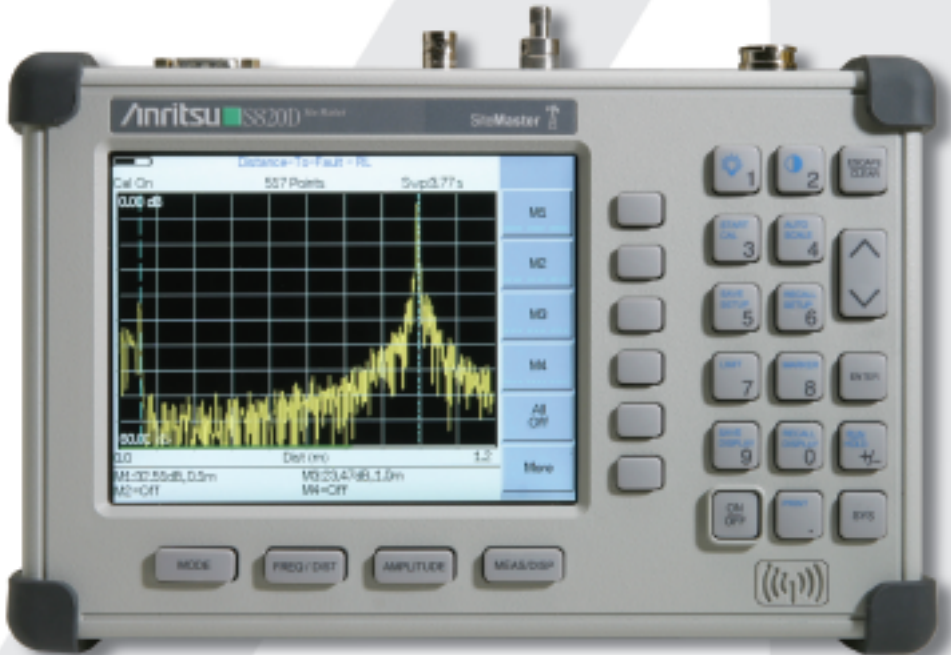


Site Master™

S810D/S820D

Cable and Antenna Analyzer
25 MHz to 20 GHz



Programming Manual



10680-00002, Revision D

Table of Contents

TABLE OF CONTENTS	3
PROGRAMMING OVERVIEW	5
GENERAL DESCRIPTION	5
CABLING	5
SERIAL COMMUNICATION PARAMETERS	5
COMMUNICATIONS ERROR CHECKING	5
PARAMETER VALIDATION	5
ENTERING REMOTE MODE	6
EXITING REMOTE MODE	6
LIFETIME OF CHANGES TO SITE MASTER OPERATING PARAMETERS	6
WRITE CYCLE LIMITATION OF EEPROM	6
DOCUMENTATION CONVENTIONS	6
<i>Numeric Representation:</i>	6
<i>Bit Positions:</i>	6
CONTROL BYTE DESCRIPTIONS	7
SETUP SYSTEM – CONTROL BYTE #1 (01H)	7
SET SITE MASTER VNA FREQUENCY – CONTROL BYTE #2 (02H)	7
SELECT MEASUREMENT MODE – CONTROL BYTE #3 (03H)	8
SET SITE MASTER VNA SCALE – CONTROL BYTE #4 (04H)	9
SET SITE MASTER VNA MARKER – CONTROL BYTE #5 (05H)	10
SET SITE MASTER VNA SINGLE LIMIT – CONTROL BYTE #6 (06H)	11
SET DTF PARAMETER – CONTROL BYTE #7 (07H)	12
SET TIME/DATE – CONTROL BYTE #8 (08H)	13
SET TRACE NAME (REFERENCE NUMBER) – CONTROL BYTE #9 (09H)	13
SERIAL PORT ECHO ON/OFF – CONTROL BYTE #10 (0AH)	14
SITE MASTER VNA SINGLE SWEEP MODE ON/OFF – CONTROL BYTE #11 (0BH)	14
WATCH-DOG TIMER ON/OFF – CONTROL BYTE #12 (0CH)	14
SEQUENCE SITE MASTER CALIBRATION – CONTROL BYTE #13 (0DH)	15
SET SITE MASTER VNA DATA POINTS – CONTROL BYTE #14 (0EH)	15
STORE SWEEP TRACE – CONTROL BYTE #16 (10H)	16
SAVE SYSTEM SETUP – CONTROL BYTE #18 (12H)	16
RECALL SYSTEM SETUP – CONTROL BYTE #19 (13H)	16
TRIGGER SELF-TEST – CONTROL BYTE #21 (15H)	17
READ FAIL COUNTER – CONTROL BYTE #22 (16H)	17
READ FAIL COUNTER AND MONITOR STATUS - CONTROL WORD (AA16H)	18
QUERY TRACE NAMES – CONTROL BYTE #24 (18H)	18
DELETE SWEEP TRACE – CONTROL BYTE #25 (19H)	19
QUERY SYSTEM STATUS – CONTROL BYTE #29 (1DH)	19
SELECT PRINTER TYPE – CONTROL BYTE #30 (1EH)	24
SELECT DTF WINDOWING – CONTROL BYTE #31 (1FH)	24
SET SITE MASTER VNA TRACE MATH – CONTROL BYTE #32 (20H)	25
RECALL SWEEP TRACE – CONTROL BYTE #33 (21H)	25
RECALL CURRENT SWEEP TRACE IN RAM – CONTROL WORD (AA21H)	30
SET SITE MASTER VNA TRACE OVERLAY – CONTROL BYTE #34 (22H)	31
UPLOAD SITE MASTER SWEEP TRACE – CONTROL BYTE #36 (24H)	31
GET OPTIONS – CONTROL BYTE #37 (25H)	35
SET SMOOTHING FACTOR – CONTROL BYTE #38 (26H)	35
QUERY POWER LEVEL – CONTROL BYTE #39 (27H) (OPTION 5 OR OPTION 22 ONLY)	35
SET POWER MONITOR UNITS – CONTROL BYTE #40 (28H) (OPTION 5 OR OPTION 22 ONLY)	36
POWER MONITOR RELATIVE MODE ON/OFF – CONTROL BYTE #41 (29H) (OPTION 5 OR OPTION 22 ONLY)	36
POWER MONITOR OFFSET MODE ON/OFF – CONTROL BYTE #42 (2AH) (OPTION 5 OR OPTION 22 ONLY)	37

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 #137 (89H)	49
SET 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)¹
 - 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
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
224 (E0h) Parameter Error : Invalid frequency range
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 represent 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
224 (E0h) Parameter Error : Invalid scale range
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:

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

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
224 (E0h) Parameter Error : Invalid limit status, limit beep status, or limit value
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
 - 224 (E0h) Parameter Error : Parameter(s) out of range
 - 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 °C) or degree Fahrenheit (for example, 934 = 93.4 °F), 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/YYYYHH: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

- 1) 0 - Delete all traces
- X - Delete single trace #X

Site Master Returns: 1 byte

- 1) 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 Mode³
- 4) Printer Type⁴
- 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 ⁵ (higher byte)
- 9) RTC battery (lower byte)
- 10) PC Board Revision ⁶ (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)¹²
- 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)¹³
- 151) Relative Propagation Velocity
- 152) Relative Propagation Velocity
- 153) Relative Propagation Velocity (lowest byte)
- 154) Cable Loss (highest byte)¹⁴
- 155) Cable Loss
- 156) Cable Loss
- 157) Cable Loss (lowest byte)
- 158) Average Cable Loss¹⁵ (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
- 166) 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
- 167) 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
- 168) 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
- 169) 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
- 170) 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
- 171) Not used
- 172) Not used
- 173) Waveguide Insertion Loss¹⁶ (highest byte)
- 174) Waveguide Insertion Loss
- 175) Waveguide Insertion Loss
- 176) Waveguide Insertion Loss (lowest byte)

¹⁶ Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.

- 177) Waveguide Cutoff Frequency¹⁷ (highest byte)
- 178) Waveguide Cutoff Frequency
- 179) Waveguide Cutoff Frequency
- 180) Waveguide Cutoff Frequency (lowest byte)
- 181) Smoothing Factor (0 = Off)
- 182) Status 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
- 183-300) 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
 - 224 (E0h) Parameter Error: Invalid DTF Windowing Method
 - 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 Format²¹
- 4) Not Used
- 5-11) Model Number (7 bytes in ASCII)
- 12-15) Software Version (4 bytes ASCII)
- 16) Measurement Mode²²
- 17-20) Time/Date (in Long Integer²³)
- 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 Frequency²⁴ (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 Top²⁵ (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 Limit²⁷ (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 X²⁸ (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 Distance²⁹ (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 ³⁰ (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 ³¹ (highest byte)
- 184) Relative Propagation Velocity
- 185) Relative Propagation Velocity
- 186) Relative Propagation Velocity (lowest byte)
- 187) Cable Loss ³² (highest byte)
- 188) Cable Loss
- 189) Cable Loss
- 190) Cable Loss (lowest byte)
- 191) Average Cable Loss ³³ (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

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 Loss³⁵ (highest byte)

213) Waveguide Insertion Loss

214) Waveguide Insertion Loss

215) Waveguide Insertion Loss (lowest byte)

216) Waveguide Cutoff Frequency³⁶ (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. gamma³⁷ (highest byte)

2. gamma

3. gamma

4. gamma (lowest byte)

5. phase³⁸ (highest byte)

6. phase

7. phase

8. phase (lowest byte)

Notes:

return loss = $-20 * (\log(\text{gamma}) / \log(10))$

VSWR = $(1 + \text{gamma}) / (1 - \text{gamma})$

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 = $\text{int}(\text{abs}(\text{value}) / 1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value}) \% 1,000,000) / 10,000$

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 Offset³⁹ (highest byte)
- 77) Power Offset
- 78) Power Offset
- 79) Power Offset (lowest byte)
- 80) Power Relative Status (00h = Off, 01h = On)
- 81) Power Relative Value⁴⁰ (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 Reading⁴² (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 Format⁴³
- 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. gamma⁴⁴ (highest byte)
2. gamma (lowest byte)
3. phase⁴⁵ (highest byte)
4. phase (lowest byte)

Magnitude only (4 bytes) format (01h): 4 bytes for each data point

1. gamma⁴⁶ (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. real⁴⁷ (highest byte)
2. real (lowest byte)
3. imaginary⁴⁸ (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 = $\sqrt{\text{real}*\text{real} + \text{imaginary}*\text{imaginary}}$

Return Loss = $-20 * (\log(\text{gamma}) / \log(10))$

VSWR = $(1+\text{gamma}) / (1-\text{gamma})$

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
 - 224 (E0h) Parameter Error: Invalid Trace Overlay Operation
 - 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 Mode⁴⁹
- 4-7) Time/Date (in Long Integer)
- 8-17) Date in String Format (MM/DD/YYYY)
- 18-25) Time in String Format (HH:MM:SS)
- 26-41) Reference number stamp (16 ASCII bytes)
- 42-43) # of data points (130, 259, 517 or 401 or 100)

For VNA Modes:

- 44) Start Frequency (highest byte)⁵⁰
- 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)⁵¹
- 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)⁵²
- 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)⁵³
- 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)⁵⁴
- 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)⁵⁵
- 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)⁵⁶

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)⁵⁷
- 171) Relative Propagation Velocity
- 172) Relative Propagation Velocity
- 173) Relative Propagation Velocity (lowest byte)
- 174) Cable Loss (highest byte)⁵⁸
- 175) Cable Loss
- 176) Cable Loss
- 177) Cable Loss (lowest byte)
- 178) Average Cable Loss⁵⁹ (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)⁶⁰
- 193-196) GPS Position – Longitude (long integer)
- 197-198) GPS Position – Altitude (short integer)
- 199) Waveguide Insertion Loss⁶¹ (highest byte)
- 200) Waveguide Insertion Loss
- 201) Waveguide Insertion Loss
- 202) Waveguide Insertion Loss (lowest byte)
- 203) Waveguide Cutoff Frequency⁶² (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. Gamma⁶³ (highest byte)
 2. Gamma
 3. Gamma
 4. Gamma (lowest byte)
 5. Phase⁶⁴ (highest byte)
 6. Phase
 7. Phase
 8. Phase (lowest byte)

Notes:

return loss = $-20 * (\log(\text{Gamma}) / \log(10))$

VSWR = $(1 + \text{Gamma}) / (1 - \text{Gamma})$

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 = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

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
-

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 +32,7687 mA, positive = Charging)
- 9-10) Battery Average current (signed integer -32,768 to +32,7687 mA, positive = Charging)
- 11-12) Average time to empty (unsigned integer 0 to 65535 minute)
- 13-14) Battery Charge Cycle Count (unsigned integer 0 to 65535 cycles)
- 15-16) Battery Capacity at Full Charge in mA Hours (unsigned integer 0 to 65535 cycles)
- 17) Unit under battery power (1 = YES; 0 = NO)

Note:

The Smart Battery Data Spec can be found at <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 byte⁶⁶
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

One Port Minimum value sent is 0 which represents 0.0 dB

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 Marker⁶⁹ (highest byte)
 - 2) Frequency at Marker
 - 3) Frequency at Marker
 - 4) Frequency at Marker (lowest byte)
 - 5) Linear Magnitude (Gamma) Value at Marker⁷⁰ (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 Marker⁷¹ (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 = $-20 * (\log(\text{Gamma}) / \log(10))$

VSWR = $(1 + \text{Gamma}) / (1 - \text{Gamma})$

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)⁷²
- 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

⁷² 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 530000000).

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
 - 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
224 (E0h) Parameter Error: Invalid user defined set number, length, or coefficient
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

Parameter	# of bytes	Step	Example / Description
Frequency	4 bytes unsigned	10 Hz	1.00003 GHz = 100003000
Scale (RL, CL)	4 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	4 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(CL2P)	4 bytes unsigned	1 / 1000 dBm 1 / 1000 dB	+60 dBm = 40000, 0.00 dBm = 100000 -60 dB = 160000
Limit (RL, CL)	4 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	4 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(CL2P)	4 bytes unsigned	1 / 1000 dBm 1 / 1000 dB	+60 dBm = 40000, 0.00 dBm = 100000 -60 dB = 160000
Multiple Limit (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
(CL2P)	2 bytes unsigned	1 / 100 dBm 1 / 100 dB	+60 dBm = 4000, 0.00 dBm = 10000 -60 dB = 16000
Markers (Frequency & distance marker)	2 bytes unsigned	1 sweep point	Marker Values are given in relative position of the graph. The lowest value is 0, while the highest is (# of data points - 1).
Distance	4 bytes unsigned	1/100,000 m/ft	12.34 m = 1234000
Relative Propagation Velocity	4 bytes unsigned	1 / 100,000	0.837 = 83700
Cable Loss	4 bytes unsigned	1 / 100,000 dB	0.345 dB/m = 34500
Gamma	4 bytes signed	1 / 10,000 (ratio)	Gamma value is the ratio of magnitude of reflected signal over the magnitude of incident signal.
Phase	4 bytes signed	1 / 10 degree	Phase value is the difference in phase between the incident and reflected signal.
Power: dBm/dB	4 bytes signed	1 / 1000 dBm 1 / 1000 dB	51.3 dBm = 51300 10.4 dB = 10400

Lock Fail Counter	2 bytes unsigned	1 error count	234 fails = 234
Integrator Fail Counter	2 bytes unsigned	1 error count	123 fails = 123

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:

```
/*
*****
/*   unsigned char EnterRemote(BYTE *ResponseBytes)           */
/*   Description: This function implements control byte #69, Enter */
/*               Remote Mode.  If successful, the unit will be in */
/*               remote mode, waiting to accept additional serial */
/*               commands.                                         */
/*   Inputs:      ResponseBytes = pointer to an array of bytes at */
/*               least 13 elements long (13 bytes are expected in */
/*               response to the Enter Remote command).           */
/*   Returns:     SUCCESS if the unit is in remote mode           */
/*               FAILURE if the command fails                     */
/*               Response bytes are returned in the variable     */
/*               ResponseBytes.                                    */
*****
*/
```

```
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 */
```

```
/*
*****
/*   unsigned char SetVNAScale(unsigned long StartScale,      */
/*               unsigned long StopScale, BYTE *ResponseBytes) */
/*   Description: This function implements control byte #4, Set VNA */
/*               Scale. It sets the VNA scale start and stop (dB). */
/*   Inputs :     StartScale = start scale value                */
/*               StopScale = stop scale value                   */
/*   NOTE:        This function assumes the values have         */
*****
*/
```

```

/*          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
    // 0xE0 = 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;
        }
    }
}

```



```

} /* SetVNAScale */

/*****
/*   unsigned char ExitRemote(BYTE *ResponseBytes)           */
/*   Description: This function implements control byte #255, Exit Remote Mode.  If successful, the unit will leave remote mode and resume sweeping. */
/*   Inputs:      ResponseBytes = pointer to an array of bytes at least 1 element long (1 byte is expected in response to the Exit Remote command). */
/*   Returns:    SUCCESS if the unit exits remote mode */
/*              FAILURE if the command fails */
/*              Response bytes are returned in the variable ResponseBytes. */
*****/
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 */
*****/

```

```

/* Returns: SUCCESS if the unit is in remote mode */
/* FAILURE if the command fails */
/* The resulting bytes are returned in the */
/* memory location pointed to by ByteData. This */
/* location must have at least 8 empty bytes. */
/*****
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) */
/* Description : This function is to Open the communication port */
/* and set the port settings */
/* Inputs: int - ComPor- entered as a command line argument */
/* int - ComBau- The Baud rate for Communication */
/* Returns: SUCCESS - If the-Communication link was established*/
/* FAIL - IF the-e was an error opening the COM Port */
/*****
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 -
    BO-L 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

Date	Change Description
4/1/05	Initial Release Manual Revision A (10680-00002A.pdf)
3/13/06	Release Manual Revision B (10680-00002B.pdf)
9/21/06	Release Manual Revision C (10680-00002C.pdf)
4/1/07	Release Manual Revision D (10680-00002D.pdf)