Site Master™
S810D/S820D

Cable and Antenna Analyzer
25 MHz to 20 GHz

Programming Manual

10680-00002, Revision D
# Table of Contents

## Programming Overview

- General Description
- Cabling
- Serial Communication Parameters
- Communications Error Checking
- Parameter Validation
- Entering Remote Mode
- Exiting Remote Mode
- Lifetime of Changes to Site Master Operating Parameters
- Write Cycle Limitation of EEPROM
- Documentation Conventions
  - Numeric Representation
  - Bit Positions

## Control Byte Descriptions

<table>
<thead>
<tr>
<th>Control Byte Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup System – Control Byte #1 (01H)</td>
<td>7</td>
</tr>
<tr>
<td>Set Site Master VNA Frequency – Control Byte #2 (02H)</td>
<td>7</td>
</tr>
<tr>
<td>Select Measurement Mode – Control Byte #3 (03H)</td>
<td>8</td>
</tr>
<tr>
<td>Set Site Master VNA Scale – Control Byte #4 (04H)</td>
<td>9</td>
</tr>
<tr>
<td>Set Site Master VNA Marker – Control Byte #5 (05H)</td>
<td>10</td>
</tr>
<tr>
<td>Set Site Master VNA Single Limit – Control Byte #6 (06H)</td>
<td>11</td>
</tr>
<tr>
<td>Set DTF Parameter – Control Byte #7 (07H)</td>
<td>12</td>
</tr>
<tr>
<td>Set Time/Date – Control Byte #8 (08H)</td>
<td>13</td>
</tr>
<tr>
<td>Set Trace Name (Reference Number) – Control Byte #9 (09H)</td>
<td>13</td>
</tr>
<tr>
<td>Serial Port Echo On/Off – Control Byte #10 (0AH)</td>
<td>14</td>
</tr>
<tr>
<td>Site Master VNA Single Sweep Mode On/Off – Control Byte #11 (0BH)</td>
<td>14</td>
</tr>
<tr>
<td>Watch-Dog Timer On/Off – Control Byte #12 (0CH)</td>
<td>14</td>
</tr>
<tr>
<td>Sequence Site Master Calibration – Control Byte #13 (0DH)</td>
<td>15</td>
</tr>
<tr>
<td>Set Site Master VNA Data Points – Control Byte #14 (0EH)</td>
<td>15</td>
</tr>
<tr>
<td>Store Sweep Trace – Control Byte #16 (10H)</td>
<td>16</td>
</tr>
<tr>
<td>Save System Setup – Control Byte #18 (12H)</td>
<td>16</td>
</tr>
<tr>
<td>Recall System Setup – Control Byte #19 (13H)</td>
<td>16</td>
</tr>
<tr>
<td>Trigger Self-Test – Control Byte #21 (15H)</td>
<td>17</td>
</tr>
<tr>
<td>Read Fail Counter – Control Byte #22 (16H)</td>
<td>17</td>
</tr>
<tr>
<td>Read Fail Counter and Monitor Status - Control Word (AA16H)</td>
<td>18</td>
</tr>
<tr>
<td>Query Trace Names – Control Byte #24 (18H)</td>
<td>18</td>
</tr>
<tr>
<td>Delete Sweep Trace – Control Byte #25 (19H)</td>
<td>19</td>
</tr>
<tr>
<td>Query System Status – Control Byte #29 (1DH)</td>
<td>19</td>
</tr>
<tr>
<td>Select Printer Type – Control Byte #30 (1EH)</td>
<td>24</td>
</tr>
<tr>
<td>Select DTF Windowing – Control Byte #31 (1FH)</td>
<td>24</td>
</tr>
<tr>
<td>Set Site Master VNA Trace Math – Control Byte #32 (20H)</td>
<td>25</td>
</tr>
<tr>
<td>Recall Sweep Trace – Control Byte #33 (21H)</td>
<td>25</td>
</tr>
<tr>
<td>Recall Current Sweep Trace in RAM – Control Word (AA21H)</td>
<td>30</td>
</tr>
<tr>
<td>Set Site Master VNA Trace Overlay – Control Byte #34 (22H)</td>
<td>31</td>
</tr>
<tr>
<td>Upload Site Master Sweep Trace – Control Byte #36 (24H)</td>
<td>31</td>
</tr>
<tr>
<td>Get Options – Control Byte #37 (25H)</td>
<td>35</td>
</tr>
<tr>
<td>Set Smoothing Factor – Control Byte #38 (26H)</td>
<td>35</td>
</tr>
<tr>
<td>Query Power Level – Control Byte #39 (27H)</td>
<td>35</td>
</tr>
<tr>
<td>Set Power Monitor Units – Control Byte #40 (28H)</td>
<td>36</td>
</tr>
<tr>
<td>Power Monitor Relative Mode On/Off – Control Byte #41 (29H)</td>
<td>36</td>
</tr>
<tr>
<td>Power Monitor Offset Mode On/Off – Control Byte #42 (2AH)</td>
<td>37</td>
</tr>
</tbody>
</table>
POWER MONITOR ZERO MODE ON/OFF – CONTROL BYTE #43 (2BH)  (OPTION 5 OR OPTION 22 ONLY) ..............37
TRIGGER SWEEP – CONTROL WORD (AA30H) .................................................................37
CHECK BATTERY STATUS – CONTROL BYTE #50 (32H) .................................................................38
AUTOMATICALLY SAVE RUNTIME SETUP – CONTROL BYTE #64 (40H) .........................................38
ENTER REMOTE MODE – CONTROL BYTE #69 (45H) .................................................................39
ENTER REMOTE MODE IMMEDIATELY – CONTROL BYTE #70 (46H) ............................................40
VIRTUAL KEY PRESS – CONTROL BYTE #75 (4BH) .....................................................................40
RECALL CABLE LIST – CONTROL BYTE #81 (51H) .................................................................41
SET SITE MASTER VNA SEGMENTED LIMIT LINES – CONTROL BYTE #112 (70H) ....................42
READ MARKER VALUE – CONTROL BYTE #117 (75H) ..........................................................43
SET SITE MASTER MARKER (PEAK/VALLEY) – CONTROL BYTE #129 (81H) .......................44
SET WAVEGUIDE COMPATIBLE FLANGE CAL PARAMETER – CONTROL BYTE #130 (82H) ..........44
SET COAXIAL DUT CONNECTOR TYPE CAL PARAMETER – CONTROL BYTE #131 (83H) .........45
SET CALIBRATION MEDIA CAL PARAMETER – CONTROL BYTE #132 (84H) ...............................45
RECALL WAVEGUIDE LIST – CONTROL BYTE #134 (86H) .....................................................46
QUERY USER COAXIAL DUT CONNECTOR COEFFICIENTS – CONTROL BYTE #135 (87H) .........47
SET USER COAXIAL DUT CONNECTOR COEFFICIENTS – CONTROL BYTE #136 (88H) ...............48
QUERY USER WAVEGUIDE FLANGE COEFFICIENTS – CONTROL BYTE #138 (8AH) ...............50
SET BAUD RATE – CONTROL BYTE #197 (C5H) ........................................................................51
SET LANGUAGE – CONTROL BYTE #198 (C6H) ........................................................................51
QUERY TIME – CONTROL BYTE #208 (D0H) ..............................................................................51
READ MAIN SERIAL NUMBER – CONTROL BYTE #221 (DDH) ..................................................52
READ ASCII SERIAL NUMBER – CONTROL BYTE #225 (E1H) ..................................................52
EXIT REMOTE MODE – CONTROL BYTE #255 (FFH) ..............................................................53
GPS POWER – CONTROL BYTE #237 (EDH)  (OPTION 31 ONLY) .............................................53
READ GPS POSITION – CONTROL BYTE #238 (EEH)  (OPTION 31 ONLY) .............................53

PARAMETER DEFINITIONS ......................................................................................................54

PROGRAMMING EXAMPLES ..................................................................................................56

EXAMPLES IN C: ..................................................................................................................56
EXAMPLE IN VISUAL BASIC ..................................................................................................62

REVISION HISTORY .............................................................................................................64
Programming Overview

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

This programming menu is written exclusively for Anritsu Site Master models S810D and S820D. For information on firmware upgrade, please contact your local Anritsu service center.

General Description

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

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

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

Cabling

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

Serial Communication Parameters

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. The Set Baud Rate serial command Control Byte #197 (C5h) can be used to change the baud rate to other common baud rates.

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.

NOTE: Sending commands with out of range or invalid input parameters to the Site Master can cause the Site Master to display incorrect settings, or may cause the Site Master to stop responding. In that case, either re-send the command with the correct input parameters, or turn the instrument OFF and then ON before proceeding.
**Entering Remote Mode**

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

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

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

**Exiting Remote Mode**

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

**Lifetime of Changes to Site Master Operating Parameters**

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

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

**Write Cycle Limitation of EEPROM**

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

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

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

**Documentation Conventions**

Through this manual the following conventions will be observed:

**Numeric Representation:**

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

**Bit Positions:**

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

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

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

*Bytes to Follow:* 2 bytes

1) Status Byte 1
   - bit 0: Fixed CW Mode On/Off (1b = On, 0b = Off)
   - bit 1: Not Used
   - bit 2: Not Used
   - bit 3: Measurement Unit Metric/English (0b = English, 1b = Metric)
   - bits 4-7: Not Used

2) Status Byte 2
   - bit 0-7: Not Used

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte
2) 238 (EEh) Time-out Error

---

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

*Description:* Sets the Site Master frequency range. Start and stop frequencies are given in terms of 10 Hz steps (for example, 1.00003 GHz would be sent as 100003000 to represent 1,000,030,000 Hz).

Valid range is 25.00 MHz – 10.50000 GHz (for S810D) or 20.00000 GHz (for S820D).

See control byte #29 (1Dh) response bytes 28 to 35 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:* 1 byte

1) 255 (FFh) Operation Complete Byte
2) 224 (E0h) Parameter Error : Invalid frequency range
3) 238 (EEh) Time-out Error

---

1 Set the Metric/English flag to the proper value before sending distance information.
Select Measurement Mode – Control Byte #3 (03h)

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

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

Bytes to Follow: 1 byte

1) Measurement Mode
   00h: RL Frequency
   01h: SWR Frequency
   02h: Cable Loss – One Port Frequency
   10h: RL Distance
   11h: SWR Distance
   41h: Power Monitor Mode (Option 5 or Option 22 only)
   42h: Cable Loss – Two Port Frequency (Option 22 only)

Site Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
    224 (E0h) Parameter Error : Invalid measurement mode
    238 (EEh) Time-out Error
**Set Site Master VNA Scale – Control Byte #4 (04h)**

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

Return Loss & Cable Loss – One Port:
- Unit is dB/1000.
- Value to send = (dB * 1000),
- Maximum value sent is 60000 which represents 60.00 dB,
- Minimum value sent is 0 which represents 0.00 dB,
- Scale Start to send corresponds to Top value,
- Scale Stop to send corresponds to Bottom value,
- Make sure Scale Start < Scale Stop

Cable Loss – Two Port
- Unit is dB(m)/1000.
- Value to send = 100000 - (dB(m) * 1000),
- Maximum value sent is 160000 which represents -60.00 dB(m),
- Minimum value sent is 40000 which represents +60.00 dB(m),
- Zero value sent is 100000 which represents 0.00 dB(m),
- Scale Start to send corresponds to Top value,
- Scale Stop to send corresponds to Bottom value,
- Make sure Scale Start < Scale Stop

**SWR:**
- Unit is 1/1000 (of ratio)
- Value to send = (SWR * 1000),
- Maximum value sent is 65530 which represents 65.53
- Minimum value sent is 1000 which represents 1.00
- Scale Start to send corresponds to Bottom value,
- Scale Stop to send corresponds to Top value,
- Make sure Scale Start < Scale Stop

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

**Bytes to Follow:** 8 bytes
1) Scale Start (highest byte)
2) Scale Start
3) Scale Start
4) Scale Start (lowest byte)
5) Scale Stop (highest byte)
6) Scale Stop
7) Scale Stop
8) Scale Stop (lowest byte)

**Site Master Returns:** 1 byte
1) 255 (FFh) Operation Complete Byte
2) 224 (E0h) Parameter Error : Invalid scale range
3) 238 (EEh) Time-out Error
Set Site Master VNA Marker – Control Byte #5 (05h)

Description: Sets an individual marker position (point) 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:

\[ \text{point} = \frac{(\text{resolution} - 1) \times (\text{marker freq} - \text{start freq})}{(\text{stop freq} - \text{start freq})} \]

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

Bytes to Follow: 5 bytes
1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
2) Marker Line On/Off (01h = On, 00h = Off)
3) Marker Delta On/Off (01h = On, 00h = Off) \(^2\)
4) Marker Point (higher byte)
5) Marker Point (lower byte)

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

\(^2\) This byte is not applicable for markers 1, 5 and 6. It will be ignored by the Site Master and no errors will be generated.
**Set Site Master VNA Single Limit – Control Byte #6 (06h)**

*Description:* Sets the position and On/Off Status of the Single Limit Line for the VNA modes.

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

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

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

*Bytes to Follow:* 6 bytes

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

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte
2) 224 (E0h) Parameter Error: Invalid limit status, limit beep status, or limit value
3) 238 (EEh) Time-out Error

*Notes:*

**Return Loss & Cable Loss – One Port:**
- Limit should be sent as ( dB * 1000 )
- Maximum value sent is 60000 which represents 60.00 dB
- Minimum value sent is 0 which represents 0.0 dB

**Cable Loss – Two Port**
- Limit should be sent as ( dB * 1000 )
- Maximum value sent is 160000 which represents -60.00 dB
- Minimum value sent is 40000 which represents +60.0 dB
- Zero value sent is 100000 which represents 0.00 dB

**SWR:**
- Limit is in thousandths (of ratio), so it should be sent as ( ratio * 1000 )
- Maximum value sent is 65530 which represents 65.53
- Minimum value sent is 1000 which represents 1.00
**Set DTF Parameter – Control Byte #7 (07h)**

*Description:* Sets Distance to Fault parameters.

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

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

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

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

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

Waveguide Cutoff Frequency is in 10 Hz (5.3 GHz would be set as 530000000).

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

See control byte #29 (1Dh) response bytes 130-137 (Distance), 150-157 (Propagation Velocity & Cable Loss), 173-180 (Waveguide Cutoff Frequency and Loss) for current Site Master configuration.

**Bytes to Follow:** 24 bytes

1. Start Distance (highest byte)
2. Start Distance
3. Start Distance
4. Start Distance (lowest byte)
5. Stop Distance (highest byte)
6. Stop Distance
7. Stop Distance
8. Stop Distance (lowest byte)
9. Relative Propagation Velocity (highest byte)
10. Relative Propagation Velocity
11. Relative Propagation Velocity
12. Relative Propagation Velocity (lowest byte)
13. Cable Loss (highest byte)
14. Cable Loss
15. Cable Loss
16. Cable Loss (lowest byte)
17. Waveguide Cutoff Frequency (highest byte)
18. Waveguide Cutoff Frequency
19. Waveguide Cutoff Frequency
20. Waveguide Cutoff Frequency (lowest byte)
21. Waveguide Loss (highest byte)
22. Waveguide Loss
23. Waveguide Loss
24. Waveguide Loss (lowest byte)

**Site Master Returns:** 1 byte

1. 255 (FFh) Operation Complete Byte
2. 224 (E0h) Parameter Error : Parameter(s) out of range
3. 238 (EEh) Time-out Error
**Set Time/Date – Control Byte #8 (08h)**

*Description:* Sets the current time and date.

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

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

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

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

*Bytes to Follow:* 7 bytes

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

*Site Master Returns:* 1 byte

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

---

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

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

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

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

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

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte  
238 (EEh) Time-out Error
**Serial Port Echo On/Off – Control Byte #10 (0Ah)**

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

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

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

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

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

*Bytes to Follow:* 1 byte

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

*Site Master Returns:* 1 byte

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

---

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

*Description:* Enables or disables the Single Sweep Mode during Site Master VNA modes of operation.

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

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

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

*Bytes to Follow:* 1 byte

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

*Site Master Returns:* 1 byte

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

---

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

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

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

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

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

---

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

*Description:* Initiates a calibration step.

The Site Master must be calibrated to give accurate measurements.

The command sequence must be sent in correct order. For Coaxial media, the order is Open -> Short -> Load. For Waveguide media, the order is 1/8th Short -> 3/8th Short -> Load. You can also abort the calibration by command – “Abort” before the command – “Load” is sent. Once command – “Load” is sent, calibration is completed, and the old calibration data is lost. For Cable Loss – Two Port, only send the CL2P Thru command.

This command is designed to be executed step by step: Coaxial – Open, Short, Load; Waveguide – 1/8th Short, 3/8th Short, Load. Issuing any other command during this command sequence will cause undesired results.

**Bytes to Follow:** 1 byte
1) Calibration Step to trigger
   01h = Open or 1/8th Short
   02h = Short or 3/8th Short
   03h = Load
   04h = CL2P Thru
   05h = Abort (sending this Abort command may remove the Site Master from Remote mode)

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

---

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

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

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

**Site Master Returns:** 1 byte
1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid number of data points
   238 (EEh) Time-out Error
**Store Sweep Trace – Control Byte #16 (10h)**

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 5 bytes

1-4) Time/Date Stamp (In long integer format)

5) Operation result: 255 (FFh) Operation Complete Byte
   224 (E0h) Out of memory (Memory full)
   238 (EEh) Time-out Error

---

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

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

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

*Bytes to Follow:* 1 byte

1) Location to save system setup parameters:
   0 – 21 for SWR Mode, Return Loss Mode, Cable Loss Modes, and DTF Mode
   0 – 5 for Power Monitor Mode (Option 5 or Option 22 only)

*Site Master Returns:* 1 byte

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

---

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

*Description:* Recalls system setup parameters from a specific store location. Storage locations depend on the measurement mode of the current setup. When the current mode is one of the Site Master VNA modes (SWR, RL, CL, DTF), one of the 25 VNA mode setups can be recalled. When the current mode is Power Monitor (Option 5 or Option 22 only), one of the Power Monitor setups can be recalled (1-5).

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

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

*Bytes to Follow:* 1 byte

1) Location from which to recall system setup parameters:
   0 = Run time setup for all measurement modes
   1 – 21 = Saved setups for Site Master VNA modes SWR, RL, CL, CL2P, DTF
   1 – 5 = Saved setups for Power Monitor mode (Option 5 or Option 22 only)
   254 = Default setup, current mode
   255 = Default setup, all modes

*Site Master Returns:* 1 byte

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

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

Description: Triggers a self test on the Site Master.

Bytes to Follow: 0 bytes

Site Master Returns: 12 bytes
1) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Not Used, always Pass
   bit 1 : Not Used, always Pass
   bit 2 : Battery
   bit 3 : Temperature
   bit 4 : EEPROM read/write
   bit 5 : RTC Battery
   bits 6-7 : Not Used
2) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Not Used, always Pass
   bit 1 : CW Module attached
   bits 2–7 : Not Used
3) Battery Voltage (higher byte)
4) Battery Voltage (lower byte)
5) Temperature (higher byte)
6) Temperature (lower byte)
7) Lock Fail Counter (higher byte)
8) Lock Fail Counter (lower byte)
9) Integrator Fail Counter (higher byte)
10) Integrator Fail Counter (lower byte)
11) CW Module Lock Fail Counter (higher byte)
12) CW Module Lock Fail Counter (lower byte)

Notes:
Battery Voltage in 1/10th of a Volt (for example, 124 = 12.4 Volts)
Temperature in 1/10th of degree Celsius (for example, 362 = 36.2 °C) or degree Fahrenheit
(for example, 934 = 93.4 °F), depending upon the current measurement unit (Metric or English) selected

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

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

Bytes to Follow: 0 bytes

Site Master Returns: 8 bytes
1) Value of SM Lock Fail Counter (higher byte)
2) Value of SM Lock Fail Counter (lower byte)
3) Value of Integration Fail Counter (higher byte)
4) Value of Integration Fail Counter (lower byte)
5) Value of CW Module Lock Fail Counter (higher byte)
6) Value of CW Module Lock Fail Counter (Lower byte)
7) Not Used
8) Not Used
**Read Fail Counter and Monitor Status - Control Word (AA16h)**

*Description:* Reads the Fail Counter and other information to monitor status.

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 33 bytes

1) Value of SM Lock Fail Counter (higher byte)
2) Value of SM Lock Fail Counter (lower byte)
3) Value of Integration Fail Counter (higher byte)
4) Value of Integration Fail Counter (lower byte)
5) Value of CW Module Lock Fail Counter (higher byte)
6) Value of CW Module Lock Fail Counter (Lower byte)
7) Cal Status (00h : Calibration Off ; 01h : Calibration On)
8-11) Time/Date (in Long Integer)
12-21) Date in String Format (current date format)
22-29) Time in String Format (HH:MM:SS)
30-31) Temperature (in Short Integer)
32-33) Battery State of Charge (Short Integer 0 to 100(%)Full; FFh = no battery)

*Notes:*

Time/Date long integer representation is in seconds since January 1, 1970.
Date String in current Date Format (MM/DD/YYYY, DD/MM/YYYY, or YYYY/MM/DD) selected.
Temperature in 1/10th of degree Celsius (for example, 362 = 36.2 ºC) or degree Fahrenheit (for example, 934 = 93.4 ºF), depending upon the current measurement unit (Metric or English) selected.

---

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

*Description:* Returns a list of all saved traces.

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 3 + (41 x number of save traces) bytes

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

255 (FFh) Operation Complete Byte
**Delete Sweep Trace – Control Byte #25 (19h)**

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

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

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

---

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

This command is new to the S8x0D. Use it, instead of Control Byte #20, to access the new features.

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

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:*
- For All Modes:
  1) Number of Following Bytes (higher byte)
  2) Number of Following Bytes (lower byte)
  3) Measurement Mode
  4) Printer Type
  5) Current Language (00h = English, 01h = French, 02h = German, 03h = Spanish, 04h = Chinese, 05h = Japanese)
  6) Not Used
  7) Date Format (00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD)
  8) RTC battery (higher byte)
  9) RTC battery (lower byte)
  10) PC Board Revision (higher byte)
  11) PC Board Revision (lower byte)
  12-25 Not Used

- For Site Master VNA Modes:
  26) Site Master VNA Mode Data Points (higher byte)
  27) Site Master VNA Mode Data Points (lower byte)
  28) VNA Start Frequency (Frequency in 10 Hz) (highest byte)
  29) VNA Start Frequency
  30) VNA Start Frequency
  31) VNA Start Frequency (lowest byte)
  32) VNA Stop Frequency (Frequency in 10 Hz) (highest byte)

---

3 Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
4 See Control Byte #30 for supported printers.
5 Value sent as Volts * 10. For example, 2.7 V = 27.
6 This value is for internal use only.
33) VNA Stop Frequency
34) VNA Stop Frequency
35) VNA Stop Frequency (lowest byte)
36) VNA Scale Start (highest byte)\(^7\)
37) VNA Scale Start
38) VNA Scale Start
39) VNA Scale Start (lowest byte)
40) VNA Scale Stop (highest byte)
41) VNA Scale Stop
42) VNA Scale Stop
43) VNA Scale Stop (lowest byte)
44) VNA Frequency Marker 1 Point (higher byte)\(^8\)
45) VNA Frequency Marker 1 Point (lower byte)
46) VNA Frequency Marker 2 Point (higher byte)
47) VNA Frequency Marker 2 Point (lower byte)
48) VNA Frequency Marker 3 Point (higher byte)
49) VNA Frequency Marker 3 Point (lower byte)
50) VNA Frequency Marker 4 Point (higher byte)
51) VNA Frequency Marker 4 Point (lower byte)
52) VNA Frequency Marker 5 Point (higher byte)
53) VNA Frequency Marker 5 Point (lower byte)
54) VNA Frequency Marker 6 Point (higher byte)
55) VNA Frequency Marker 6 Point (lower byte)
56) Site Master VNA Single Limit (highest byte)\(^9\)
57) Site Master VNA Single Limit
58) Site Master VNA Single Limit
59) Site Master VNA Single Limit (lowest byte)
60) VNA Multiple Limit Segment # (1)
61) VNA Multiple Limit Segment Status (0h = Off, 01h = On)
62) VNA Multiple Limit Segment Start X (highest byte)\(^10\)
63) VNA Multiple Limit Segment Start X
64) VNA Multiple Limit Segment Start X
65) VNA Multiple Limit Segment Start X (lowest byte)
66) VNA Multiple Limit Segment Start Y (higher byte)
67) VNA Multiple Limit Segment Start Y (lower byte)
68) VNA Multiple Limit Segment End X (highest byte)
69) VNA Multiple Limit Segment End X
70) VNA Multiple Limit Segment End X
71) VNA Multiple Limit Segment End X (lowest byte)
72) VNA Multiple Limit Segment End Y (higher byte)
73) VNA Multiple Limit Segment End Y (lower byte)
74-129) Repeat bytes 60 – 73 for segments 2 - 5
130) Start Distance (highest byte)\(^11\)
131) Start Distance
132) Start Distance
133) Start Distance (lowest byte)
134) Stop Distance (highest byte)
135) Stop Distance
136) Stop Distance

\(^7\) See “Set Site Master VNA Scale” Control Byte #4 for data format.
\(^8\) Marker Point = ( # data points – 1 ) * ( marker freq – start freq) / ( stop freq – start freq)
Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.
\(^9\) See Control Byte #6, “Set Site Master VNA Single Limit” for data format.
\(^10\) See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format.
\(^11\) Distance data uses units 1/100,000m or 1/100,000 ft
137) Stop Distance (lowest byte)
138) Distance Marker 1 Point (higher byte)
139) Distance Marker 1 Point (lower byte)
140) Distance Marker 2 Point (higher byte)
141) Distance Marker 2 Point (lower byte)
142) Distance Marker 3 Point (higher byte)
143) Distance Marker 3 Point (lower byte)
144) Distance Marker 4 Point (higher byte)
145) Distance Marker 4 Point (lower byte)
146) Distance Marker 5 Point (higher byte)
147) Distance Marker 5 Point (lower byte)
148) Distance Marker 6 Point (higher byte)
149) Distance Marker 6 Point (lower byte)
150) Relative Propagation Velocity (highest byte)
151) Relative Propagation Velocity
152) Relative Propagation Velocity
153) Relative Propagation Velocity (lowest byte)
154) Cable Loss (highest byte)
155) Cable Loss
156) Cable Loss
157) Cable Loss (lowest byte)
158) Average Cable Loss (highest byte)
159) Average Cable Loss
160) Average Cable Loss
161) Average Cable Loss (lowest byte)
162) Status Byte 1: (0b = Off, 1b = On)
   (LSB) bit 0: Site Master Marker 1 On/Off
   bit 1: Site Master Marker 2 On/Off
   bit 2: Site Master Marker 3 On/Off
   bit 3: Site Master Marker 4 On/Off
   bit 4: Site Master Marker 5 On/Off
   bit 5: Site Master Marker 6 On/Off
   bits 6-7: Not Used
163) Status Byte 2: (0b = Off, 1b = On)
   (LSB) bit 0: Not Used
   bit 1: Site Master Marker 2 Delta On/Off
   bit 2: Site Master Marker 3 Delta On/Off
   bit 3: Site Master Marker 4 Delta On/Off
   bits 4-7: Not Used
164) Status Byte 3: (0b = Off, 1b = On)
   (LSB) bit 0: Site Master Limit Type (0b = Single, 1b = Multiple)
   bit 1: Site Master Limit Beep On/Off
   bit 2: FREQ-SWR Multiple Limit Segment 1 Status On/Off
   bit 3: FREQ-SWR Multiple Limit Segment 2 Status On/Off
   bit 4: FREQ-SWR Multiple Limit Segment 3 Status On/Off
   bit 5: FREQ-SWR Multiple Limit Segment 4 Status On/Off
   bit 6: FREQ-SWR Multiple Limit Segment 5 Status On/Off
   bit 7: Site Master Single Limit Status On/Off
165) Status Byte 4: (0b = Off, 1b = On)
   (LSB) bits 0-1: Not Used

---

12 Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)
Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.
13 Relative Propagation Velocity uses units 1/100,000.
14 Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
15 Average Cable Loss is dB * 1000. CL2P Average Cable Loss is 100000 – (dB * 1000).
bit 2: FREQ-RL Multiple Limit Segment 1 Status On/Off
bit 3: FREQ-RL Multiple Limit Segment 2 Status On/Off
bit 4: FREQ-RL Multiple Limit Segment 3 Status On/Off
bit 5: FREQ-RL Multiple Limit Segment 4 Status On/Off
bit 6: FREQ-RL Multiple Limit Segment 5 Status On/Off
bit 7: Not Used

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

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

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

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

Status Byte 9: (0b = Off, 1b = On )
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Site Master VNA Cal On/Off
bit 2 : Not Used
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bit 4 : CL2P Cal On/Off
bit 5 : Waveguide Cal On/Off
bits 6-7 : Not Used

Not used

Not used

Waveguide Insertion Loss¹⁶ (highest byte)

Waveguide Insertion Loss

Waveguide Insertion Loss

Waveguide Insertion Loss (lowest byte)

---

¹⁶ Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
Waveguide Cutoff Frequency\(^{17}\) (highest byte)\nWaveguide Cutoff Frequency\nWaveguide Cutoff Frequency\nWaveguide Cutoff Frequency (lowest byte)\nSmoothing Factor (0 = Off)\nStatus Byte 10: (0b = Off, 1b = On) (LSB) bits 0-1: Not Used
  bit 2: FREQ-CL2P Multiple Limit Segment 1 Status On/Off
  bit 3: FREQ-CL2P Multiple Limit Segment 2 Status On/Off
  bit 4: FREQ-CL2P Multiple Limit Segment 3 Status On/Off
  bit 5: FREQ-CL2P Multiple Limit Segment 4 Status On/Off
  bit 6: FREQ-CL2P Multiple Limit Segment 5 Status On/Off
  bit 7: Not Used

For Power Monitor Mode (option 5):
  26-45) Not Used
  46) Power Monitor Offset (highest byte)\(^{18}\)
  47) Power Monitor Offset
  48) Power Monitor Offset
  49) Power Monitor Offset (lowest byte)
  50) Power Monitor Relative (highest byte)\(^{19}\)
  51) Power Monitor Relative
  52) Power Monitor Relative
  53) Power Monitor Relative (lowest byte)
  54) Not used
  55) Power Monitor Unit (00h = Watts or %, 01h = dBm or dB)
  56) Power Monitor Relative Status (00h = Off, 01h = On)
  57) Power Monitor Offset Status (00h = Off, 01h = On)
  58-68) Not Used
  69) Zero Status (00h = Off, 01h = On)
  70) Zero Value (highest byte)\(^{20}\)
  71) Zero Value
  72) Zero Value
  73) Zero Value (lowest byte)
  74-120) Not Used

\(^{17}\) Frequency units are 10 Hz
\(^{18}\) Value sent as (value in dB * 1000)
\(^{19}\) Value as ((value in dBm * 1000) + 100)
\(^{20}\) Value sent as ((value in dBm * 1000) + 100)
**Select Printer Type – Control Byte #30 (1Eh)**

*Description:* Select Printer Type.

*Bytes to Follow:* 1 byte

1) **Printer ID**
   
   - 0 – Epson Stylus Models
   - 1 – Epson LQ Models
   - 2 – Citizen PN Models
   - 3 – NEC Superscript Models
   - 4 – NEC Silentwriter Models
   - 5 – Seiko DPU 411, 414 Models
   - 6 – Canon BJC 50
   - 7 – Canon BJC 80
   - 8 – Canon BJC 250
   - 9 – Canon BJC 4400
   - 10 – HP DJ 300 Series
   - 11 – HP DJ 400 Series
   - 12 – HP DJ 500 Series
   - 13 – HP DJ 600 Series
   - 14 – HP DJ 800 Series
   - 15 – HP DJ 1120
   - 16 – HP LJ 6L, 6P, 4000
   - 17 – Epson Esc/P Compatible
   - 18 – Epson Esc/P2 Compatible
   - 19 – Epson Esc/P Raster Compatible
   - 20 – HP PCL3 Compatible

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte

---

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

*Description:* Select DTF Windowing Methods.

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

*Bytes to Follow:* 1 byte

1) **Windowing Method**
   
   - 00h = Rectangular (finest resolution, highest side lobes)
   - 01h = Nominal Side Lobe (balance between resolution and side lobes)
   - 02h = Low Side Lobe
   - 03h = Minimum Side Lobe

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte

2) 224 (E0h) Parameter Error: Invalid DTF Windowing Method

3) 238 (EEh) Time-out Error
Set Site Master VNA Trace Math – Control Byte #32 (20h)

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

*Bytes to Follow:* 2 bytes
   1) Trace Math Operation
      - 00h = Off
      - 01h = Addition
      - 02h = Subtraction
   2) Trace on which to Perform Math Operation <TN – 1>, where TN is a trace number from 1 to 100 as received via command #24.

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

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

This command is new to the S8x0D. Use it, instead of Control Byte #17, to access the new features.

*Description:* Queries the Site Master for sweep trace data.

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

*Bytes to Follow:* 1 byte
   0 = Last sweep trace before entering remote mode (sweep trace in RAM)
   1-200 = Specific saved sweep number (stored sweeps in Flash memory)

*Site Master Returns:*
   1-2) # of following bytes (total length - 2)
   3) Current Instrument Date Format\(^{21}\)
   4) Not Used
   5-11) Model Number (7 bytes in ASCII)
   12-15) Software Version (4 bytes ASCII)
   16) Measurement Mode\(^{22}\)
   17-20) Time/Date (in Long Integer\(^{23}\))
   21-30) Date in String Format (mm/dd/yyyy)
   31-38) Time in String Format (hh:mm:ss)
   39-54) Reference number stamp (16 bytes in ASCII)
   55-56) # data points (130, 259 or 517 or 401 or 100)

For all “Site Master VNA Modes”:
   57) Start Frequency\(^{24}\) (highest byte)
   58) Start Frequency
   59) Start Frequency
   60) Start Frequency (lowest byte)
   61) Stop Frequency (highest byte)
   62) Stop Frequency

---

\(^{21}\) 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD

\(^{22}\) Refer to Control Byte #3 “Select Measurement Mode” for detailed value.

\(^{23}\) Time/Date long integer representation is in seconds since January 1, 1970

\(^{24}\) Frequency units are 10 Hz
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\(^{25}\) (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 Point \(^{26}\) (higher byte)
78) Frequency Marker 1 Point (lower byte)
79) Frequency Marker 2 Point (higher byte)
80) Frequency Marker 2 Point (lower byte)
81) Frequency Marker 3 Point (higher byte)
82) Frequency Marker 3 Point (lower byte)
83) Frequency Marker 4 Point (higher byte)
84) Frequency Marker 4 Point (lower byte)
85) Frequency Marker 5 Point (higher byte)
86) Frequency Marker 5 Point (lower byte)
87) Frequency Marker 6 Point (higher byte)
88) Frequency Marker 6 Point (lower byte)
89) Single Limit\(^{27}\) (highest byte)
90) Single Limit
91) Single Limit
92) Single Limit (lowest byte)
93) Multiple Limit Segment # (1)
94) Multiple Limit Segment Status
95) Multiple Limit Start X\(^{28}\) (highest byte)
96) Multiple Limit Start X
97) Multiple Limit Start X
98) Multiple Limit Start X (lowest byte)
99) Multiple Limit Start Y (higher byte)
100) Multiple Limit Start Y (lower byte)
101) Multiple Limit End X (highest byte)
102) Multiple Limit End X
103) Multiple Limit End X
104) Multiple Limit End X (lowest byte)
105) Multiple Limit End Y (higher byte)
106) Multiple Limit End Y (lower byte)
107–162) Repeat bytes 93-106 for segments 2-5
163) Start Distance\(^{29}\) (highest byte)
164) Start Distance
165) Start Distance
166) Start Distance (lowest byte)

\(^{25}\) See Control Byte \#4 “Set Site Master Scale” for data format
\(^{26}\) marker point = ( (# of data points - 1 ) * ( marker freq – start freq ) / ( stop freq – start freq ) where # of data points can be found in bytes 55-56, start freq is in bytes 57-60, and stop freq is in bytes 61-64.
\(^{27}\) See Control Byte \#6 “Set Site Master VNA Single Limit” for data format.
\(^{28}\) See Control Byte \#112 “Set Site Master VNA Segmented Limit Lines” for data format.
\(^{29}\) Distance data uses units 1/100,000m (or feet)
167) Stop Distance (highest byte)
168) Stop Distance
169) Stop Distance
170) Stop Distance (lowest byte)
171) Distance Marker 1 Point (higher byte)
172) Distance Marker 1 Point (lower byte)
173) Distance Marker 2 Point (higher byte)
174) Distance Marker 2 Point (lower byte)
175) Distance Marker 3 Point (higher byte)
176) Distance Marker 3 Point (lower byte)
177) Distance Marker 4 Point (higher byte)
178) Distance Marker 4 Point (lower byte)
179) Distance Marker 5 Point (higher byte)
180) Distance Marker 5 Point (lower byte)
181) Distance Marker 6 Point (higher byte)
182) Distance Marker 6 Point (lower 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) Average Cable Loss (highest byte)
192) Average Cable Loss
193) Average Cable Loss
194) Average Cable Loss (lowest byte)
195) Status Byte 1: ( 0b = Off, 1b = On)
   (LSB) bit 0: Marker 1 On/Off
   bit 1: Marker 2 On/Off
   bit 2: Marker 3 On/Off
   bit 3: Marker 4 On/Off
   bit 4: Marker 5 On/Off
   bit 5: Marker 6 On/Off
   bits 6-7 : Not Used
196) Status Byte 2: ( 0b = Off, 1b = On)
   (LSB) bit 0: Marker 2 Delta On/Off
   bit 1: Marker 3 Delta On/Off
   bit 2: Marker 4 Delta On/Off
   bits 3-7 : Not Used
197) Status Byte 3: ( 0b = Off, 1b = On)
   (LSB) bit 0: Single Limit On/Off
   bit 1: CW On/Off
   bit 2: Trace Math On/Off
   bit 3: CL2P Cal On/Off
   bit 4: Waveguide Cal On/Off
   bit 5: Site Master VNA Cal On/Off
   bit 6: Limit Type ( 0b = Single; 1b = Multiple)
   bit 7: Unit of Measurement (1b = Metric, 0b = English)

30 Marker Point = ( # data points – 1 ) * ( marker dist – start dist ) / ( stop dist – start dist )
Where # of data points can be found in bytes 55-56, start dist is in bytes 163-166, and stop dist is in bytes 167-170.
31 Relative Propagation Velocity uses units 1/100,000 dB/m or 1/100,000 dB/ft.
32 Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
33 Average Cable Loss is dB * 1000. CL2P Average Cable Loss is 100000 – (dB * 1000).
198) Status Byte 4:
   (LSB) bit 0 - 1 : DTF Windowing Mode
   bit: 1 0
      |   |
   0 0 - Rectangular (No Windowing)
   0 1 - Nominal Side Lobe
   1 0 - Low Side Lobe
   1 1 - Minimum Side Lobe
   bits 2 – 7 : Not Used

199) Status Byte 5 (Cal Status):
   00h : Calibration Off
   01h : Standard Calibration On

200) Not used
201) Not used
202-205) GPS Position – Latitude (long integer)\(^{34}\)
206-209) GPS Position – Longitude (long integer)
210-211) GPS Position – Altitude (short integer)
212) Waveguide Insertion Loss\(^ {35} \) (highest byte)
213) Waveguide Insertion Loss
214) Waveguide Insertion Loss
215) Waveguide Insertion Loss (lowest byte)
216) Waveguide Cutoff Frequency\(^ {36} \) (highest byte)
217) Waveguide Cutoff Frequency
218) Waveguide Cutoff Frequency
219) Waveguide Cutoff Frequency (lowest byte)
220) Smoothing Factor (0 = Off)
221-324) Not Used
325-1364) Sweep Data (130 points * 8 bytes/point = 1040 bytes)
325-2396) Sweep Data (259 points * 8 bytes/point = 2072 bytes)
325-4460) Sweep Data (517 points * 8 bytes/point = 4136 bytes)
   8 bytes for each data point
   1. gamma\(^ {37} \) (highest byte)
   2. gamma
   3. gamma
   4. gamma (lowest byte)
   5. phase\(^ {38} \) (highest byte)
   6. phase
   7. phase
   8. phase (lowest byte)

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

For Power Monitor Mode (option 5):
57) Power Monitor Mode (00h = Off, 01h = On)

\(^{34}\) Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative
latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West
hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
\(^{35}\) Waveguide Insertion Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
\(^{36}\) Frequency units are 10 Hz
\(^{37}\) Gamma data uses 1/10,000 units; CL2P Gamma data uses 1/10,000 units.
\(^{38}\) Phase data uses 1/10 degree unit. Use two’s-complement method to decode negative phase values.
58) Power Monitor Unit (00h = Watts, 01h = dBm)
59-74) Not Used
75) Power Offset Status (00h = Off, 01h = On)
76) Power Offset\(^{39}\) (highest byte)
77) Power Offset
78) Power Offset
79) Power Offset (lowest byte)
80) Power Relative Status (00h = Off, 01h = On)
81) Power Relative Value\(^{40}\) (highest byte)
82) Power Relative Value
83) Power Relative Value
84) Power Relative Value (lowest byte)
85) Not Used
86) Power Zero Status (00h = Off, 01h = On)
87-105) Not Used
106-109) GPS Position – Latitude (long integer)\(^{41}\)
110-113) GPS Position – Longitude (long integer)
114-115) GPS Position – Altitude (short integer)
116-150) Not Used
151) Power Monitor Reading\(^{42}\) (highest byte)
152) Power Monitor Reading
153) Power Monitor Reading
154) Power Monitor Reading (lowest byte)

Site Master Returns (For invalid sweeps/empty stored sweep locations): 11 bytes
1-2) Number of following bytes (9 bytes for invalid sweep recall)
3) Current Instrument Date Format\(^{43}\)
4) Model # (unsigned integer, 1Eh for Site Master model S810D; 1Fh for S820D)
5-11) Extended Model # (7 bytes in ASCII)

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

\(^{39}\) Value sent as (value in dB * 1000), valid values are 0 to 60 dB
\(^{40}\) Value sent as (value in dBm * 1000)
\(^{41}\) Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
\(^{42}\) Power sent as (power in dBm * 1000). Use two’s-complement method to decode negative power levels.
\(^{43}\) 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD
Recall Current Sweep Trace in RAM – Control Word (AA21h)

Description: Queries the Site Master for current sweep trace in RAM (the last sweep trace before entering remote mode). Recall command optimized for sweep data only in requested formats.

Bytes to Follow: 1 byte

00h = Magnitude (2 bytes) and Phase (2 bytes) format
01h = Magnitude only (4 bytes) format
02h = Real (2 bytes) and Imaginary (2 bytes) format

Site Master Returns:

1-2) # of following bytes (total length - 2)
3-4) # data points (130, 259, or 517)
5- 524) Sweep Data (130 points * 4 bytes/point = 520 bytes)
5-1040) Sweep Data (259 points * 4 bytes/point = 1036 bytes)
5-2072) Sweep Data (517 points * 4 bytes/point = 2068 bytes)

Magnitude (2 bytes) and Phase (2 bytes) format (00h): 4 bytes for each data point
1. gamma\(^{44}\) (highest byte)
2. gamma (lowest byte)
3. phase\(^{45}\) (highest byte)
4. phase (lowest byte)

Magnitude only (4 bytes) format (01h): 4 bytes for each data point
1. gamma\(^{46}\) (highest byte)
2. gamma
3. gamma
4. gamma (lowest byte)

Real (2 bytes) and Imaginary (2 bytes) format (02h): 4 bytes for each data point
1. real\(^{47}\) (highest byte)
2. real (lowest byte)
3. imaginary\(^{48}\) (highest byte)
4. imaginary (lowest byte)

---

\(^{44}\) Gamma data uses 1/10,000 units; CL2P Gamma data uses 1/10,000 units in entire 4 bytes.
\(^{45}\) Phase data uses 1/10 degree unit. Use two’s-complement method to decode negative phase values.
\(^{46}\) Gamma data uses 1/10,000 units; CL2P Gamma data uses 1/10,000 units.
\(^{47}\) Real data uses 1/10,000 units. Use two’s-complement method to decode negative values.
\(^{48}\) Imaginary data uses 1/10,000 units. Use two’s-complement method to decode negative values.
Notes:

Gamma Magnitude = sqrt( real*real + imaginary*imaginary )

Return Loss = -20* (log(gamma) / log(10))

VSWR = (1+gamma) / (1-gamma)

Phase compares the reflected to the incident (reference)

---

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

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

**Bytes to Follow:** 2 bytes

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

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

**Site Master Returns:** 1 byte

1) 255 (FFh) Operation Complete Byte
2) 224 (E0h) Parameter Error: Invalid Trace Overlay Operation
3) 238 (EEh) Time-out Error

---

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

This command is new to the S8x0D. Use it, instead of Control Bytes #26 and #28, to access the new features.

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

**Bytes to Follow:**

For All Modes:

1-2) # of following bytes
3) Measurement Mode
4-7) Time/Date (in Long Integer)
8-17) Date in String Format (MM/DD/YYYY)
26-41) Reference number stamp (16 ASCII bytes)
42-43) # of data points (130, 259, 517 or 401 or 100)

For VNA Modes:

44) Start Frequency (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

---

49 See Control Byte #3 “Set Measurement Mode” for available measurement modes.

50 Frequency in 10 Hz
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 Point (higher byte)
65) Frequency Marker 1 Point (lower byte)
66) Frequency Marker 2 Point (higher byte)
67) Frequency Marker 2 Point (lower byte)
68) Frequency Marker 3 Point (higher byte)
69) Frequency Marker 3 Point (lower byte)
70) Frequency Marker 4 Point (higher byte)
71) Frequency Marker 4 Point (lower byte)
72) Frequency Marker 5 Point (higher byte)
73) Frequency Marker 5 Point (lower byte)
74) Frequency Marker 6 Point (higher byte)
75) Frequency Marker 6 Point (lower 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) Multiple Limit Segment # (1)
81) Multiple Limit Segment Status (00h = Off, 01h = On)
82) Multiple Limit Start X (highest byte)
83) Multiple Limit Start X
84) Multiple Limit Start X
85) Multiple Limit Start X (lowest byte)
86) Multiple Limit Start Y (higher byte)
87) Multiple Limit Start Y (lower byte)
88) Multiple Limit End X (highest byte)
89) Multiple Limit End X
90) Multiple Limit End X
91) Multiple Limit End X (lowest byte)
92) Multiple Limit End Y (higher byte)
93) Multiple Limit End Y (lower byte)
94-149) Repeat bytes 80-93 for segments 2-5
150) Start Distance (highest byte)
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 Point (higher byte)

51 See Control Byte #4, “Set Site Master VNA Scale” for data format.
52 Marker point = (Number of data points – 1) * (marker freq – start freq) / (stop freq – start freq)
53 See Control Byte #6, “Set Site Master VNA Single Limit” for data format
54 See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format.
55 Distance data uses units 1/100,000m or 1/100,000 ft
56 Marker point = ( # of data points – 1 ) * ( marker dist – start dist ) / ( stop dist – start dist )
159) Distance Marker 1 Point (lower byte)
160) Distance Marker 2 Point (higher byte)
161) Distance Marker 2 Point (lower byte)
162) Distance Marker 3 Point (higher byte)
163) Distance Marker 3 Point (lower byte)
164) Distance Marker 4 Point (higher byte)
165) Distance Marker 4 Point (lower byte)
166) Distance Marker 5 Point (higher byte)
167) Distance Marker 5 Point (lower byte)
168) Distance Marker 6 Point (higher byte)
169) Distance Marker 6 Point (lower 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) Average Cable Loss (highest byte)
179) Average Cable Loss
180) Average Cable Loss
181) Average Cable Loss (lowest byte)
182) Status Byte 1: (0b = Off, 1b = On)
   (LSB) bit 0 : Marker 1 On/Off
   bit 1 : Marker 2 On/Off
   bit 2 : Marker 3 On/Off
   bit 3 : Marker 4 On/Off
   bit 4 : Marker 5 On/Off
   bit 5 : Marker 6 On/Off
   bits 6-7 : Not Used
183) Status Byte 2: (0b = Off, 1b = On)
   (LSB) bit 0 : Marker 2 Delta On/Off
   bit 1 : Marker 3 Delta On/Off
   bit 2 : Marker 4 Delta On/Off
   bits 3-7: Not Used
184) Status Byte 3: (0b = Off, 1b = On)
   (LSB) bit 0 : Single Limit On/Off
   bit 1 : CW On/Off
   bit 2 : Trace Math On/Off
   bit 3 : CL2P Cal On/Off
   bit 4 : Waveguide Cal On/Off
   bit 5 : Site Master VNA Cal On/Off
   bit 6 : Limit Type (0b = Single; 1b = Multiple)
   bit 7 : Unit of measurement (1b = Metric, 0b = English)
185) Status Byte 4:
   (LSB) bit 0 – 1 : DTF Windowing Mode
   bit: 1 0
   0 0 Rectangular (No Windowing)
   0 1 - Nominal- Side Lobe
   1 0 - Low Side Lobe
   1 1 - Minimum Side Lobe

57 Relative Propagation Velocity uses units 1/100,000
58 Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft
59 Average Cable Loss is dB * 1000. CL2P Average Cable Loss is 100000 – (dB * 1000).
bits 2 – 7 : Not Used

186) Status Byte 5 (Cal Status) :
   00h : Calibration Off
   01h : Standard Calibration On

187) Not used
188) Not used
189-192) GPS Position – Latitude (long integer)
193-196) GPS Position – Longitude (long integer)
197-198) GPS Position – Altitude (short integer)
199) Waveguide Insertion Loss (highest byte)
200) Waveguide Insertion Loss
201) Waveguide Insertion Loss
202) Waveguide Insertion Loss (lowest byte)
203) Waveguide Cutoff Frequency (highest byte)
204) Waveguide Cutoff Frequency
205) Waveguide Cutoff Frequency
206) Waveguide Cutoff Frequency (lowest byte)
207) Smoothing Factor (0 = Off)
208-314) Not Used
315-1354) Sweep Data (130 points * 8 bytes/point= 1040 bytes)
315-2386)   (259 points * 8 bytes/point= 2072 bytes)
315-4450)   (517 points * 8 bytes/point= 4136 bytes)

8 bytes for each data point
1. Gamma (highest byte)
2. Gamma
3. Gamma
4. Gamma (lowest byte)
5. Phase (highest byte)
6. Phase
7. Phase
8. Phase (lowest byte)

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

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

60 Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
61 Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.
62 Frequency units are 10 Hz
63 Gamma uses units scaled to 1/1,000; CL2P Gamma uses units scaled to 1/10,000
64 Phase is transmitted in 1/10ths of a degree. Use two’s-complement method to decode negative phase values.
**Get Options – Control Byte #37 (25h)**

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* Number of bytes, depending on the option(s) installed:
- Option 2: “/2”
- Option 5: “/5”
- Option 11NF: “/11NF”
- Option 22: “/22”
- Option 31: “/31”

If NO options: “None”

---

**Set Smoothing Factor – Control Byte #38 (26h)**

*Description:* Set Frequency Domain Trace Smoothing Factor where 0 = Off and other values = On (20 max).

*Bytes to Follow:* 1 byte

1) Smoothing Factor
- 0 = Off
- 1 to 20 = On and applying smoothing factor (20 max)

*Site Master Returns:* 1 byte

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

---

**Query Power Level – Control Byte #39 (27h)** *(Option 5 or Option 22 only)*

*Description:* Return Power Level seen by the RF Detector. Also returns power monitor settings.

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 30 bytes

1) Statyte #1 (0b = Off, 1b = On)
   - (LSB) bit 0 : Unit (0b - Watt/% – 1b – dBm/dBr)
   - bit 1 : Not Used
   - bit 2 : Relative Mode On/Off
   - bit 3: Offset Mode On/Off
   - bit 4: Zero Mode On/Off
   - bits 5-7: Not Used

2) Not Used

3 - 6) Relative Mode Reference Power Level

7 - 10) Offset Mode Power Level

11 - 14) Zero Mode Reference Power Level

15 - 18) Absolute Power Level

19 - 22) Power Reading

23 - 26) Not Used

27 - 30) Not Used

*Notes:*

Power Levels are 4 bytes, highest byte first, lowest byte last.
Use two’s-complement method to decode negative power levels.
Relative Mode Reference Power Level is returned as (dBm * 1000)
Offset Mode Power Level is returned as (dB * 1000)
Zero Mode Reference Power Level is returned as (dBm * 1000)
Absolute Power Level is raw measurement from the RF Detector returned as (dBm * 1000)
Power Reading is returned as (dBm * 1000) or (dB * 1000) depending on Relative Mode

---

**Set Power Monitor Units – Control Byte #40 (28h) (Option 5 or Option 22 only)**

*Description:* Set Power Monitor units to Watts or dBm.

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

*Site Master Returns:* 1 byte

2) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid Units
238 (EEh) Time-out Error

---

**Power Monitor Relative Mode On/Off – Control Byte #41 (29h) (Option 5 or Option 22 only)**

*Description:* Enable or disable Power Monitor Relative Mode.

*Bytes to Follow:* 1 byte

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

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid parameter
   238 (EEh) Time-out Error
Power Monitor Offset Mode On/Off – Control Byte #42 (2Ah)  
(Option 5 or Option 22 only)

*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 (Multiplied by 1000)

*Site Master Returns:* 1 byte

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

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

Power Monitor Zero Mode On/Off – Control Byte #43 (2Bh)  
(Option 5 or Option 22 only)

*Description:* Enable or disable Power Monitor Zeroing Mode.

*Bytes to Follow:* 1 byte

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

*Site Master Returns:* 1 byte

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

Trigger Sweep – Control Word (AA30h)

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

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 2 bytes

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

---

65 Byte 2 is returned only if Serial Port Echo is set to On – see command #10
**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 +32,768 mA, positive = Charging)
9-10) Battery Average current (signed integer -32,768 to +32,768 mA, positive = Charging)
11-12) Average time to empty (unsigned integer 0 to 65535 minute)
13-14) Battery Charge Cycle Count (unsigned integer 0 to 65535 cycles)
15-16) Battery Capacity at Full Charge in mA Hours (unsigned integer 0 to 65535 cycles)
17) Unit under battery power (1 = YES; 0 = NO)

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

---

**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) Savetime setup On/Off
   - 00h = Off (default)
   - 01h = On

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte
   - 238 (EEh) Time Out Error
**Enter Remote Mode – Control Byte #69 (45h)**

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

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

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

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

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 13 bytes

1-2) Model # (unsigned integer, 1Eh for Site Master S810D, 1Fh for Site Master S820D)

3-9) Extended Model # (7 bytes in ASCII)

10-13) Software Version - 4 byte– (ASCII)
**Enter Remote Mode Immediately – Control Byte #70 (46h)**

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

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

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

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 13 bytes

1-2) Model # (unsigned integer, 1Eh for Site Master S810D, 1Fh for Site Master S820D))
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version (4 bytes in ASCII)

**Virtual Key Press – Control Byte #75 (4Bh)**

*Description:* Commands a virtual press of the selected key.

*Bytes to Follow:* 1 byte

00h: Null
0Dh: Enter
1Bh: Escape
2Eh: Print
30h: Recall Display
31h: Backlight
32h: Contrast
33h: Start Cal
34h: Auto Scale
35h: Save Setup
36h: Recall Setup
37h: Limit
38h: Marker
39h: Save Display
61h: Run/Hold
62h: Up
63h: Down
64h: Menu Key 1
65h: Menu Key 2
66h: Menu Key 3
67h: Menu Key 4
68h: Menu Key 5
69h: Menu Key 6
70h: System
71h: Mode
72h: Freq/Dist
73h: Amplitude
74h: Meas/Disp
Site Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

Recall Cable List – Control Byte #81 (51h)

Description: Query the cable list.

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

Frequency is in 10 Hz (5.3 GHz would be set as 530000000).

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

Bytes to Follow: 0 byte

Site Master Returns:
Command received correctly: variable bytes
1-2) Version #
3-4) Total number of records in this package (Maximum 125)
(1st Record)
5-6) Type of record
7-27) Cable name (ASCII 21 bytes)
28-31) Propagation Velocity
32-35) Frequency 1
36-39) Insertion Loss 1
40-43) Frequency 2
44-47) Insertion Loss 2
48-51) Frequency 3
52-55) Insertion Loss 3
(2nd Record)
(56-106) Repeat from 5 to 55
………
Last byte) FF (End of the return bytes)

Command error: 1 byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

\(^{66}\) When sending command #75 followed by 30h (Recall Display), the Site Master will return the Operation Complete Byte followed by the results of command #24 (Query Trace Names) except that there will be no Operation Complete Byte at the end of that list.
Set Site Master VNA Segmented Limit Lines – Control Byte #112 (70h)

Description: Sets the position and On/Off status of the limit lines.

Site Master VNA modes support 5 limit segments. Each segment may have any finite slope and can be enabled and disabled independently of every other segment. The limit beep is enabled for all segments or no segments.

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

See control byte #29 (14h) response bytes 36 to 105 for the current Site Master configuration.

Bytes to Follow: 14 bytes

1) Limit Number
2) Limit Line On/Off (01h = On, 00h = Off)
3) Starting X (highest byte)\(^{67}\)
4) Starting X
5) Starting X
6) Starting X (lowest byte)
7) Starting Y (higher byte)
8) Starting Y (lower byte)
9) Ending X (highest byte)\(^{68}\)
10) Ending X
11) Ending X
12) Ending X (lowest byte)
13) Ending Y (higher byte)
14) Ending Y (lower byte)

Site Master Returns: 1 byte

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

Notes:

Limit Value depends on the current display mode selected.

Return Loss &:

Limit should be sent as ( dB * 1000 )

Cable Loss –

Maximum value sent is 60000 which represents 60.00 dB
Minimum value sent is 0 which represents 0.00 dB

One Port

Cable Loss -

Limit should be sent as ( dB * 100 )

Two Port

Maximum value sent is 16000 which represents -60.00 dB
Minimum value sent is 4000 which represents +60.00 dB
Zero value sent is 10000 which represents 0.00 dB

SWR:

Limit is in thousandths (of ratio), so it should be sent as ( ratio * 1000 )

Maximum value sent is 65530 which represents 65.53
Minimum value sent is 1000 which represents 1.00

\(^{67}\) Frequency in 10 Hz or Distance in 1/100,000 ft (or meters)

\(^{68}\) Frequency in 10 Hz or Distance in 1/100,000 ft (or meters)
Read Marker Value – Control Byte #117 (75h)

Description: Returns the frequency location of the specified marker, and the value at that location.

Bytes to Follow: 1 byte
   1) Marker number (1-6)

Site Master Returns: 12 bytes (1 byte if an error occurs)
   1) Frequency at Marker\(^{69}\) (highest byte)
   2) Frequency at Marker
   3) Frequency at Marker
   4) Frequency at Marker (lowest byte)
   5) Linear Magnitude (Gamma) Value at Marker\(^{70}\) (highest byte)
   6) Linear Magnitude (Gamma) Value at Marker
   7) Linear Magnitude (Gamma) Value at Marker
   8) Linear Magnitude (Gamma) Value at Marker (lowest byte)
   9) Phase Value at Marker\(^{71}\) (highest byte)
  10) Phase Value at Marker
  11) Phase Value at Marker
  12) Phase Value at Marker (lowest byte)
   or
   1) 224 (E0h) Parameter Error: Invalid marker number
      238 (EEh) Time-out Error

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

---

\(^{69}\) Frequency in 10 Hz
\(^{70}\) Magnitude (Gamma) data use 1/10,000 units
\(^{71}\) Phase data use 1/10 degree units. Use two’s-complement method to decode negative phase values.
Set Site Master Marker (Peak/Valley) – Control Byte #129 (81h)

Description: Sets an individual marker in current measurement mode to either peak (maximum) signal or valley (minimum) signal.

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

Site Master Returns: 3 bytes (1 byte if an error occurs)
1) Marker Position (higher byte)\(^2\)
2) Marker Position (lower byte)
3) 255 (FFh) Operation Complete Byte

OR

1) 224 (E0h) Parameter Error: Invalid marker or marker search status
238 (EEh) Time Out Error

Set Waveguide Compatible Flange Cal Parameter – Control Byte #130 (82h)

Description: Sets the type of waveguide compatible flange being used in the calibration.

Bytes to Follow: 1 byte
00h = WG11A/WR229/R40
01h = WG12/WR187/R48
02h = WG13/WR159/R58
03h = WG14/WR137/R70
04h = WG15/WR112/R84
05h = WG16/WR90/R100
06h = WG17/WR75/R120
07h = WG18/WR62/R140
08h = WG20/WR42/R220
09h = WG User Defined #1
0Ah = WG User Defined #2

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

\(^2\) The marker position is sent as a data point on the display. Equivalent Frequency = (position * span / (# data points – 1)) + start frequency
Set Coaxial DUT Connector Type Cal Parameter – Control Byte #131 (83h)

Description: Sets the type of coaxial DUT connector type being used in the calibration.

Bytes to Follow: 1 byte
- 00h = K Male
- 01h = K Female
- 02h = N Male
- 03h = N Female
- 04h = 7/16 Male
- 05h = 7/16 Female
- 06h = TNC Male
- 07h = TNC Female
- 08h = Coax User Defined #1
- 09h = Coax User Defined #2

Site Master Returns: 1 byte
- 255 (FFh) Operation Complete Byte
- 224 (E0h) Parameter Error: Invalid coaxial DUT connector type
- 238 (EEh) Time Out Error

Set Calibration Media Cal Parameter – Control Byte #132 (84h)

Description: Sets the calibration media type being used in the calibration.

Bytes to Follow: 1 byte
- 00h = Coaxial
- 01h = Waveguide

Site Master Returns: 1 byte
- 255 (FFh) Operation Complete Byte
- 224 (E0h) Parameter Error: Invalid cal media type
- 238 (EEh) Time Out Error
**Recall Waveguide List – Control Byte #134 (86h)**

*Description:* Query the waveguide list for DTF.

Waveguide Cutoff Frequency is in 10 Hz (5.3 GHz would be set as 53000000).
Waveguide Insertion Loss is in hundred-thousandths of dB/m (0.345 dB/m would be sent as 34500).

*Bytes to Follow:* 0 byte

*Site Master Returns:*

Command received correctly: variable bytes

1-2) Version #
3-4) Total number of records in this package (Maximum 175)
(1st Record)
5-6) Type of record
7-27) Cable name (ASCII 21 bytes)
28-31) Waveguide Cutoff Frequency
32-35) Waveguide Insertion Loss
(2nd Record)
(56-86) Repeat from 5 to 55
… …
Last byte) FF (End of the return bytes)

Command error : 1 byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error
**Query User Coaxial DUT Connector Coefficients – Control Byte #135 (87h)**

*Description:* Query the User #1 or User #2 coefficients for the Coaxial DUT Connector. Byte following command is either 1 = User #1 or 2 = User #2.

Short and Open Offset Lengths in 1/1,000 millimeters, ranging from 0mm to 99.999mm. (12.700mm would be sent as 12700 and 11.680mm would be sent as 11680).

Open Capacitive Coefficients C0, C1, C2, and C3, ranging from -999.999 to +999.999. Value sent = (Cap Value * 1,000) + 1,000,000. (45.000 would be sent as 1045000 and -123.456 would be sent as 876544). Factors and units for coefficients are: C0 (E-15) F; C1 (E-27) F/Hz; C2 (E-36) F/Hz²; and C3 (E-45) F/Hz³.

*Bytes to Follow: 1 byte*

- 01h = Query Coax User Defined #1
- 02h = Query Coax User Defined #2

*Site Master Returns: 24 bytes (1 byte if an error occurs)*

1) Short Offset Length (highest byte)
2) Short Offset Length
3) Short Offset Length
4) Short Offset Length (lowest byte)
5) Open Offset Length (highest byte)
6) Open Offset Length
7) Open Offset Length
8) Open Offset Length (lowest byte)
9) Open Capacitive Coefficient C0 (highest byte)
10) Open Capacitive Coefficient C0
11) Open Capacitive Coefficient C0
12) Open Capacitive Coefficient C0 (lowest byte)
13) Open Capacitive Coefficient C1 (highest byte)
14) Open Capacitive Coefficient C1
15) Open Capacitive Coefficient C1
16) Open Capacitive Coefficient C1 (lowest byte)
17) Open Capacitive Coefficient C2 (highest byte)
18) Open Capacitive Coefficient C2
19) Open Capacitive Coefficient C2
20) Open Capacitive Coefficient C2 (lowest byte)
21) Open Capacitive Coefficient C3 (highest byte)
22) Open Capacitive Coefficient C3
23) Open Capacitive Coefficient C3
24) Open Capacitive Coefficient C3 (lowest byte)

**OR**

1) 224 (E0h) Parameter Error : Invalid user defined query number
2) 238 (EEh) Time Out Error
**Set User Coaxial DUT Connector Coefficients – Control Byte #136 (88h)**

*Description:* Set the User #1 or User #2 coefficients for the Coaxial DUT Connector. Byte following command is either 1 = User #1 or 2 = User #2.

Short and Open Offset Lengths in 1/1,000 millimeters, ranging from 0mm to 99.999mm. (12.700mm would be set using 12700 and 11.680mm would be set using 11680).

Open Capacitive Coefficients C0, C1, C2, and C3, ranging from -999.999 to +999.999. Value to set = (Cap Value * 1,000) + 1,000,000. (45.000 would be set using 1045000 and -123.456 would be set using 876544). Factors and units for coefficients are: C0 (E-15) F; C1 (E-27) F/Hz; C2 (E-36) F/Hz²; and C3 (E-45) F/Hz³.

*Bytes to Follow:* 25 bytes

1) Coaxial User Defined to Set (1 = User #1, 2 = User #2)
2) Short Offset Length (highest byte)
3) Short Offset Length
4) Short Offset Length
5) Short Offset Length (lowest byte)
6) Open Offset Length (highest byte)
7) Open Offset Length
8) Open Offset Length
9) Open Offset Length (lowest byte)
10) Open Capacitive Coefficient C0 (highest byte)
11) Open Capacitive Coefficient C0
12) Open Capacitive Coefficient C0
13) Open Capacitive Coefficient C0 (lowest byte)
14) Open Capacitive Coefficient C1 (highest byte)
15) Open Capacitive Coefficient C1
16) Open Capacitive Coefficient C1
17) Open Capacitive Coefficient C1 (lowest byte)
18) Open Capacitive Coefficient C2 (highest byte)
19) Open Capacitive Coefficient C2
20) Open Capacitive Coefficient C2
21) Open Capacitive Coefficient C2 (lowest byte)
22) Open Capacitive Coefficient C3 (highest byte)
23) Open Capacitive Coefficient C3
24) Open Capacitive Coefficient C3
25) Open Capacitive Coefficient C3 (lowest byte)

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete Byte
2) 224 (E0h) Parameter Error: Invalid user defined set number, length, or coefficient
3) 238 (EEh) Time Out Error
**Query User Waveguide Flange Coefficients – Control Byte #137 (89h)**

*Description:* Query the User #1 or User #2 coefficients for the Waveguide Flange. Byte following command is either 1 = User #1 or 2 = User #2.

Short and Open Offset Lengths in 1/1,000 millimeters, ranging from 0mm to 99.999mm. (12.700mm would be sent as 12700 and 11.680mm would be sent as 11680).

Waveguide Cutoff Frequency is in 10 Hz (5.3 GHz would be sent as 530000000).

*Bytes to Follow:* 1 byte

01h = Query Waveguide User Defined #1
02h = Query Waveguide User Defined #2

*Site Master Returns:* 12 bytes (1 byte if an error occurs)

1) 1/8th Short Offset Length (highest byte)
2) 1/8th Short Offset Length
3) 1/8th Short Offset Length
4) 1/8th Short Offset Length (lowest byte)
5) 3/8th Short Offset Length (highest byte)
6) 3/8th Short Offset Length
7) 3/8th Short Offset Length
8) 3/8th Short Offset Length (lowest byte)
9) Cutoff Frequency (highest byte)
10) Cutoff Frequency
11) Cutoff Frequency
12) Cutoff Frequency (lowest byte)

**OR**

2) 224 (E0h) Parameter Error : Invalid user defined query number
238 (EEh) Time Out Error
**Set User Waveguide Flange Coefficients – Control Byte #138 (8Ah)**

*Description:* Set the User #1 or User #2 coefficients for the Waveguide Flange. Byte following command is either 1 = User #1 or 2 = User #2.

Short and Open Offset Lengths in 1/1,000 millimeters, ranging from 0mm to 99.999mm. (12.700mm would be set using 12700 and 11.680mm would be sent using 11680).

Waveguide Cutoff Frequency is in 10 Hz (5.3 GHz would be set using 530000000).

*Bytes to Follow:* 13 bytes

1) Waveguide Flange to Set (1 = User #1, 2 = User #2)
2) 1/8th Short Offset Length (highest byte)
3) 1/8th Short Offset Length
4) 1/8th Short Offset Length
5) 1/8th Short Offset Length (lowest byte)
6) 3/8th Short Offset Length (highest byte)
7) 3/8th Short Offset Length
8) 3/8th Short Offset Length
9) 3/8th Short Offset Length (lowest byte)
10) Cutoff Frequency (highest byte)
11) Cutoff Frequency
12) Cutoff Frequency
13) Cutoff Frequency (lowest byte)

*Site Master Returns:* 1 byte

2) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid user defined set number, length, or cutoff freq
   238 (EEh) Time Out Error
**Set Baud Rate – Control Byte #197 (C5h)**

*Description:* Set baud rate for this session. An invalid setting returns the baud rate to 9600.

*Bytes to Follow:* 1 byte

1) Baud Rate Index
   - 00h = 9600 baud
   - 01h = 19200 baud
   - 02h = 38400 baud
   - 03h = 56000 baud
   - 04h = 115200 baud

*Site Master Returns:* 1 byte

3) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid baud rate index
   238 (EEh) Time Out Error

---

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

*Description:* Set the Site Master display language.

*Bytes to Follow:* 1 byte

1) Language Index
   - 00h = English
   - 01h = French
   - 02h = German
   - 03h = Spanish
   - 04h = Chinese
   - 05h = Japanese

*Site Master Returns:* 1 byte

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

---

**Query Time – Control Byte #208 (D0h)**

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 8 bytes (HH:MM:SS)

1) Hour (higher byte)
2) Hour (lower byte)
3) :
4) Minute (higher byte)
5) Minute (lower byte)
6) :
7) Second (higher byte)
8) Second (lower byte)
**Read Main Serial Number – Control Byte #221 (DDh)**

*Description:* Returns the Main (External) Serial Number as four bytes. This command remains for backward compatibility.

A better command to use would be “Read ASCII Serial Number” #225 (E1h) which returns the serial number in ASCII format.

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 4 bytes
1) Main Serial Number (highest byte)
2) Main Serial Number
3) Main Serial Number
4) Main Serial Number (lowest byte)

---

**Read ASCII Serial Number – Control Byte #225 (E1h)**

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

*Bytes to Follow:* 1 byte
1) Serial number storage location
   - 01h = Main (External) Serial Number
   - 02h = Secondary (Motherboard) Serial Number
   - 03h = Option 5/22 Serial Number
   - 04h = UW Board Serial Number
   - 05h = UW Module Serial Number
   - 06h = CW source Module Serial Number (if available)

*Site Master Returns:* 8 bytes
1-8) Serial Number (in ASCII)
**Exit Remote Mode – Control Byte #255 (FFh)**

*Description:* Site Master exits remote mode.

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

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

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

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

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

*Bytes to Follow:* 0 bytes

*Site Master Returns:* 1 byte

1) 255 (FFh) Operation Complete

---

**GPS Power – Control Byte #237 (EDh) (Option 31 only)**

*Description:* Turn On/Off power of GPS module.

*Bytes to Follow:* 1 bytes

1) Power Switch (1=ON, others=OFF)

*Site Master Returns:* 1 byte

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

---

**Read GPS Position – Control Byte #238 (EEh) (Option 31 only)**

*Description:* Read current GPS position data: Latitude, Longitude, and Altitude.

*Bytes to Follow:* nothing

*Site Master Returns:* 13 bytes (if Ok)

1-2) Number of satellites in use (< 3 if not locked)
3-6) GPS Position – Latitude (long integer) 73 (= -1 if not valid)
7-10) GPS Position – Longitude (long integer) (= -1 if not valid)
11-12) GPS Position – Altitude (short integer) (= -30000 if not valid)
13) 255 (FFh) Operation Complete Byte

Error code: 1 byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

---

73 Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000
### Parameter Definitions

<table>
<thead>
<tr>
<th>Parameter</th>
<th># of bytes</th>
<th>Step</th>
<th>Example / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4 bytes</td>
<td>unsigned</td>
<td>10 Hz 1.00003 GHz = 100003000</td>
</tr>
<tr>
<td>Scale (RL, CL)</td>
<td>4 bytes</td>
<td>unsigned</td>
<td>1/1000 dB = 51300</td>
</tr>
<tr>
<td>(SWR)</td>
<td>4 bytes</td>
<td>1/1000 (ratio)</td>
<td>65.53 = 65530</td>
</tr>
<tr>
<td>(CL2P)</td>
<td>4 bytes</td>
<td>1/1000 dBm / 1000 dB</td>
<td>+60 dBm = 40000, 0.00 dBm = 100000</td>
</tr>
<tr>
<td>Limit (RL, CL)</td>
<td>4 bytes</td>
<td>unsigned</td>
<td>1/1000 dB = 51300</td>
</tr>
<tr>
<td>(SWR)</td>
<td>4 bytes</td>
<td>1/1000 (ratio)</td>
<td>65.53 = 65530</td>
</tr>
<tr>
<td>(CL2P)</td>
<td>4 bytes</td>
<td>1/1000 dBm / 1000 dB</td>
<td>+60 dBm = 40000, 0.00 dBm = 100000</td>
</tr>
<tr>
<td>Multiple Limit (RL, CL)</td>
<td>2 bytes</td>
<td>unsigned</td>
<td>1/1000 dB = 51300</td>
</tr>
<tr>
<td>(SWR)</td>
<td>2 bytes</td>
<td>1/1000 (ratio)</td>
<td>65.53 = 65530</td>
</tr>
<tr>
<td>(CL2P)</td>
<td>2 bytes</td>
<td>1/100 dBm / 100 dB</td>
<td>+60 dBm = 40000, 0.00 dBm = 100000</td>
</tr>
<tr>
<td>Markers (Frequency &amp; distance marker)</td>
<td>2 bytes</td>
<td>unsigned</td>
<td>1 sweep point Marker Values are given in relative position of the graph. The lowest value is 0, while the highest is (# of data points - 1).</td>
</tr>
<tr>
<td>Distance</td>
<td>4 bytes</td>
<td>1/100,000 m/ft</td>
<td>12.34 m = 1234000</td>
</tr>
<tr>
<td>Relative Propagation Velocity</td>
<td>4 bytes</td>
<td>unsigned</td>
<td>1/100,000</td>
</tr>
<tr>
<td>Cable Loss</td>
<td>4 bytes</td>
<td>unsigned</td>
<td>1/100,000 dB = 0.345 dB/m = 34500</td>
</tr>
<tr>
<td>Gamma</td>
<td>4 bytes</td>
<td>signed (ratio)</td>
<td>Gamma value is the ratio of magnitude of reflected signal over the magnitude of incident signal.</td>
</tr>
<tr>
<td>Phase</td>
<td>4 bytes</td>
<td>1/10 degree</td>
<td>Phase value is the difference in phase between the incident and reflected signal.</td>
</tr>
<tr>
<td>Power: dBm/DB</td>
<td>4 bytes</td>
<td>signed</td>
<td>51.3 dBm = 51300 10.4 dB = 10400</td>
</tr>
<tr>
<td>Counter Type</td>
<td>Data Type</td>
<td>Error Count</td>
<td>Failures</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>Lock Fail Counter</td>
<td>2 bytes unsigned</td>
<td>1 error</td>
<td>234</td>
</tr>
<tr>
<td>Integrator Fail</td>
<td>2 bytes unsigned</td>
<td>1 error</td>
<td>123</td>
</tr>
</tbody>
</table>
Programming Examples

This section contains several sample functions written in C, (and one in Visual Basic) that can be used as references when programming the Anritsu Handheld Products. These include functions to set up the comm Port, enter and exit remote mode, and set the scale start and stop of the VNA. These reference examples are not meant to be used verbatim, but are included to aid software developers in writing their own programming codes.

**Examples in C:**

```c
unsigned char EnterRemote(BYTE *ResponseBytes) {
    BYTE *SendEnterRemoteCharPointer; // Data to send
    BYTE SerialCommand;

    SendEnterRemoteCharPointer = &SerialCommand;
    SerialCommand = 69; // 69 is the Enter Remote Mode serial command

    // Write 1 byte of data from SendEnterRemoteCharPointer to the
    // COM Port
    WriteToPort (SendEnterRemoteCharPointer, 1);

    // Read the data returned by the SiteMaster – expecting 13 bytes,
    // give the unit 30 seconds to respond before timing out.
    if(!ReadfromPort(13, ResponseBytes, 30))
        { return FAILURE; }
    else
        { return SUCCESS; }
} /* EnterRemote */
```

```c
unsigned char SetVNAScale(unsigned long StartScale, unsigned long StopScale, BYTE *ResponseBytes) {
    BYTE SerialCommand;

    SerialCommand = 4; // 4 is the Set VNA Scale serial command

    // Write 2 bytes of data from SerialCommand to the
    // COM Port
    WriteToPort (SerialCommand, 2);

    // Read the data returned by the SiteMaster - expecting 13 bytes,
    // give the unit 30 seconds to respond before timing out.
    if(!ReadfromPort(13, ResponseBytes, 30))
        { return FAILURE; }
    else
        { return SUCCESS; }
} /* SetVNAScale */
```
already been checked to fall in the valid range and scaled according to the formulas in the Programming Manual.

ResponseBytes = pointer to an array of bytes at least 1 element long (1 byte is expected in response to the Set Spectrum Analyzer Scale command).

Returns: SUCCESS if the values are set
FAILURE if the command fails
Response bytes are returned in the variable ResponseBytes.

/*==========================================================================
unsigned char SetVNAScale(unsigned long StartScale,
                       unsigned long StopScale, BYTE *ResponseBytes)
{
BYTE *SendScalePointer; // Data to send
BYTE SendBytes[9];
BYTE SerialCommand;

// Serial Command to Set Scale on the VNA.
SerialCommand = 4;

// Data pointer.
SendScalePointer = &SendByte[0];

// First byte to send is the serial command, #4.
SendBytes[0] = SerialCommand;

// Convert the start and stop scale into 8 bytes
// (4 bytes each) for the VNA. Put the bytes in the SendBytes variable, starting with byte 1 (leave byte 0 as the command byte).
Get8Bytes(StartScale, StopScale, &SendBytes[1]);

// Write 9 bytes of data in SendScalePointer to the port.
WriteToPort(SendScalePointer, 9);

// Expecting 1 byte back (give the unit 5 seconds to respond):
// 0xFF = success
// 0x0E = parameter failure (invalid value)
// 0xEE = time-out (insufficient # of bytes received by SPA)
if(!ReadFromPort(1, ResponseBytes, 5))
{
    return FAILURE;
}
else
{
    if ( *ResponseBytes != 0xFF )
    {
        return FAILURE;
    } else
    {
        return SUCCESS;
    }
}
unsigned char ExitRemote(BYTE *ResponseBytes)
{
    BYTE *SendExitRemoteCharPointer; // Data to send
    BYTE SerialCommand;

    SendExitRemoteCharPointer = &SerialCommand;
    SerialCommand = 255; // 255 is the Exit Remote Serial Command

    // Write 1 byte of data from SendExitRemoteCharPointer to the
    // COM Port
    WriteToPort (SendExitRemoteCharPointer, 1);

    // Expecting 1 byte back (give the unit 5 seconds to respond):
    // 0xFF = success
    if(!ReadFromPort(1, ResponseBytes, 1))
    {
        return FAILURE;
    }
    else
    {
        if ( *ResponseBytes != 0xFF )
        {
            return FAILURE;
        }
        else
        {
            return SUCCESS;
        }
    }
} /* ExitRemote */

void Get8Bytes(unsigned long parm1, unsigned long parm2, BYTE* ByteData )
{ /*
    Description: This function converts the 2 four byte values to
    8 bytes for transmission to the SiteMaster. parm1 occupies
    the first four bytes, parm2 occupies the second 4 bytes.
    Inputs: parm1 - 4 byte unsigned long integer
    parm2 - 4 byte unsigned long integer
*/

void Get8Bytes(unsigned long parm1, unsigned long parm2, 
    BYTE* ByteData)
{
    // MSB of 1st parameter
    *ByteData = (BYTE)((parm1 & 0xFF000000)>>24);
    *(ByteData+1) = (BYTE)((parm1 & 0x00FF0000)>>16);
    *(ByteData+2) = (BYTE)((parm1 & 0x0000FF00)>>8);
    // LSB of 1st parameter
    *(ByteData+3) = (BYTE)(parm1 & 0x000000FF);

    // MSB of 2nd parameter
    *(ByteData+4) = (BYTE)((parm2 & 0xFF000000)>>24);
    *(ByteData+5) = (BYTE)((parm2 & 0x00FF0000)>>16);
    *(ByteData+6) = (BYTE)((parm2 & 0x0000FF00)>>8);
    // LSB of 2nd parameter
    *(ByteData+7) = (BYTE)(parm2 & 0x000000FF);
} /* Get8Bytes */

BOOL OpenCommunications(int ComPort, int ComBaud)
{
    DCB CommSettings; // Structure with COM Port settings
    LPCTSTR ComPortNumber; // Pointer to the COM port number
    BOOL PortReady; // Return val after setting the COM Port
    COMMTIMEOUTS timeout; // Structure with Time out values

    switch (ComPort)
    {
    case '1':
        ComPortNumber = "COM1";
        break;
    case '2':
        ComPortNumber = "COM2";
        break;
    case '3':
        ComPortNumber = "COM3";
        break;
    case '4':
        ComPortNumber = "COM4";
        break;
    default:
CloseHandle(ComHandle);
fclose(fp);
exit(0);
break;
}

/* Creating a File to Open a COM Port*/
ComHandle = CreateFile( ComPortNumber,
    GENERIC_READ | GENERIC_WRITE,
    0, // exclusive access
    NULL, // no security
    OPEN_EXISTING,
    0, // no overlapped I/O
    NULL); // null template

/* Set up the COM Ports Input and Output Buffer
Syntax -
BOOL SetupComm(
    HANDLE hFile,     // handle to communications device
    DWORD dwInQueue,  // size of input buffer
    DWORD dwOutQueue  // size of output buffer
    );
*/
PortReady = SetupComm(ComHandle, 5000, 5000);

/* Open the existing COM Settings
Syntax -
BOOL GetCommState(
    HANDLE hFile, // handle to communications device
    LPDCB lpDCB   // pointer to device-control block
    // structure
    );
*/
PortReady = GetCommState(ComHandle, &CommSettings);

/*Check to see if it was successful*/
if(!PortReady)
{
    CloseHandle(ComHandle);
fclose(fp);
    exit(0);
}

/* This is Used to Update the CommSettings Structure Variables*/
// Setting the Baud Rate
switch (ComBaud)
{
    case '1':
        CommSettings.BaudRate = CBR_9600; // rate - 9600
        break;
    case '2':
        CommSettings.BaudRate = CBR_19200; // rate - 19200
        break;
    case '3':
        CommSettings.BaudRate = CBR_38400; // rate - 38400
        break;
    case '4':
        }
CommSettings.BaudRate = CBR_56000; // rate - 56000
break;
case '5':
    CommSettings.BaudRate = CBR_115200; // rate - 115200
    break;
default:
    CommSettings.BaudRate = CBR_9600; // Default - 9600
    break;
}

// disable null stripping
CommSettings.fNull = FALSE;
// RTS flow control
CommSettings.fRtsControl = RTS_CONTROL_ENABLE;
// XON/XOFF in flow control
CommSettings.fInX = FALSE;
// XON/XOFF out flow control
CommSettings.fOutX = FALSE;
// DTR flow control type
CommSettings.fDtrControl = DTR_CONTROL_ENABLE;
// number of bits/byte, 4-8
CommSettings.ByteSize = 8;
// 0-4=no, odd, even, mark, space
CommSettings.Parity = NOPARITY;
// 0, 1, 2 = 1, 1.5, 2
CommSettings.StopBits = ONESTOPBIT;

/* Setting the COM State with the changed parameters
   Syntax -
   BOOL SetCommState(
       HANDLE hFile,  // handle to communications device
       LPDCB lpDCB    // pointer to device-control block structure
   );
*/

PortReady = SetCommState (ComHandle, &CommSettings);

/* Setting the parameters for the timeouts.
   NOTE: Without Timeout Settings, Reading the COM Port will not work properly*/

    // This gives the Timeout value for each bytes received
timeout.ReadIntervalTimeout = MAXDWORD;
timeout.ReadTotalTimeoutConstant = 0;
timeout.ReadTotalTimeoutMultiplier = 0;

/* Sets the communication timeouts
   Syntax -
   BOOL SetCommTimeouts(
       HANDLE hFile,  // handle to comm device
       LPCOMMTIMEOUTS lpCommTimeouts /* pointer to comm time-out
   structure */
   );
*/
SetCommTimeouts(ComHandle, &timeout);

if(PortReady)
{ 
    return SUCCESS;
}
else
{
    CloseHandle(ComHandle);
    fclose(fp);
    return FAIL;
    exit(0);
}

Example in Visual Basic
Private Sub cmdSetBaudRateSM_Click()
    Dim ChangeBaudSerialCmd As Integer
    Dim BaudRate As Integer
    Dim strInputBuf As Variant
    Dim PreviousSettings As String
    PreviousSettings = commCtrl.Settings

'Check that we’re in remote and have selected a baud rate
If CheckInitialConditions(True, False, True) = False Then
    GoTo SetSMBaud_err_handler
End If

    ChangeBaudSerialCmd = 197       'Setting Baud rate Serial Command
    BaudRate = GetBaudSerialCmd     'Get the Serial cmd for the specific baud rate
    commCtrl.Output = Chr$(ChangeBaudSerialCmd) + Chr$(BaudRate)    'Sending the data

    Delay (300)

'Change the Baud setting for the application also
If BaudRate = 0 Then
    commCtrl.Settings = "9600,n,8,1"
ElseIf BaudRate = 1 Then
    commCtrl.Settings = "19200,n,8,1"
ElseIf BaudRate = 2 Then
    commCtrl.Settings = "38400,n,8,1"
ElseIf BaudRate = 3 Then
    commCtrl.Settings = "56000,n,8,1"
ElseIf BaudRate = 4 Then
    commCtrl.Settings = "115200,n,8,1"
Else
    'Box will fail, set back to 9600.
    commCtrl.Settings = "9600,n,8,1"
End If

    Delay (1000)
    strInputBuf = CStr(commCtrl.Input)
    strInputBuf = Mid(strInputBuf, 1, 1)
    If strInputBuf = "" Then

MsgBox "Invalid"Baud Rate - NO STRING"
    GoTo SetSMBaud_err_handler
End If

If Asc(strInputBuf) = 255 Then
    MsgBox "Set Baud Rate Successfully"
ElseIf Asc(strInputBuf) = 238 Then
    MsgBox "SiteMaster Timed out"
    GoTo SetSMBaud_err_handler
ElseIf Asc(strInputBuf) = 224 Then
    MsgBox "Invalid Baud Rate - ERR 224"
    GoTo SetSMBaud_err_handler
Else
    MsgBox "Invalid Baud Rate - ERR " + CStr(Asc(strInputBuf))
    GoTo SetSMBaud_err_handler
End If

Exit Sub
SetSMBaud_err_handler:
    commCtrl.Settings = PreviousSettings
End Sub
## Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/1/05</td>
<td>Initial Release Manual Revision A (10680-00002A.pdf)</td>
</tr>
<tr>
<td>3/13/06</td>
<td>Release Manual Revision B (10680-00002B.pdf)</td>
</tr>
<tr>
<td>9/21/06</td>
<td>Release Manual Revision C (10680-00002C.pdf)</td>
</tr>
<tr>
<td>4/1/07</td>
<td>Release Manual Revision D (10680-00002D.pdf)</td>
</tr>
</tbody>
</table>