

# Anritsu

## Site Master Model S251C Antenna and Cable Analyzer

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*Programming Manual*



**Hand-Held Tester for Transmission Lines  
and other RF Components**

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## **UPDATES**

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

## Programming Overview

*NOTE: This programming manual is written exclusively for the Anritsu Site Master Model S251C. For information on firmware upgrades, contact your local Anritsu Service Center. Commands listed in this manual are not all backward-compatible with earlier Site Master Models.*

### General Description

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

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

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

### Interface Cable Installation

The Site Master is a DTE-type serial device. Communication between the Site Master and a PC is accomplished over a null modem serial cable provided with the Site Master (Anritsu part number 800-441). Connect the cable to the Serial Interface connector on the Site Master Test Connector Panel and to the appropriate COM port connector on the PC.

### Serial Communication Parameters

The Site Master begins communication at 9600 bps when first powered on. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used. The Set Baud Rate Control Byte #197 (C5h) serial command can be used to change the baud rate to 19,200, 38,400, 56,000 or 115,200. An invalid setting returns the rate to 9600.

### Communications Error Checking

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. Use the expected number of response bytes (listed in the control byte description section of this manual) when waiting for feedback 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 the current sweep. Send the Enter Remote Mode Immediately byte #70 (46h) to enter remote mode in the middle of a sweep.

The Site Master serial port buffer is one byte wide. No internal buffer exists, so waiting for the response from the unit is essential. If the Site Master is not in remote mode, sending a second byte overwrites the original byte commanding it to enter remote mode. If control byte #69 is sent, the Site Master will enter remote mode at the end of the current sweep. If control byte #70 is sent, the unit will enter remote mode as soon as it receives the byte. This means that data stored for the current sweep may be incomplete. Once a response string is received from the Site Master, the unit is ready to accept additional control bytes.

## Exiting Remote Mode

To exit remote mode, send the Exit Remote Control byte #255 (FFh) to the Site Master. The Site Master sends a response byte of 255 (FFh) then exits remote mode. Remote mode can also be exited by pressing the **ESCAPE/CLEAR** front panel key.

## Remote Mode Changes to Site Master Operating Parameters

System parameters changed during remote mode remain changed for normal operation after the unit exits remote mode. However, the changes are not automatically written to the non-volatile EEPROM. Turning off the Site Master power erases the changed settings.

To retain the changes, the setup must be saved to one of the setup memory locations. Use either the run-time setup location 0, (which holds the power-on defaults) or one of the nine other setup locations. Control byte #64 (40h) sets the auto-save flag which commands the Site Master to automatically save the changes to the run-time setup location upon exiting remote mode. See the Site Master User's Guide or information in this manual on control byte #18 (12h) for further 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, setup #1 can be stored 100,000 times and setup #2 can be stored 100,000 times, etc. Because of this, the Site Master does not automatically store the changed system parameters to the EEPROM. Be aware of the EEPROM write cycle limitation when programming the Site Master and keep the number of write cycles to a minimum.

## Documentation Conventions

Throughout this manual, the following conventions will be observed:

### Numeric Representation

Hexadecimal numbers are represented with the suffix h. For example, the decimal number 255 is represented in hexadecimal as FFh.

Binary numbers are represented with the suffix b. For example, the decimal number 2 is represented in binary as 10b.

Decimal numbers are represented with the prefix # when referring to a control byte (command byte) and without a prefix or suffix in all other cases.

### Bit Positions

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

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# 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 back light 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 136 and 138 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) (0b = Off, 1b = On)  
(LSB) bit 0 = Fixed CW mode On/Off  
bit 1 = Not Used  
bit 2 = LCD Back Light On/Off  
bit 3 = Measurement Unit Metric/English (0 = English, 1 = Metric)  
bit 4 = Cal On/Off  
bits 5-7 : Not Used

**Site Master Returns:** 255 (FFh) Operation Complete Byte  
224 (E0h) Parameter Error : Invalid Setting  
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. Otherwise, 244(E0h) will be returned.

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## Set Site Master Frequency - Control Byte #2 (02h)

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

See control byte #20 (14h) response bytes 4 to 11 for current Site Master start and stop frequencies.

**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

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

**Description:** Sets the measurement mode of the Site Master. You must have a valid calibration at current frequencies before setting a mode in the distance domain.

See control byte #20 (14h) response byte 1 for the current Site Master measurement mode.

**Byte 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
  - 50h : RF Source Mode

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

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### Set Site Master 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 12 to 19 for current Site Master scaling.

**Bytes to Follow:** 8 bytes

- 1) Scale Start Value (highest byte)
- 2) Scale Start Value
- 3) Scale Start Value
- 4) Scale Start Value (lowest byte)
- 5) Scale Stop Value (highest byte)
- 6) Scale Stop Value
- 7) Scale Stop Value
- 8) Scale Stop Value (lowest byte)

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

Note:

Return Loss & Cable Loss	Scaling is in <b>thousandths</b> 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 <b>thousandths</b> (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 <b>hundredths</b> of a dB Maximum value sent is 22000 which represents -120.0 dB Minimum value sent is 0 which represent 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 marker position and status in the current measurement mode.

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

To calculate the data point from a frequency (or distance) do the following:

$$\text{point} = (\text{resolution} - 1) * (\text{marker freq} - \text{start freq}) / (\text{stop freq} - \text{start freq})$$

See control byte #20 (14h) response bytes 20 to 31 for current frequency markers.

See control byte #20 (14h) response bytes 114 to 125 for current distance markers.

See control byte #20 (14h) response byte 134 for current marker on/off status and byte 135 for the marker delta status.

**Bytes to Follow:** 5 bytes

- 1) Marker Number (01h-06h : marker 1-6)
- 2) Marker Line On/Off (01h = On, 00h = Off)
- 3) Marker Delta On/Off (01h = On, 00h = Off)<sup>1</sup>
- 4) Marker Value (highest byte)
- 5) Marker Value (lowest 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

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## Set Segmented Limit Lines - Control Byte #6 (06h)

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

S251C supports 5 limit segments. Each segment may have any finite slope and can be enabled and disabled independently of every other segment. The limit beep is enabled for all segments or no segments.

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

See control byte #20 (14h) response byte 36 to 105 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) (Frequency in Hz)
- 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) (Frequency in Hz)
- 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

<sup>1</sup> This byte is not applicable for markers 5 and 6. It will be ignored by the Site Master.



## 238 (EEh) Time-out Error

**Limit Values** depend on the current display mode selected.

Return Loss &	Limit is in <b>thousandths</b> of a dB
Cable Loss	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 a dB Maximum value sent is 22000 which represents -120.0 dB Minimum value sent is 0 which represents 100.0 dB

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

**Description:** Sets Distance to Fault parameters.

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

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

See control byte #20 (14h) response bytes 106 to 113 and 126 to 133 for current Site Master configuration.

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

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

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

**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

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## Set Time/Date - Control Byte #8 (08h)

**Description:** Sets the current time and date.

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

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

The current time setting can be found by using control byte #17 to recall trace 0 and examining response bytes 31-38.

The current date setting can be found by using control byte #17 to recall trace 0 and examining response bytes 21-30.

**Bytes to Follow:** 7 bytes

- 1) Hour : 0-23
- 2) Minute : 0-59
- 3) Month : 1-12
- 4) Day : 1-31
- 5) Year (highest byte) : Treat the two bytes as an integer. E.g. 07h,D1h stands for
- 6) Year (lowest byte)        2001
- 7) Daylight Saving (ON/~OFF) : 0 or 1

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

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## Set Reference Number - Control Byte #9 (09h)

**Description:** Stores a Reference Number with the sweep trace.

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

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

**Bytes to Follow:** 16 bytes (ASCII text string)

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

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## 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

**Byte 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

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### Single Sweep Mode On/Off - Control Byte #11 (0Bh)

**Description:** Enables or disables the Single Sweep Mode during Site Master modes of operation. 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 and waits for either the Run/Hold Key of the Site Master keypad or triggering byte #48 (30h).

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

**Byte 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

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### 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.

**Byte to Follow:** 1 byte

- 1) Watch-dog timer On/Off
  - 00h = Off
  - 01h = On

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

---

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

**Description:** Initiates a calibration step.

The Site Master must be calibrated to give accurate measurements. Calibration is based on frequency range. Once the frequency range is set, sequence the calibration process using this control byte. Measure each component (open, short, load) then trigger the calculate step. The calculate step uses the measurements obtained and generates the correction factors.

When this control byte is received, any old calibration data is lost. The Site Master does the calibration step specified by the second byte. After the measurements, the calculation step must be triggered to complete the calibration.

After receiving the calculate byte, the Site Master checks to see if all 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 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

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### Set Site Master Data Points - Control Byte #14 (0Eh)

**Description:** Set number of measurement data points for Site Master modes. See control byte #20 (14h) response bytes 2 and 3 for the current configuration.

**Byte to Follow:** 1 byte

- 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

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### Set Site Master Limit Beep Status - Control Byte #15 (0Fh)

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

**Byte to Follow:** 1 byte

- 00h = Limit Beep Status Off
- 01h = Limit Beep Status On

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

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### Store Sweep Trace - Control Byte #16 (10h)

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

**Byte 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 (total length – 2)
- 3-4) Not Used
- 5-11) Model Number (7 bytes in ASCII)
- 12-15) Software Version (4 bytes ASCII)
- 16) Measurement Mode
- 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 (highest byte)
- 78) Frequency Marker 1 (lowest byte)
- 79) Frequency Marker 2 (highest byte)
- 80) Frequency Marker 2 (lowest byte)
- 81) Frequency Marker 3 (highest byte)
- 82) Frequency Marker 3 (lowest byte)
- 83) Frequency Marker 4 (highest byte)
- 84) Frequency Marker 4 (lowest byte)
- 85) Frequency Marker 5 (highest byte)
- 86) Frequency Marker 5 (lowest byte)
- 87) Frequency Marker 6 (highest byte)
- 88) Frequency Marker 6 (lowest byte)
- 89) Single limit line value (highest byte)
- 90) Single limit line value
- 91) Single limit line value

- 92) Single limit line value (lowest byte)
- 93) Segment # (1)
- 94) Segment Status
- 95) Start X (highest byte)
- 96) Start X
- 97) Start X
- 98) Start X (lowest byte)
- 99) Start Y (highest byte)
- 100) Start Y (lowest byte)
- 101) End X (highest byte)
- 102) End X
- 103) End X
- 104) End X (lowest byte)
- 105) End Y (highest byte)
- 106) End Y (lowest byte)
- 107–162) Repeat bytes 93-106 for segments 2-5
- 163) Start Distance (highest byte)
- 164) Start Distance
- 165) Start Distance
- 166) Start Distance (lowest byte)
- 167) Stop Distance (highest byte)
- 168) Stop Distance
- 169) Stop Distance
- 170) Stop Distance (lowest byte)
- 171) Distance Marker 1 (highest byte)
- 172) Distance Marker 1 (lowest byte)
- 173) Distance Marker 2 (highest byte)
- 174) Distance Marker 2 (lowest byte)
- 175) Distance Marker 3 (highest byte)
- 176) Distance Marker 3 (lowest byte)
- 177) Distance Marker 4 (highest byte)
- 178) Distance Marker 4 (lowest byte)
- 179) Distance Marker 5 (highest byte)
- 180) Distance Marker 5 (lowest byte)
- 181) Distance Marker 6 (highest byte)
- 182) Distance Marker 6 (lowest byte)
- 183) Relative Propagation Velocity (highest byte)
- 184) Relative Propagation Velocity
- 185) Relative Propagation Velocity
- 186) Relative Propagation Velocity (lowest byte)
- 187) Cable Loss (highest byte)
- 188) Cable Loss
- 189) Cable Loss
- 190) Cable Loss (lowest byte)
- 191) 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 : Marker 5 On/Off
  - bit 5 : Marker 6 On/Off
  - bit 6-7 : Not Used
- 192) Status Byte 2: (0 = Off, 1 = On)
  - (LSB) bit 0 : Marker 2 delta On/Off
  - bit 1 : Marker 3 delta On/Off
  - bit 2 : Marker 4 delta On/Off
  - bit 3-7: Not Used
- 193) Status Byte 3: ( 0 = Off , 1 = On)
  - (LSB) bit 0 : single limit line On/Off
  - bit 1 : CW mode On/Off

bit 2 : Bias – T On/Off  
bit 3 : High Power On/Off  
bit 4 : Not Used  
bit 5 : Cal On/Off  
bit 6 : Limit Type ( 0 = Single; 1 = multiple)  
bit 7 : Unit of measurement (1 = metric, 0 = English)

194) Status Byte 4:

(LSB) bit 0 - 1 : DTF Windowing Mode  
bit: 1 0  
| |  
0 0 - Rectangular (No Windowing)  
0 1 - Nominal Side Lobe  
1 0 - Low Side Lobe  
1 1 - Minimum Side Lobe

bit 2 – 7 : Not Used

195–228) Not Used (34 bytes)

229-1268) Sweep Data (130 points \* 8 bytes/point=1040 Bytes)

229-2300) (259 points \* 8 bytes/point= 2072 bytes)

229-4364) (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(Gamma/1000)  
VSWR = (1+Gamma)/(1-Gamma)  
insertion loss/gain = - 2000 \* log(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, 00h for Site Master)
- 5-11) Extended Model # (7 bytes in ASCII)

**Invalid sweep location :** 1 byte

224 (E0) : Parameter error : Invalid sweep location

Notes:

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

**Phase** is in **tenths** of 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 Query System Status - Control Byte #20 (14h) (except Serial Port Echo status) to the specified store location. Store location 0 is the run-time setup of the Site Master. It holds the power-on defaults of the Site Master.

**Bytes to Follow:** 1 byte

- 1) Location to save system setup parameters, 0 - 10

**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 Query System Status (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 from which to recall system setup parameters:
  - 0 = Run time setup
  - 1 – 10 = Saved setups
  - 255 = Default setup

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

---

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

**Description:** Queries the Site Master for current system settings.

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

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 176 bytes

- 1) Measurement Mode
- 2) Site Master Mode Data Points (highest byte)
- 3) Site Master Mode Data Points (lowest 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 (highest byte)
- 21) Frequency Marker 1 (lowest byte)
- 22) Frequency Marker 2 (highest byte)
- 23) Frequency Marker 2 (lowest byte)



- 24) Frequency Marker 3 (highest byte)
- 25) Frequency Marker 3 (lowest byte)
- 26) Frequency Marker 4 (highest byte)
- 27) Frequency Marker 4 (lowest byte)
- 28) Frequency Marker 5 (highest byte)
- 29) Frequency Marker 5 (lowest byte)
- 30) Frequency Marker 6 (highest byte)
- 31) Frequency Marker 6 (lowest byte)
- 32) Single limit line value (highest byte)
- 33) Single limit line value
- 34) Single limit line value
- 35) Single limit line value (lowest byte)
- 36) Segment # (1)
- 37) Segment Status
- 38) Start X (highest byte)
- 39) Start X
- 40) Start X
- 41) Start X (lowest byte)
- 42) Start Y (highest byte)
- 43) Start Y (lowest byte)
- 44) End X (highest byte)
- 45) End X
- 46) End X
- 47) End X (lowest byte)
- 48) End Y (highest byte)
- 49) End Y (lowest byte)
- 50-105) Repeat bytes 36-49 for segments 2-5
- 106) Start Distance (highest byte)
- 107) Start Distance
- 108) Start Distance
- 109) Start Distance (lowest byte)
- 110) Stop Distance (highest byte)
- 111) Stop Distance
- 112) Stop Distance
- 113) Stop Distance (lowest byte)
- 114) Distance Marker 1 (highest byte)
- 115) Distance Marker 1 (lowest byte)
- 116) Distance Marker 2 (highest byte)
- 117) Distance Marker 2 (lowest byte)
- 118) Distance Marker 3 (highest byte)
- 119) Distance Marker 3 (lowest byte)
- 120) Distance Marker 4 (highest byte)
- 121) Distance Marker 4 (lowest byte)
- 122) Distance Marker 5 (highest byte)
- 123) Distance Marker 5 (lowest byte)
- 124) Distance Marker 6 (highest byte)
- 125) Distance Marker 6 (lowest byte)
- 126) Relative Propagation Velocity (highest byte)
- 127) Relative Propagation Velocity
- 128) Relative Propagation Velocity
- 129) Relative Propagation Velocity (lowest byte)
- 130) Cable Loss (highest byte)
- 131) Cable Loss
- 132) Cable Loss
- 133) Cable Loss (lowest byte)
- 134) 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 : Site Master Marker 5 On/Off
- bit 5 : Site Master Marker 6 On/Off
- bit 6 - 7 : Not Used
- 135) 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
- 136) Status Byte 3: ( 0 = Off , 1 = On)  
(LSB) bit 0 : Single Limit Status On/Off  
bits 1-3: Not Used  
bit 4 : Site Master Cal On/Off  
bit 6 : Site Master Limit Beep On/Off  
bit 7 : Not Used
- 137) 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 : Not Used
- 138) Status Byte 5:  
(LSB) bit 0 : Fixed CW mode On/Off  
bit 1 : Not Used  
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 : Not Used
- 139) Serial Port Echo Status On/~Off (1=On, 0=Off)
- 140) Printer Type
- 141) Trace Overlay Status
- 142) Trace Overlay Trace Number
- 143) Current Language  
( 0 = English, 1 = French, 2 = German, 3 = Spanish, 4 = Chinese, 5 = Japanese)
- 144) LCD Contrast Value (0-255)
- 145) RTC battery (highest byte)
- 146) RTC battery (lowest byte)
- 147) PC board revision (highest byte) (internal use only)
- 148) PC board revision (lowest byte)
- 149-176) Not Used

Note: bit Value: (0b = Off, 1b = 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: (0b = Fail, 1b = Pass)  
(LSB) bit 0 : Phase Lock Loop  
bit 1 : Integrator  
bit 2 : Battery  
bit 3 : Temperature

- bit 4 : EEPROM read/write
- bit 5 : RTC battery
- bits 6-7 : Not Used.
- 2) Battery Voltage (highest byte)
- 3) Battery Voltage (lowest byte)
- 4) Temperature (highest byte)
- 5) Temperature (lowest byte)
- 6) Lock Fail Counter (highest byte)
- 7) Lock Fail Counter (lowest byte)
- 8) Integrator Fail Counter (highest byte)
- 9) Integrator Fail Counter (lowest 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. Check these counters at the end of the sweep to insure a successful measurement.

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 (highest byte)
  - 2) Lock Fail Counter (lowest byte)
  - 3) Integrator Fail Counter (highest byte)
  - 4) Integrator Fail Counter (lowest 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)

---

### 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 x number of save traces + Operation Complete Byte (FFH)

1-2) # of saved traces

for each trace:

1-2) Trace Index

3) Measurement Mode (refer to Control Byte #3)

4-21) Date/Time in string format (“MM/DD/YYYYHH:MM:SS”)

22-25) Date/Time as Unsigned Long Integer (seconds since January 1, 1970)

26–41) Trace Name (16 bytes)

---

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

**Description:** Delete single trace 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:** Operation Complete Byte # 255 (FFh)

---

## Upload Sweep Trace - Control Byte #26 (1Ah)

**Description:** Uploads a sweep trace to the Site Master

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

- 1-2) # of following bytes
- 3) Measurement Mode
- 4-7) Time/Date(in Long Integer)
- 8-17) Date in String Format(mm/dd/yyyy)
- 18-25) Time in String Format(hh:mm:ss)
- 26-41) Reference number stamp
- 42-43) # data points
- 44) Start Frequency (highest byte)
- 45) Start Frequency
- 46) Start Frequency
- 47) Start Frequency (lowest byte)
- 48) Stop Frequency (highest byte)
- 49) Stop Frequency
- 50) Stop Frequency
- 51) Stop Frequency (lowest byte)
- 52) Minimum Frequency Step Size (highest byte)
- 53) Minimum Frequency Step Size
- 54) Minimum Frequency Step Size
- 55) Minimum Frequency Step Size (lowest byte)
- 56) Scale Top (highest byte)
- 57) Scale Top
- 58) Scale Top
- 59) Scale Top (lowest byte)
- 60) Scale Bottom (highest byte)
- 61) Scale Bottom
- 62) Scale Bottom
- 63) Scale Bottom (lowest byte)
- 64) Frequency Marker 1 (highest byte)
- 65) Frequency Marker 1 (lowest byte)
- 66) Frequency Marker 2 (highest byte)
- 67) Frequency Marker 2 (lowest byte)
- 68) Frequency Marker 3 (highest byte)
- 69) Frequency Marker 3 (lowest byte)
- 70) Frequency Marker 4 (highest byte)
- 71) Frequency Marker 4 (lowest byte)
- 72) Frequency Marker 5 (highest byte)
- 73) Frequency Marker 5 (lowest byte)
- 74) Frequency Marker 6 (highest byte)
- 75) Frequency Marker 6 (lowest byte)
- 76) Single Limit Line value (highest byte)
- 77) Single Limit Line value

- 78) Single Limit Line value
- 79) Single Limit Line value (lowest byte)
- 80) Segment # (1)
- 81) Segment Status
- 82) Start X (highest byte)
- 83) Start X
- 84) Start X
- 85) Start X (lowest byte)
- 86) Start Y (highest byte)
- 87) Start Y (lowest byte)
- 88) End X (highest byte)
- 89) End X
- 90) End X
- 91) End X (lowest byte)
- 92) End Y (highest byte)
- 93) End Y (lowest byte)
- 94–149) Repeat bytes 80-93 for segments 2-5
- 150) Start Distance (highest byte)
- 151) Start Distance
- 152) Start Distance
- 153) Start Distance (lowest byte)
- 154) Stop Distance (highest byte)
- 155) Stop Distance
- 156) Stop Distance
- 157) Stop Distance (lowest byte)
- 158) Distance Marker 1 (highest byte)
- 159) Distance Marker 1 (lowest byte)
- 160) Distance Marker 2 (highest byte)
- 161) Distance Marker 2 (lowest byte)
- 162) Distance Marker 3 (highest byte)
- 163) Distance Marker 3 (lowest byte)
- 164) Distance Marker 4 (highest byte)
- 165) Distance Marker 4 (lowest byte)
- 166) Distance Marker 5 (highest byte)
- 167) Distance Marker 5 (lowest byte)
- 168) Distance Marker 6 (highest byte)
- 169) Distance Marker 6 (lowest byte)
- 170) Relative Propagation Velocity (highest byte)
- 171) Relative Propagation Velocity
- 172) Relative Propagation Velocity
- 173) Relative Propagation Velocity (lowest byte)
- 174) Cable Loss (highest byte)
- 175) Cable Loss
- 176) Cable Loss
- 177) Cable Loss (lowest byte)
- 178) 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 : Marker 5 On/Off
  - bit 5 : Marker 6 On/Off
  - bit 6-7 : Not Used
- 179) Status Byte 2: (0 = Off, 1 = On)
  - (LSB) bit 0 : Marker 2 delta On/Off
  - bit 1 : Marker 3 delta On/Off
  - bit 2 : Marker 4 delta On/Off
  - bit 3-7: Not Used
- 180) Status Byte 3: ( 0 = Off , 1 = On)
  - (LSB) bit 0 : Single limit On/Off

bit 1 : CW Mode On/Off  
bit 2 : Bias – T On/Off  
bit 3 : High Power On/Off  
bit 4 : Not Used  
bit 5 : Cal On/Off  
bit 6 : Limit Type ( 0b = Single; 1b = Multiple)  
bit 7 : Unit of measurement (1b = Metric, 0b = English)

181) Status Byte 4:

(LSB) bit 0 - 1 : DTF Windowing Mode  
bit: 1 0  
| |  
0 0 - Rectangular (No Windowing)  
0 1 - Nominal Side Lobe  
1 0 - Low Side Lobe  
1 1 - Minimum Side Lobe

bits 2 – 7 : Not Used

182-215)

Not Used (34 bytes)

216-1255)

Sweep Data (130 points \* 8 bytes/point= 1040 Bytes)

216-2287)

(259 points \* 8 bytes/point= 2072 bytes)

216-4351)

(517 points \* 8 bytes/point= 4136 bytes)

8 bytes for each data point

1. Gamma 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 Site Master to store  
238 (EEh) Time-out Error

Note:  $\text{return loss} = -20 * \log(\text{Gamma})$   
 $\text{VSWR} = (1 + \text{Gamma}) / (1 - \text{Gamma})$   
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

Printer ID

- 0 – Epson Stylus Models
- 1 – Epson LQ Models
- 2 – Citizen PN Models
- 3 – NEC Superscript Models
- 4 – NEC Silentwriter Models
- 5 – Seiko DPU 411, 414 Models
- 6 – Canon BJC 50
- 7 – Canon BJC 80
- 8 – Canon BJC 250
- 9 – Canon BJC 4400
- 10 – HP DJ 340, 350
- 11 – HP DJ 500 Series
- 12 – HP DJ 600 Series
- 13 – HP DJ 800 Series
- 14 – HP DJ 1120
- 15 – HP LJ 6L, 6P, 4000
- 16 – Epson Esc/P Compatible
- 17 – Epson Esc/P2 Compatible
- 18 – Epson Esc/P Raster Compatible
- 19 – HP PCL3 Compatible

**Site Master Returns:** 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 bytes

- 1) Trace Math Operation (0 to 2)
  - 00h = Off
  - 01h = Subtraction
  - 02h = Addition

- 2) Trace on which to Perform Math Operation (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 status and Frequency. Frequency should be sent in Hz.

**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  
238 (EEh) Time-out Error

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

---

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

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

**Bytes to Follow:** 2 bytes

- 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  
238 (EEh) Time-out Error

---

### Get Options - Control Byte #37 (25h)

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

5 = "Option 5" – Power Meter  
10A = "Option 10A" – Bias T

**Bytes to Follow:** 0 bytes

**Site Master Returns:** : 1-5 bytes, depending on the option(s)  
Maximum String: "5,10A"  
Minimum String: "5"  
If NO options are installed: "None"

---

### 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 bytes

**Site Master Returns:** 21 bytes  
1) Status Byte (0b = Off, 1b = On)  
(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  
bits 5- 7 : Not 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 or 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 1000 of dBm.

Relative power is in 1000 of dBr.

Offset is in 1000 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 (dB 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 (01h = On, 00h = Off)

2 - 5) Offset Power level in dB\*1000

**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 with 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, this byte does nothing.

Note: 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:** Return smart battery status

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 17 bytes

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

Note: The Smart Battery Data Spec is at <http://www.sbs-forum.org/specs/index.html>

---

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

**Description:** Obtains Marker status information for peak value in the current trace. The value of the byte for marker number should be the marker number -1. For example, to set marker 1 to peak, send command number 51 followed by 0.

The return value is a display point. To calculate the corresponding frequency (or distance):

$$\text{Marker Frequency} = (\text{resolution} - 1) * (\text{marker freq} - \text{start freq})$$

**Bytes to Follow:** 1 byte

- 1) Marker Number (00h - 03h)

**Site Master Returns:** 2 bytes

- 1) Marker Position at Peak (highest byte)
  - 2) Marker Position at Peak (lowest byte)
-

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

**Description:** Obtains Marker status information for valley value in the current trace. The value of the byte for marker number should be the marker number -1. For example, to set marker 1 to valley, send command number 52 followed by 0.

The return value is a display point. To calculate the corresponding frequency (or distance):

$$\text{Marker Frequency} = (\text{resolution} - 1) * (\text{marker freq} - \text{start freq})$$

**Bytes to Follow:** 1 byte

- 1) Marker Number (00h - 03h)

**Site Master Returns:** 2 bytes

- 1) Marker Position at Valley (highest byte)
  - 2) Marker Position at Valley (lowest byte)
- 

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

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

**Bytes to Follow:** 1 byte

- 00h - Turns the Bias Tee Off
- 01h - Turns the Bias Tee On

**Site Master Returns:**

If bias tee is turned Off (1 byte)

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

If bias tee is turned On (10 Bytes)

- 1) Bias Tee Board Indicator (00h = No Board Installed, 01h = 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) : voltage value is in volt/10
- 7) 10 \* Bias Tee Voltage
- 8) 10 \* Bias Tee Voltage
- 9) 10 \* Bias Tee Voltage (lowest byte)
- 10) 255 (FFh) Operation Complete Byte
- 224 (E0h) Parameter Error

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.

---

### Set Site Master Single Limit - Control Byte #55 (37h)

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

S251C supports Single Limit Line. The Control Byte will set the limit status and the limit value for current measurement mode.

**Bytes to Follow:** 3 bytes

- 1) Limit status (01h = On; 00h = Off)
- 2) Limit Y (highest byte)
- 3) Limit 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** depend on the current display mode selected.

Return Loss &	Limit is in <b>thousandths</b> of a dB
Cable Loss	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 a dB Maximum value sent is 22000 which represents -120.0 dB Minimum value sent is 0 which represents 100.0 dB

---

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

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

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

**Bytes to Follow:** 1 byte

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

**Site Master Returns:** 255 (FFh) Operation Complete  
238 (EEh) Time Out Error

---

### Enter Remote Mode - Control Byte #69 (45h)

**Description:** Enter remote mode 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, 0Dh for S251C)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version (4 bytes in 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, 0Dh for S251C)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version (4 bytes in 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:** 25 bytes

- 1) Not Used
- 2) Cable List Index (0 - 49)
- 3 – 17) Cable Description (ASCII)
- 18) Propagation Velocity (highest byte)
- 19) Propagation Velocity
- 20) Propagation Velocity
- 21) Propagation Velocity (lowest byte)
- 22) Insertion Loss (highest byte)
- 23) Insertion Loss
- 24) Insertion Loss
- 25) Insertion Loss (lowest byte)

**Site Master Returns::** 255 (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:** 2 bytes

- 1) Not Used
- 2) Cable List Index (0-49)

**Site Master Returns:** 24 bytes

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

### Set Site Master Marker (Peak/Valley) - Control Byte #129 (81h)

**Description:** Sets an individual marker in current measurement mode.

The Site Master sets the position of a marker by its relative position on the graph. The lowest position is 0 at the start frequency (or distance). The highest position is at the stop frequency (or distance). The On/Off Status of a Marker can be toggled using this control byte.

**Bytes to Follow:** 2 bytes

- 1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
- 2) Marker Line Search Status (01h = Peak , 00h = Valley)

**Site Master Returns:**

Ok: (3 bytes)

- 1) Marker Position (highest byte)
- 2) Marker Position (lowest byte)
- 3) 255 (FFh) Operation Complete Byte

Failure: (1 byte)

- 224 (E0h) Parameter Error : Invalid marker, marker status, or marker position
  - 238 (EEh) Time-out Error
- 

### Set Baud Rate - Control Byte #197 (C5h)

**Description:** Sets the Baud Rate for serial communications. An invalid setting returns the baud rate to 9600.

**Bytes to Follow:** 1 byte

Baud rate index:

- 00h = 9600 baud
- 01h = 19200 baud
- 02h = 38400 baud
- 03h = 56000 baud
- 04h = 115200 baud

**Site Master Returns: :** 255 (FFh) Operation Complete  
224 (E0h) Parameter Error: Invalid baud rate setting.  
238 (EEh) Time Out Error

---

### Set Language – Control Byte #198 (C6h)

**Description:** Set the Site Master display language.

**Byte to Follow:** 1 byte

- 00h = English
- 01h = French
- 02h = German
- 03h = Spanish
- 04h = Chinese
- 05h = Japanese

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

---

### Query Time - Control Byte #208 (D0h)

**Description:** Queries the Site Master for the current time in ASCII format.

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 8 bytes “HH:MM:SS”

- 1) Hour
  - 2) Hour
  - 3) :
  - 4) Minute
  - 5) Minute
  - 6) :
  - 7) Second
  - 8) Second
- 

### Read Main Serial Number - Control Byte #221 (DDh)

**Description:** Returns the 1<sup>st</sup> serial number

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 4 bytes

- 1) Main Serial Number (highest byte)
  - 2) Main Serial Number
  - 3) Main Serial Number
  - 4) Main Serial Number (lowest byte)
- 

### Read ASCII Serial Number - Control Byte #225 (E1h)

**Description:** Reads and returns the Site Master serial number as 8 ASCII bytes.

**Bytes to Follow:** 1 byte

Serial number storage location

01h=main Site Master serial number,

02h=secondary Site Master serial number,

**Site Master Returns:** 8 bytes

1-8) Serial Number (in ASCII)

---

### Exit Remote Mode - Control Byte #255 (FFh)

**Description:** Site Master exits remote mode

**Bytes to Follow:** 0 bytes

**Site Master Returns:** 255 (FFh) Operation Complete

The computer sends the Exit Remote control byte #255 (FFh) to the Site Master. Site Master Returns a confirm flag (FFh). The Site Master resumes sweeping, either continuously or singly.

You may also press the “ESCAPE” key on the Site Master key pad to exit from remote mode (given that the serial communication is still in sync). In this case, the Site Master does not return a confirm byte to the serial port.

When exiting remote mode, system parameters changed during remote mode are used immediately.

System parameters changed during remote mode are not written to the non-volatile EEPROM.

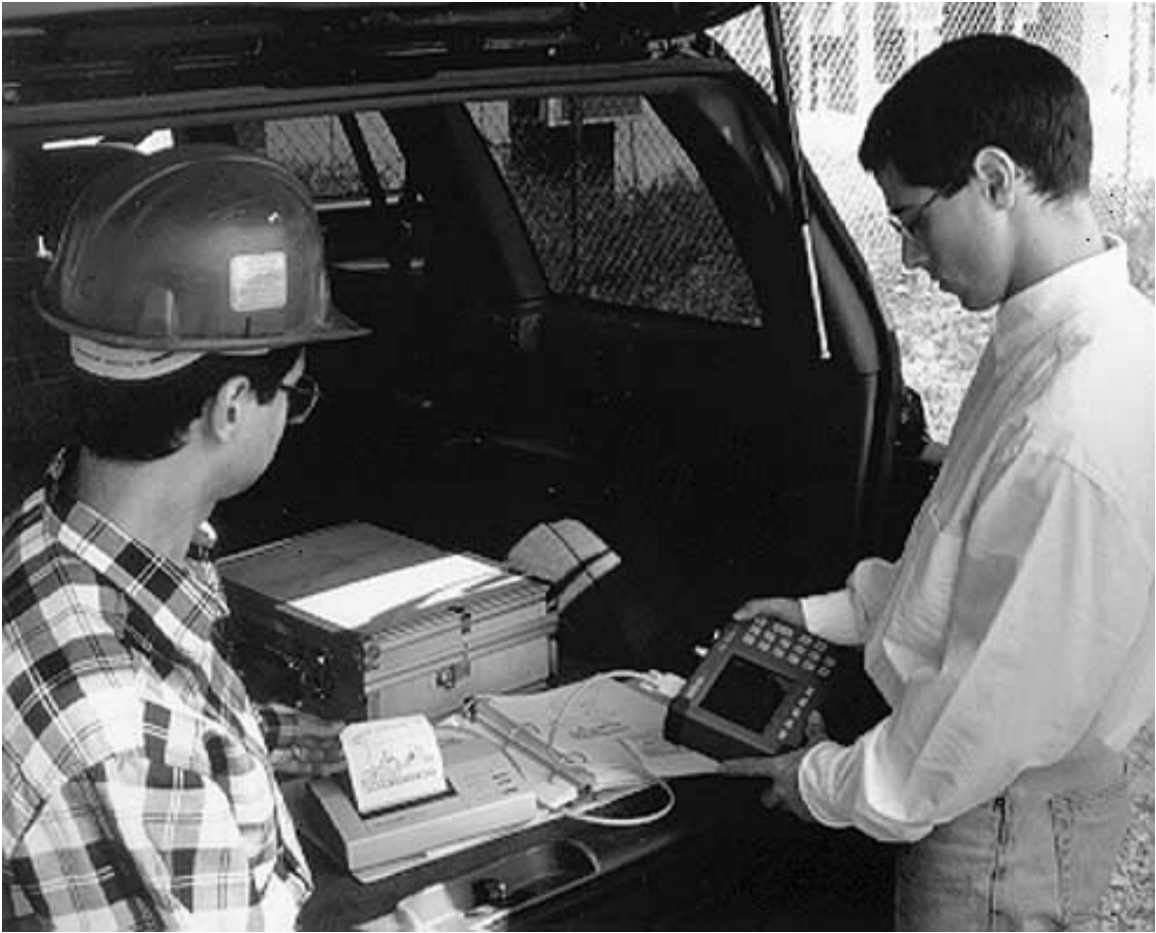
You may want to save the change to the run-time setup (saved setup location 0, which holds the power-on defaults) or one of the nine saved setups (saved setup location 1-9). See control byte #18 (12h) for details.

## Parameter Definitions

Parameter	# of bytes	Step	Example / Description
Frequency	4 bytes unsigned	1 Hz	1000.3 MHz = 1000300000
Scale (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(G/IL)	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/IL)	2 bytes unsigned	1 / 100 dB	100 dB = 0 120 dB = 22000
Markers (Frequency & distance marker)	2 bytes unsigned	1 sweep point	Marker Values are given in relative position of the graph. The lowest value is 0, while the highest 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	-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







**Anritsu**