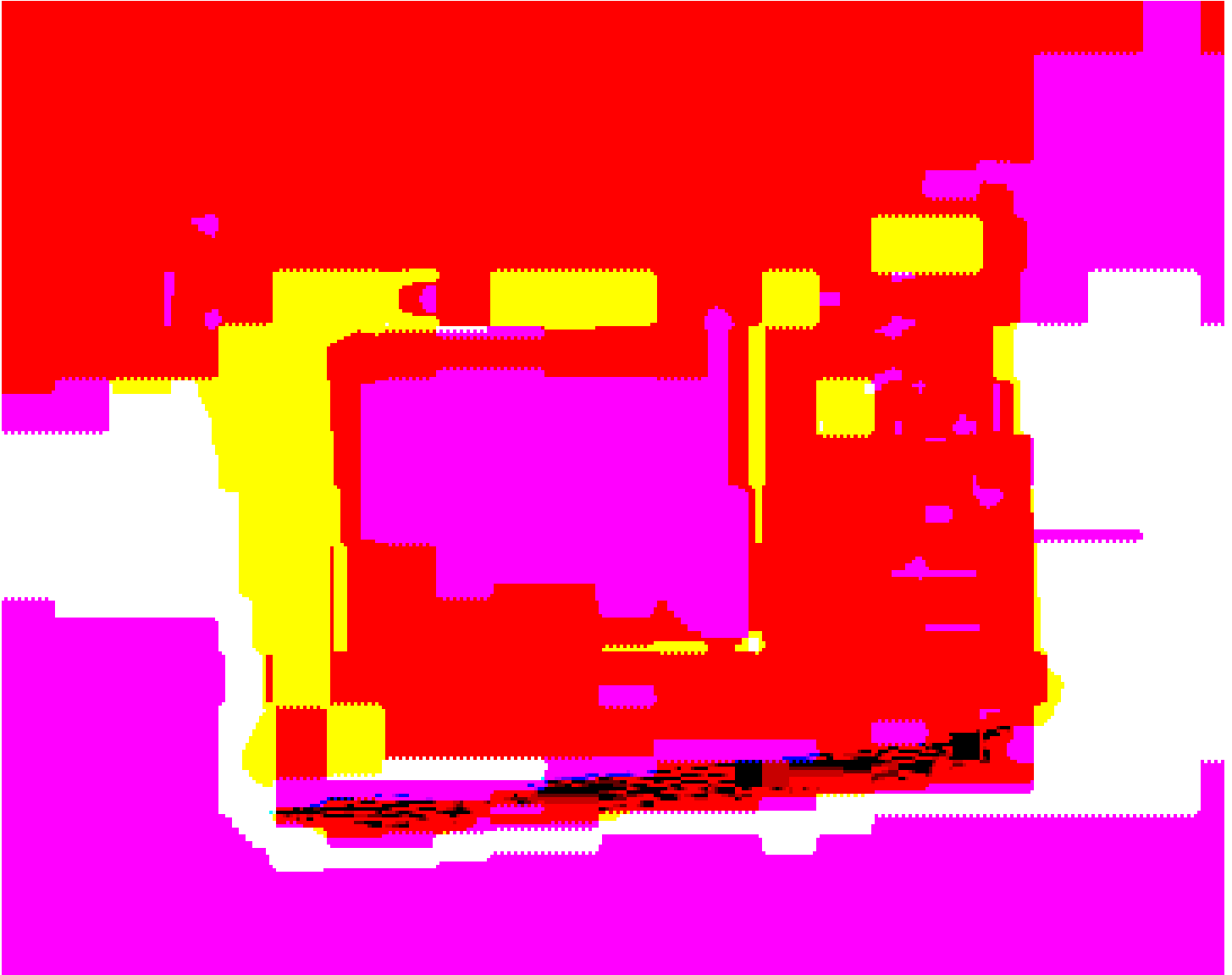


# Anritsu

**Site Master™**  
**S251B**  
**Antenna and**  
**Cable Analyzer**  

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*Programming Manual*



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

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## 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 Model S251B with firmware Version 1.52 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 test port 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 soon 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)

**RF Source Mode** - see control byte #33 (21h)

**Bias Tee On/Off** - see control byte #54 (36h)

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

## CONFIGURE MEASUREMENT

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

Site Master measurement mode selectable in frequency or distance domain, power monitor mode, or RF source 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)

**Marker peak** - see control byte #51 (33h)

**Marker valley** - see control byte #52 (34h)

#### CONFIGURE LIMITS

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

**Limit beep (on/off)** - see control byte #15 (0Fh)

**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)

**Download sweep trace** - see control byte #26 (1Ah)

**Query sweep memory** - see control byte #27 (1Bh)

## 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.

**Set trace overlay** - see control byte #34 (22h)

## CALIBRATION

**Calibrate** - see control byte #13 (0Dh)

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

## 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 2)

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
26 (1Ah)	Download sweep trace	Downloads a sweep trace to the Site Master	—
27 (1Bh)	Query sweep memory	Get percentage of Site Master memory available for trace storage	—
30 (1Eh)	Select printer type	Select printer type	Yes

Control Byte Summary (2 of 2)

Control Byte #	Name	Description	Watch-dog Timer
31 (1Fh)	Select DTF Windowing	Select DTF Windowing Methods	Yes
32 (20h)	Set Trace Math	Select Trace Math operation	—
33 (21h)	Set RF Source Mode	Sets RF Source Mode and Frequency	—
34 (22h)	Set Trace Overlay	Setup trace overlay operation and trace	—
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	—
51 (33h)	Set Marker Peak	Set marker to peak for current trace	—
52 (34h)	Set Marker Valley	set marker to valley for current trace	—
54 (36h)	Bias Tee On/Off	Turns Bias Tee function On/Off	—
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	—
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 bytes 124 and 126 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 : 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 thru 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. 1000.3 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
  - 21h : Insertion Loss
  - 22h : Insertion Gain
  - 40h : Power Monitor Mode
  - 50h : RF Source Mode

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

Insertion Loss/ Gain: 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  
Displayed value = (10,000 - value sent) / 100  
Scale Start Value is the top of the graph  
Scale Stop Value is the bottom 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 (i.e. the corresponding data point). The lowest position is 0 at the start frequency (or distance). The highest position is 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 106 to 113 for current distance markers. See control byte #20 (14h) response byte 122 for current marker on/off status and response byte 123 for the marker delta 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.

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

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

The Site Master S251B supports five limit segments. Each segment may have any finite slope and can be enabled and disabled independent of every other segment. The limit beep is enabled for all segments or no segments.

Limit segments are specified by their end points (starting and ending in “x” and “y” values).

See control byte #20 (14h) response bytes 28 to 97 for current Site Master configuration.

**Bytes to Follow:** 14 bytes:

- 1) Limit Number
- 2) Limit Line On/~Off (01h = On, 00h = Off)
- 3) Starting X (highest byte)
- 4) Starting X
- 5) Starting X
- 6) Starting X (lowest byte)
- 7) Starting Y (highest byte)
- 8) Starting Y (lowest byte)
- 9) Ending X (highest byte)
- 10) Ending X
- 11) Ending X
- 12) Ending X (lowest byte)
- 13) Ending Y (highest byte)
- 14) Ending Y (lowest byte)

**Site Master Returns:** 255 (FFh) Operation Complete Byte  
224 (E0h) Parameter Error : Invalid limit segment, 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 <b>thousandths</b> 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 <b>thousandths</b> (of ratio) Maximum value sent is 65530 which represents 65.53 Minimum value sent is 1000 which represents 1.00
Insertion Gain/ Loss:	Limit is in <b>hundredths</b> (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 98 to 105 and 114 to 121 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 current time and date.

This Time/Date is stamped into all stored sweeps (for user's 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:second). Recommended data format is "mm/dd/yyyy" (month/day/year).

Current time setting can be found in trace 0 response bytes 31 to 38 (1Fh to 26h). Current date setting can be found in trace 0 response bytes 21 to 30 (15h to 1Eh).

**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 39 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, THRU, ISOL) then trigger the calculate step. The calculate step uses the measurements obtained and generates the correction factors.

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:** 1 byte

- 1) Calibration Step to trigger
  - 01h = open
  - 02h = short
  - 03h = load
  - 04h = isolate
  - 05h = thru
  - 06h = 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.  
See control byte #20 (14h) response bytes 2 and 3 for the current configuration.

**Bytes to Follow:** 1 byte

- 1)
  - 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

---

### **Set Site Master limit beep status - Control Byte #15 (0Fh)**

**Description:** Enable or disable the limit beep for all limit segments.

**Bytes to Follow:** 1 byte

- 1) Status (00h = Off; 01h = On)

**Site Master Returns:** 255 (FFh) Operation Complete Byte  
224 (E0h) Parameter Error : Invalid status value  
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
- 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
- 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) Segment # (1)
- 86) Segment Status
- 87) Start X (highest byte)
- 88) Start X
- 89) Start X
- 90) Start X (lowest byte)
- 91) Start Y (higher byte)
- 92) Start Y (lower byte)
- 93) End X (highest byte)
- 94) End X
- 95) End X
- 96) End X (lowest byte)
- 97) End Y (higher byte)
- 98) End Y (lower byte)
- 99-154) Repeat bytes 85-98 for segments 2-5
- 155) Start Distance (highest byte)
- 156) Start Distance
- 157) Start Distance
- 158) Start Distance (lowest byte)
- 159) Stop Distance (highest byte)
- 160) Stop Distance
- 161) Stop Distance
- 162) Stop Distance (lowest byte)
- 163) Distance Marker 1 (higher byte)
- 164) Distance Marker 1 (lower byte)
- 165) Distance Marker 2 (higher byte)
- 166) Distance Marker 2 (lower byte)
- 167) Distance Marker 3 (higher byte)
- 168) Distance Marker 3 (lower byte)
- 169) Distance Marker 4 (higher byte)
- 170) Distance Marker 4 (lower byte)
- 171) Relative Propagation Velocity (highest byte)
- 172) Relative Propagation Velocity
- 173) Relative Propagation Velocity
- 174) Relative Propagation Velocity (lowest byte)
- 175) Cable Loss (highest byte)
- 176) Cable Loss
- 177) Cable Loss
- 178) Cable Loss (lowest byte)

- 179) 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
- 180) 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
- 181) Status byte 3 : (0 = Off, 1 = On)  
 (LSB) bit 0 : Unused  
 bit 1 : CW mode On/Off  
 bit 2 : Bias Tee On/Off  
 bit 3 : High Power On/Off  
 bit 4 : Cal On/Off  
 bit 5 : Not Used  
 bit 6 : Unit of Measurement (1 = metric, 0 = English)  
 bit 7 : Not Used
- 182) 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
- 183-192) Reserved Bytes
- 193-1232) Sweep Data (130 points \* 8 bytes/point = 1040 bytes)
- 193-2264) (259 points \* 8 bytes/point = 2072 bytes)
- 193-4328) (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 =  $-20000 * \log(\text{gamma}/1000)$   
 VSWR =  $(1+\text{gamma})/(1-\text{gamma})$   
 insertion loss/gain =  $-2000 * \log(\text{gamma}/10000000)$   
 phase compares the reflected to the incident (reference)  
 For Transmission Mode, Phase will be sent as 0

**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 - 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 becomes the run time setup (i.e. setup 0). This means that if the power is cycled immediately, the Site Master starts up in the mode that was recalled.

**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  
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:** 137 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 (highest byte)
- 13) Scale Start
- 14) Scale Start
- 15) Scale Start (lowest byte)
- 16) Scale Stop (highest byte)
- 17) Scale Stop
- 18) Scale Stop
- 19) Scale Stop (lowest byte)
- 20) Frequency Marker 1 (higher byte)
- 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) Segment # (1)
- 29) Segment Status
- 30) Start X (highest byte)
- 31) Start X
- 32) Start X
- 33) Start X (lowest byte)
- 34) Start Y (higher byte)
- 35) Start Y (lower byte)
- 36) End X (highest byte)
- 37) End X
- 38) End X
- 39) End X (lowest byte)
- 40) End Y (higher byte)
- 41) End Y (lower byte)
- 42-97) Repeat bytes 28-41 for segments 2-5

- 98) Start Distance (highest byte)
- 99) Start Distance
- 100) Start Distance
- 101) Start Distance (lowest byte)
- 102) Stop Distance (highest byte)
- 103) Stop Distance
- 104) Stop Distance
- 105) Stop Distance (lowest byte)
- 106) Distance Marker 1 (higher byte)
- 107) Distance Marker 1 (lower byte)
- 108) Distance Marker 2 (higher byte)
- 109) Distance Marker 2 (lower byte)
- 110) Distance Marker 3 (higher byte)
- 111) Distance Marker 3 (lower byte)
- 112) Distance Marker 4 (higher byte)
- 113) Distance Marker 4 (lower byte)
- 114) Relative Propagation Velocity (highest byte)
- 115) Relative Propagation Velocity
- 116) Relative Propagation Velocity
- 117) Relative Propagation Velocity (lowest byte)
- 118) Cable Loss (highest byte)
- 119) Cable Loss
- 120) Cable Loss
- 121) Cable Loss (lowest byte)
- 122) 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
- 123) 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
- 124) Status byte 3 : (0 = Off, 1 = On)
  - (LSB) bit 0 : Unused
  - 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
- 125) 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

- 126) Status byte 5 :
  - (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 : High Power On/Off
  - bit 5 : Bias Tee On/Off
  - bit 6-7 : Currently Unused
- 127) Serial Port Echo Status On/~Off (1=On, 0=Off)
- 128) Printer Type
- 129) Trace Overlay Status
- 130) Trace Overlay Trace Number
- 131-137) 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:** 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 circuitry 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 counter 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:** 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:** 2 + 41× number of saved traces

1-2) # of saved traces

for each trace:

- 1-2) Trace Index
- 3) Measurement Mode (refer to Control Byte #3)
- 4-21) Date/Time in string format ("MM/DD/YYYYHH:MM:SS")
- 22-25) Date/Time as Unsigned Long Integer
- 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

---

## **Download Sweep Trace - Control Byte #26 (1Ah)**

**Description:** Downloads a sweep trace to the Site Master.

**Bytes to Follow:** 1219, 2251, or 4315 Bytes (depending on resolution)

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

- 69) Frequency Marker 4 (higher byte)
- 70) Frequency Marker 4 (lower byte)
- 71) Segment # (1)
- 72) Segment Status
- 73) Start X (highest byte)
- 74) Start X
- 75) Start X
- 76) Start X (lowest byte)
- 77) Start Y (higher byte)
- 78) Start Y (lower byte)
- 79) End X (highest byte)
- 80) End X
- 81) End X
- 82) End X (lowest byte)
- 83) End Y (higher byte)
- 84) End Y (lower byte)
- 85-140) Repeat bytes 71-84 for segments 2-5
- 141) Start Distance (highest byte)
- 142) Start Distance
- 143) Start Distance
- 144) Start Distance (lowest byte)
- 145) Stop Distance (highest byte)
- 146) Stop Distance
- 147) Stop Distance
- 148) Stop Distance (lowest byte)
- 149) Distance Marker 1 (higher byte)
- 150) Distance Marker 1 (lower byte)
- 151) Distance Marker 2 (higher byte)
- 152) Distance Marker 2 (lower byte)
- 153) Distance Marker 3 (higher byte)
- 154) Distance Marker 3 (lower byte)
- 155) Distance Marker 4 (higher byte)
- 156) Distance Marker 4 (lower byte)
- 157) Relative Propagation Velocity (highest byte)
- 158) Relative Propagation Velocity
- 159) Relative Propagation Velocity
- 160) Relative Propagation Velocity (lowest byte)
- 161) Cable Loss (highest byte)
- 162) Cable Loss
- 163) Cable Loss
- 164) Cable Loss (lowest byte)
- 165) 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
- 166) 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

- 167) Status byte 3 : (0 = Off, 1 = On)  
 (LSB) bit 0 : Unused  
       bit 1 : CW mode On/Off  
       bit 2 : Bias Tee On/Off  
       bit 3 : High Power On/Off  
       bit 4 : Cal On/Off  
       bit 5 : Not Used  
       bit 6 : Unit of measurement (1 = metric, 0 = English)  
       bit 7 : Not Used
- 168) 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
- 169-178) Reserved Bytes  
 179-1219) Sweep Data (130 points \* 8 bytes/point = 1040 bytes)  
 179-2251)               (259 points \* 8 bytes/point = 2072 bytes)  
 179-4315)               (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

**Site Master Returns:** 255 (FFh) Operation Complete Byte  
 224 (E0h) Parameter Error : Not enough bytes transferred  
 225 (E1h) Memory Error: Not enough memory in SM to store

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

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

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

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 1 byte - % of memory currently used (0 to 100)

---

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

**Description:** Select Printer Type

**Bytes to Follow:** 1 byte

0 = No Printer Selected  
1... = Available Printers

**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 200)

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

---

## **Set RF Source Mode Frequency - Control Byte #33 (21h)**

**Description:** Sets RF Source mode frequency.

**Bytes to Follow:** 4 bytes

- 1) RF Frequency (highest byte)
- 2) RF Frequency
- 3) RF Frequency
- 4) RF Frequency (lowest byte)

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

---

## **Set Trace Overlay - Control Byte #34 (22h)**

**Description:** Setup trace overlay operation and trace.

**Bytes to Follow:** 2 bytes if turning trace overlay on; 1 byte if turning trace overlay off

- 1) Trace Overlay Operation (0 to 1)  
00h = Off  
01h = On

- 2) Trace to Perform Overlay Operation on (1 to 200)

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

---

## **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)

---

### **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)

---

### **Set Bias Tee Function - Control Byte #54 (36h)**

**Description:** Set the Bias Tee function On/Off. If the Bias Tee is turned off, the Site Master returns the results of Bias Tee.

**Bytes to Follow:** 1 Byte  
0 - Turns Bias Tee Off  
1 - Turns Bias Tee On

**Site Master Returns:** *If bias tee is turned off (1 byte)*  
255 (FFh) Operation Complete Byte  
224 (E0h) Parameter Error

*If bias tee is turned on (10 bytes)*  
1) Bias Tee board indicator (0 = no board installed; 1 = board installed)  
2) Bias Tee Current (highest byte)  
3) Bias Tee Current  
4) Bias Tee Current  
5) Bias Tee Current (lowest byte)  
6) 10 \* Bias Tee Voltage (highest byte)  
7) 10 \* Bias Tee Voltage  
8) 10 \* Bias Tee Voltage  
9) 10 \* Bias Tee Voltage (lowest byte)



- 10) 255 (FFh) Operation Complete Byte
- 224 (E0h) Parameter Error

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

---

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

**Description:** Automatically save the runtime setup when exiting remote mode.

This flag must be set once per power cycle of the Site Master. It returns to its default value when the unit is turned off. The default value is (0), Do Not automatically save the runtime setup.

**Bytes to Follow:** 1 byte

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

**Site Master Returns:** 225 (FFh) Operation Complete

---

### **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.

---

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

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

**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

- 0) Cable List Index (0 - 24)
- 1-15) Cable Description (string)
- 16) Propagation Velocity (highest byte)
- 17) Propagation Velocity
- 18) Propagation Velocity
- 19) Propagation Velocity (lowest byte)
- 20) Insertion Loss (highest byte)
- 21) Insertion Loss
- 22) Insertion Loss
- 23) 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 (0 - 24)

**Site Master Returns:** 24 bytes

- 0) Upper Bound of Custom Cable Index
- 1-15) Cable Description (string)
- 16) Propagation Velocity (highest byte)
- 17) Propagation Velocity
- 18) Propagation Velocity
- 19) Propagation Velocity (lowest byte)
- 20) Insertion Loss (highest byte)
- 21) Insertion Loss
- 22) Insertion Loss
- 23) Insertion Loss (lowest 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 unless you have chosen to automatically save the runtime setup at the start of the remote session (see control byte #64). 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
(G/I/L)	2 bytes unsigned	1 / 100 dB	100 dB = 0 120 dB = 22000
Limit (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(G/I/L)	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.
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: 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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