Cable Loss
- 90) Cable Loss (lowest byte)
- 91) Center Frequency (highest byte)
- 92) Center Frequency
- 93) Center Frequency
- 94) Center Frequency (lowest byte)
- 95) Waveguide Cutoff Frequency (highest byte)
- 96) Waveguide Cutoff Frequency
- 97) Waveguide Cutoff Frequency
- 98) Waveguide Cutoff Frequency (lowest byte)
- 99) Waveguide Loss (highest byte)
- 100) Waveguide Loss
- 101) Waveguide Loss
- 102) Waveguide Loss (lowest byte)
- 103) Status byte 1: (0 = Off , 1 = On)
 - (LSB) bit 0 : Limit On/Off
 - bit 1 : Marker 1 On/Off
 - bit 2 : Marker 2 On/Off
 - bit 3 : Marker 3 On/Off
 - bit 4 : Marker 4 On/Off
 - bit 5 : Cal On/Off
 - bit 6 : Unit of measurement (0 = Metric, 1 = English)
 - bit 7 : Cal Type (0 = Coax, 1 = Waveguide)
- 104) Status byte 2: (0 = Off, 1 = On)
 - (LSB) bit 0 : Marker 2 Delta Status
 - bit 1 : Marker 3 Delta Status
 - bit 2 : Marker 4 Delta Status
 - bits 3 to 7 : Not Used
- 105) Status byte 3: (Extended Status Byte for Version 3.00 of Firmware)
 - (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 2-3: Printer Type (see control byte #1)
 - bit 4-5: Measurement Mode (see Notes)
 - bit: 5 4
 - | |
 - 0 0 - SWR
 - 0 1 - RL
 - 1 0 - Cable/Waveguide Insertion Loss
 - bit 6-7: Currently Unused
- 106 - 108) Currently Unused

109 - 624) Sweep Data (130 points * 4 bytes/point= 520 bytes)
4 bytes for each data point
1. gamma MSB
2. gamma LSB
3. phase MSB
4. 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 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

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 - 6

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, currently 0 - 6

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid store location
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 1 through 9 for data formats.

Bytes to Follow: 0 bytes

Site Master Returns: 63 bytes

- 1) Domain (0 = Frequency Domain, 1 = Distance Domain)
- 2) Start Frequency (highest byte)
- 3) Start Frequency
- 4) Start Frequency
- 5) Start Frequency (lowest byte)
- 6) Stop Frequency (highest byte)
- 7) Stop Frequency
- 8) Stop Frequency
- 9) Stop Frequency (lowest byte)
- 10) Scale Start (higher byte)
- 11) Scale Start (lower byte)
- 12) Scale Stop (higher byte)
- 13) Scale Stop (lower byte)
- 14) Frequency Marker 1 (higher byte)
- 15) Frequency Marker 1 (lower byte)
- 16) Frequency Marker 2 (higher byte)
- 17) Frequency Marker 2 (lower byte)
- 18) Frequency Marker 3 (higher byte)
- 19) Frequency Marker 3 (lower byte)
- 20) Frequency Marker 4 (higher byte)
- 21) Frequency Marker 4 (lower byte)
- 22) Limit (higher byte)
- 23) Limit (lower byte)
- 24) Start Distance (highest byte)
- 25) Start Distance
- 26) Start Distance
- 27) Start Distance (lowest byte)
- 28) Stop Distance (highest byte)
- 29) Stop Distance
- 30) Stop Distance
- 31) Stop Distance (lowest byte)
- 32) Distance Marker 1 (higher byte)
- 33) Distance Marker 1 (lower byte)
- 34) Distance Marker 2 (higher byte)

- 35) Distance Marker 2 (lower byte)
- 36) Distance Marker 3 (higher byte)
- 37) Distance Marker 3 (lower byte)
- 38) Distance Marker 4 (higher byte)
- 39) Distance Marker 4 (lower byte)
- 40) Relative Propagation Velocity (highest byte)
- 41) Relative Propagation Velocity
- 42) Relative Propagation Velocity
- 43) Relative Propagation Velocity (lowest byte)
- 44) Cable Loss (highest byte)
- 45) Cable Loss
- 46) Cable Loss
- 47) Cable Loss (lowest byte)
- 48) Center Frequency (highest byte)
- 49) Center Frequency
- 50) Center Frequency
- 51) Center Frequency (lowest byte)
- 52) Waveguide Cutoff Frequency (highest byte)
- 53) Waveguide Cutoff Frequency
- 54) Waveguide Cutoff Frequency
- 55) Waveguide Cutoff Frequency (lowest byte)
- 56) Waveguide Loss (highest byte)
- 57) Waveguide Loss
- 58) Waveguide Loss
- 59) Waveguide Loss (lowest byte)
- 60) bit data 1 : (0 = Off, 1 = On)
 - (LSB) bit 0 = Limit On/Off
 - bit 1 = Marker 1 On/Off
 - bit 2 = Marker 2 On/Off
 - bit 3 = Marker 3 On/Off
 - bit 4 = Marker 4 On/Off
 - bit 5 = Beep at Limit On/Off
 - bit 6 = Watch-dog Timer On/Off
 - bit 7 = Single Sweep Mode On/Off
- 61) bit data 2
 - (LSB) bit 0 = Fixed CW On/Off
 - bit 1 = Keyboard Lock On/Off
 - 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 : Printer type select
 - bit: 7 6 5
 - | | |
 - 0 0 0 - none, no printer selected (system default)
 - 0 0 1 - Seiko DPU-411/414 thermal printer
 - 0 1 0 - HP Deskjet 340 ink jet printer
 - 0 1 1 - 1 1 1 reserved
- 62) bit data 3: (Extended Status Byte for Version 3.00 of Firmware)
 - (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 2-3: Measurement Mode (See Notes)
 bit: 2 3
 | |
 0 0 - SWR
 0 1 - RL
 1 0 - Cable/Waveguide Insertion Loss
 bit 4 : Marker 2 Delta Status On/Off
 bit 5 : Marker 3 Delta Status On/Off
 bit 6 : Marker 4 Delta Status On/Off
 bit 7 : Currently Unused
 63) Serial Port Echo Status On/~Off (1=On, 0=Off)

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: 9 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) Battery Voltage(higher byte)
- 3) Battery Voltage(lower byte)
- 4) Temperature (higher byte)
- 5) Temperature (lower byte)
- 6) Lock Fail Counter (higher byte)
- 7) Lock Fail Counter (lower byte)
- 8) Integrator Fail Counter (higher byte)
- 9) Integrator 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 Lock Fail Counter and Analog Integrator Fail Counter.

This duplicates the functionality of the front panel icons. If the Analog Integrator takes too long to reach measurement level, due to low battery or an interfering signal, the count increments. If the phase lock cir-

cuity fails, its count increments. You can check these counters at the end of the sweep to make sure everything went okay.

The Site Master preserves the value of each of these counters when power is turned off.

Bytes to Follow: 0 bytes

Site Master Returns: 4 bytes (unsigned integer)

- 1) Lock Fail counter (higher byte)
- 2) Lock Fail counter (lower byte)
- 3) Integrator Fail Counter (higher byte)
- 4) Integrator Fail Counter (lower byte)

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

Description: Resets the Lock Fail Counter and Integrator Fail Counter.

Bytes to Follow: 0 bytes

Site Master Returns: Operation Complete Byte # 255 (FFh)

Get Options - Control Byte #24 (18h)

Description: Gets the options installed on the Site Master.

Bytes to Follow: Varied

Site Master Returns: String showing list of options installed on the Site Master. This string of alpha characters is terminated with a null.
Operation Complete Byte #255 (FFh)

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 byte

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

- 2) Trace to Perform Math Operation on (1 to 70)

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

Set OSOSL Cal Parameters - Control Byte #35 (23h)

Description: Set OSOSL Calibration Parameters

Be sure to set OSOSL calibration parameters before sequencing through the calibration steps.

Bytes to Follow: 8 bytes

- 1) Offset Length 1 (highest byte)
- 2) Offset Length 1
- 3) Offset Length 1
- 4) Offset Length 1 (lowest byte)
- 5) Offset Length 2 (highest byte)
- 6) Offset Length 2
- 7) Offset Length 2
- 8) Offset Length 2 (lowest byte)
- 9) Cut-off Frequency (highest byte)
- 10) Cut-off Frequency
- 11) Cut-off Frequency
- 12) Cut-off Frequency (lowest byte)

Site Master Returns: Operation Complete Byte #255 (FFh)

Notes: **Offset Length** is in **ten-thousandths of a millimeter** (1.0020 mm would be sent as 10020)
Cut-off Frequency is in **kHz** (10.000 GHz would be sent as 10000000)

Set OSL Cal Parameter - Control Byte #36 (24h)

Description: Set OSL Calibration Parameter

Be sure to set OSL calibration parameter before sequencing through the calibration steps.

Bytes to Follow: 1 bytes

- 1) DUT Connector Type
 - 00h: K Male
 - 01h: K Female
 - 02h: SMA Male
 - 03h: SMA Female
 - 04h: N Male or Female

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

Set Power Monitor Mode - Control Byte #38 (26h)

Description: Set Power Monitor Mode On/Off

Use this control byte to instruct the Site Master to remain in power monitor mode after exiting remote mode.

Bytes to Follow: 1 byte
00h - Off
01h - On

Site Master Returns: 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Option not available
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 byte

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.

Extra Setup Marker Info - Control Byte #49 (31h)

Description: Obtains Marker Status Information.

Bytes to Follow: 0 byte

Site Master Returns: 25 Bytes

- 1) Number of Markers for this Unit
- 2) Marker #1 On/Off Status
- 3) Reserved
- 4) Frequency Marker #1 Point (high byte)
- 5) Frequency Marker #2 Point (low byte)
- 6) Distance Marker #1 Point (high byte)
- 7) Distance Marker #2 Point (low byte)
- 8) Marker #2 On/Off Status
- 9) Marker #2 Delta Status
- 10) Frequency Marker #2 Point (high byte)
- 11) Frequency Marker #2 Point (low byte)
- 12) Distance Marker #2 Point (high byte)
- 13) Distance Marker #2 Point (low byte)
- 14) Marker #3 On/Off Status
- 15) Marker #3 Delta Status
- 16) Frequency Marker #3 Point (high byte)

- 17) Frequency Marker #3 Point (low byte)
- 18) Distance Marker #3 Point (high byte)
- 19) Distance Marker #3 Point (low byte)
- 20) Marker #4 On/Off Status
- 21) Marker #4 Delta Status
- 22) Frequency Marker #4 Point (high byte)
- 23) Frequency Marker #4 Point (low byte)
- 24) Distance Marker #4 Point (high byte)
- 25) Distance Marker #4 Point (low byte)

Extra Sweep Marker Info - Control Byte #50 (32h)

Description: Obtains Marker Status Information for a saved trace in EEPROM.

Bytes to Follow: 1 byte

- 0 - Last sweep trace before entering remote mode (sweep trace in RAM)
- 1 - 70 - Specific save sweep number (stored sweeps in EEPROM)

Site Master Returns: 25 Bytes

- 1) Number of Markers for this Unit
- 2) Marker #1 On/Off Status
- 3) Reserved
- 4) Frequency Marker #1 Point (high byte)
- 5) Frequency Marker #2 Point (low byte)
- 6) Distance Marker #1 Point (high byte)
- 7) Distance Marker #2 Point (low byte)
- 8) Marker #2 On/Off Status
- 9) Marker #2 Delta Status
- 10) Frequency Marker #2 Point (high byte)
- 11) Frequency Marker #2 Point (low byte)
- 12) Distance Marker #2 Point (high byte)
- 13) Distance Marker #2 Point (low byte)
- 14) Marker #3 On/Off Status
- 15) Marker #3 Delta Status
- 16) Frequency Marker #3 Point (high byte)
- 17) Frequency Marker #3 Point (low byte)
- 18) Distance Marker #3 Point (high byte)
- 19) Distance Marker #3 Point (low byte)
- 20) Marker #4 On/Off Status
- 21) Marker #4 Delta Status
- 22) Frequency Marker #4 Point (high byte)
- 23) Frequency Marker #4 Point (low byte)
- 24) Distance Marker #4 Point (high byte)
- 25) Distance Marker #4 Point (low byte)

Set Marker Peak - Control Byte #51 (33h)

Description: Obtains Marker Status Information for peak value in the current trace.

Bytes to Follow: 1 byte
1) Marker Number

Site Master Returns: 2 bytes
1) Marker Position at Peak (high byte)
2) Marker Position at Peak (low byte)

Set Marker Valley - Control Byte #52 (34h)

Description: Obtains Marker Status Information for valley value in the current trace.

Bytes to Follow: 1 byte
1) Marker Number

Site Master Returns: 2 Bytes
1) Marker Position at Valley (high byte)
2) Marker Position at Valley (low byte)

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 byte

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.

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 kHz	12.43 GHz = 12340000
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 on the graph. The lowest value is 0; the highest value is 129. (130 data points in total)
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/m/ft	-0.345 dB/m = 34500
Gamma	2 bytes signed	1 / 1000 (ratio)	Gamma value is the ratio of magnitude of reflected signal over the magnitude of incident signal.
Phase	2 bytes signed	1 / 10 degree	Phase value is the difference in phase between the incident and reflected signal.
Power: dBm/dBr	4 bytes unsigned	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

Mini-Applications

Anritsu can provide you with four mini-applications written in Visual Basic 4.0 (Professional Edition) for Windows. Each application is self-contained and performs several simple, but important tasks. The source code, available upon request, or on the Anritsu Web Page (www.anritsu.com), is ready to run.



Anritsu