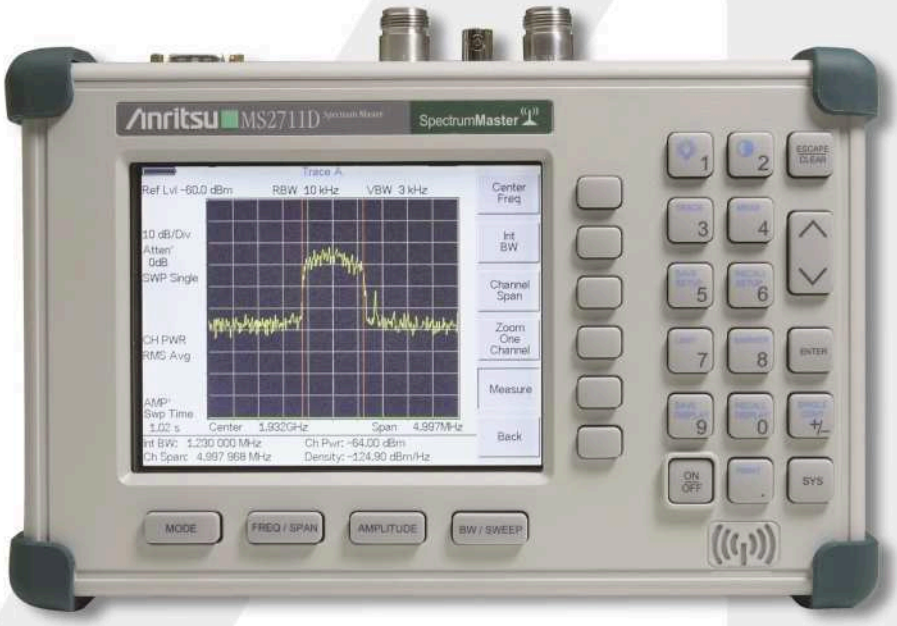
Anritsu

Spectrum Master™

MS2711D

Fast. Accurate, Repeatable, Portable Spectrum Analysis



Programming Manual

SiteMaster | SpectrumMaster | CellMaster

Anritsu

MS2711D Programming Manual
MS2711D

Remote Mode Command Specification

Software Rev 1.45

May 2007

Part Number: 10580-00098
Revision: D

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Programming Overview

Warning: This programming manual is written exclusively for Anritsu Spectrum Master Model MS2711D. For information on firmware upgrades, contact your local Anritsu Service Center. Commands listed in this manual are not all backward-compatible with earlier Anritsu models.

General Description

The Spectrum 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 Spectrum Master suspends normal operations and attends to the serial port. The front panel display indicates when the Spectrum Master is in remote mode.

Once in remote mode, you send a series of control bytes and associated data to the Spectrum Master. These control byte sequences command the Spectrum 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 Spectrum Master rear panel.

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

Cables for the Spectrum Master

Serial communications take place via the 9 pin connector on the back of the Spectrum Master. The Spectrum 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 Spectrum Master. (Anritsu part number 800-441)

Serial Communication Parameters

The Spectrum 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 Spectrum Master. For data streams going to the Spectrum 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 Spectrum Master validates input parameters for each control byte sequence. If the input parameters are out of range or invalid, the Spectrum Master notifies the computer by sending Parameter Error Byte #224 (E0h). The Spectrum Master discards the received data and waits for the next control byte.

Entering Remote Mode

Send the Enter Remote Mode Byte #69 (45h) to the Spectrum 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 Spectrum Master's serial port buffer is one byte wide. No internal buffer exists, so waiting for the unit's response is essential. If the Spectrum 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 Spectrum Master, you are in remote mode.

Exiting Remote Mode

Send the Exit Remote control byte #255 (FFh) to the Spectrum Master. Spectrum 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 Spectrum 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, etc.

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

Be aware of the EEPROM write cycle limitation when programming the Spectrum 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 Spectrum 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 275 and 276 for current Spectrum Master configuration.

Bytes to Follow: 1 byte

1) Status byte
   - bit 0 = RBW Coupling (to span) (1b = auto 0b = manual)
   - bit 1 = VBW Coupling (to RBW) (1b = auto 0b = manual)
   - bit 2 = LCD Back Light ON/OFF (1b = ON 0b = OFF)
   - bits 3-4 = Logarithmic Amplitude units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
   - bits 5-6 = Detection algorithm (00b = positive peak 01b = RMS average 10b = negative peak 11b = Sampling)
   - bit 7 = Attenuation Coupling (to ref level) (1b = auto 0b = manual)

Spectrum Master Returns: 1 byte

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

***Select Measurement Mode* – Control Byte #3 (03h)**

Description: Sets the measurement mode of the Spectrum 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 Spectrum Master measurement mode.

Bytes to Follow: 1 byte

1) Measurement Mode
   - 30h: Spectrum Analyzer Mode
   - 31h: Transmission Mode
   - 39h: Channel Scanner Mode
   - 3Bh: Interference Analyzer Mode
   - 3Ch: CW Signal Generator Mode
   - 40h: Power Meter Mode (narrow band)
   - 41h: Power Monitor Mode (Option 5)
   - 42h: High Accuracy Power Meter Mode

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid measurement mode
   238 (Eeh) Time-out Error

***Read Time/Date* – Control Byte #7 (07h)**

Description: Reads the current time and date from the real time clock.

This Time/Date is stamped into all stored sweeps (for users' reference). The real time clock time and date can be set using control byte #8.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 7 bytes

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

***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 Spectrum 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)

Spectrum 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)

Spectrum Master Returns: 1 byte
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 Spectrum Master sends a Sweep Complete Byte #192 (C0h) to the serial port.

This mode activates once the Spectrum 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 Spectrum Master and computer by doing the following:

1) Enter remote mode. Set Serial Port Echo Mode On. Exit remote mode.
2) The Spectrum 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

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid serial port echo 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 Spectrum Master incorporates a watch-dog timer for higher reliability in serial communication. In selected control bytes (see control byte summary), the Spectrum 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 Spectrum Master notifies the computer by sending Time-out Byte #238 (EEh). The Spectrum 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

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid watch-dog timer status

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***Store Sweep Trace* – Control Byte #16 (10h)**

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

Bytes to Follow: 0 bytes

Spectrum 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

***OBSOLETE: Recall Sweep Trace* – Control Byte #17 (11h)**

This command exists for backward compatibility with MS2711B models. To access the new features use Control Byte #33 (21h). This command cannot be used with a frequency extension module (option 6 required) attached.

Description: Queries the Spectrum 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 Spectrum 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 Spectrum 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)

Spectrum Master Returns: 1950 bytes

1-2) # of following bytes (1948 for a valid sweep)
3-4) Model ID (16h for the MS2711D)
5-11) Model Number (7 bytes in ASCII)
12-15) Software Version (4 bytes in ASCII)
16) Measurement Mode[1]

[1] See Control Byte #3 for available measurement modes.

17-20) Time/Date (long integer format)
21-30) Date in String Format (mm/dd/yyyy)
31-38) Time in String Format (hh:mm:ss)
39-54) Reference Number/Trace Name (16 bytes in ASCII)
55-56) # data points (400)
57) Start Frequency (in Hz) (Highest byte)
58) Start Frequency (in Hz)
59) Start Frequency (in Hz)
60) Start Frequency (in Hz) (Lowest byte)
61) Stop Frequency (in Hz) (Highest byte)
62) Stop Frequency (in Hz)
63) Stop Frequency (in Hz)
64) Stop Frequency (in Hz) (Lowest byte)
65) Center Frequency (in Hz) (Highest byte)
66) Center Frequency (in Hz)
67) Center Frequency (in Hz)
68) Center Frequency (in Hz) (Lowest byte)
69) Frequency Span (in Hz) (Highest byte)
70) Frequency Span (in Hz)
71) Frequency Span (in Hz)
72) Frequency Span (in Hz) (Lowest byte)
73) Minimum Frequency Step Size (in Hz) (Highest byte)
74) Minimum Frequency Step Size (in Hz)
75) Minimum Frequency Step Size (in Hz)
76) Minimum Frequency Step Size (in Hz) (Lowest byte)
77) Ref Level[2] (Highest byte)
78) Ref Level
79) Ref Level
80) Ref Level (Lowest byte)
81) Scale per div[3] (Highest byte)
82) Scale per div
83) Scale per div
84) Scale per div (Lowest byte)
85) Frequency Marker 1[4] (Higher byte)
86) Frequency Marker 1 (Lower byte)
87) Frequency Marker 2 (Higher byte)
88) Frequency Marker 2 (Lower byte)
89) Frequency Marker 3 (Higher byte)
90) Frequency Marker 3 (Lower byte)
91) Frequency Marker 4 (Higher byte)
92) Frequency Marker 4 (Lower byte)
93) Frequency Marker 5 (Higher byte)
94) Frequency Marker 5 (Lower byte)
95) Frequency Marker 6 (Higher byte)
96) Frequency Marker 6 (Lower byte)
97) Single Limit[5] (Highest byte)
98) Single Limit
99) Single Limit

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[2] "value" sent as (value in dBm * 1,000) + 270,000
[3] "value" sent as (value * 1,000)
[4] Display/Data Point
To convert from "point" to frequency:
((span / (#data points-1)) * point) + start frequency
where span is stored in bytes 69-72 and #data points is stored in bytes 55-56
[5] "value" sent as (value in dBm * 1,000) + 270,000

100) Single Limit (Lowest byte)
101) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
102) Multiple Upper Limit 1 Start X (Frequency in Hz)
103) Multiple Upper Limit 1 Start X (Frequency in Hz)
104) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
105) Multiple Upper Limit 1 Start Y (Power Level[6]) (Highest byte)
106) Multiple Upper Limit 1 Start Y (Power Level)
107) Multiple Upper Limit 1 Start Y (Power Level)
108) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
109) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
110) Multiple Upper Limit 1 End X (Frequency in Hz)
111) Multiple Upper Limit 1 End X (Frequency in Hz)
112) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
113) Multiple Upper Limit 1 End Y (Power Level[7]) (Highest byte)
114) Multiple Upper Limit 1 End Y (Power Level)
115) Multiple Upper Limit 1 End Y (Power Level)
116) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
117-260) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 101-116 for format)
261) RBW Setting (Frequency in Hz) (Highest byte)
262) RBW Setting (Frequency in Hz)
263) RBW Setting (Frequency in Hz)
264) RBW Setting (Frequency in Hz) (Lowest byte)
265) VBW Setting (Frequency in Hz) (Highest byte)
266) VBW Setting (Frequency in Hz)
267) VBW Setting (Frequency in Hz)
268) VBW Setting (Frequency in Hz) (Lowest byte)
269) OCC BW Method (00h = % of power, 01h = dB down)
270) OCC BW % Value (0-99) (Highest byte)
271) OCC BW % Value (0-99)
272) OCC BW % Value (0-99)
273) OCC BW % Value (0-99) (Lowest byte)
274) OCC BW dBc (0–120) (Highest byte)
275) OCC BW dBc (0–120)
276) OCC BW dBc (0–120)
277) OCC BW dBc (0–120) (Lowest byte)
278) Attenuation[8] (Highest byte)
279) Attenuation
280) Attenuation
281) Attenuation (Lowest byte)
282-297) Antenna Name (16 bytes in ASCII)
298) Reference Level Offset[9] (Highest byte)
299) Reference Level Offset
300) Reference Level Offset
301) Reference Level Offset (Lowest byte)
302) Impedance[10]
303) Impedance Loss[11] (Highest byte)

[6] "value" sent as (value in dBm * 1,000) + 270,000
[7] "value" sent as (value in dBm * 1,000) + 270,000
[8] "value" sent as (value * 1,000)
[9] "value" sent as (value in dBm * 1,000) + 270,000
[10] Impedance adapters:
00h = 50 Ω
0Ah = 75 Ω, adapter 12N50-75B
0Ch = 75 Ω, other adapter offset
[11] "value" sent as (value * 1,000)

304) Impedance Loss
305) Impedance Loss
306) Impedance Loss (Lowest byte)
307) N/A
308) N/A
309) N/A
310) N/A
311) N/A
312) N/A
313) N/A
314) N/A
315) 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
316) 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
317) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 10b = neg. peak 11b = RMS averaging)
bits 3-4 : Logarithmic Amplitude Units (00b = dBm 01b = dBV 10b = dBmV11b = dBuV)
bit 5 : Channel Power On/Off
bit 6 : Adjacent Channel Power On/Off
bit 7 : Occupied Bandwidth On/Off
318) Status Byte 4: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Not Used
bit 2 : Single Limit On/Off
bit 3 : Single Limit Level UPPER/ LOWER
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Limit Level UPPER / LOWER
319) Status Byte 5: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Limit Level UPPER / LOWER
320) Status Byte 6: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Lower Segment 4 Status On/Off

bit 5 : Multiple Limit Lower Segment 4 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Limit Level UPPER / LOWER

321) Status Byte 7
(LSB) bits 0-6 : Number of Sweeps to Average (1-25, 1 implies averaging Off)
bit 7 : Reserved

322) Status Byte 8: (0b = Off, 1b = On
(LSB) bit 0 : Preamp On/Off
bit 1 : Normalization On/Off
bit 2 : Bias Tee On/Off
bit 3 : Scale Type (0b = Log, 1b = Linear)
bit 4 : Linear Units (0b = Watts, 1b = Volts)
bits 5-7 : Date Format (000b = MMDDYYYY, 001b = DDMMYYYY, 010b = YYYYMMDD)

323) N/A

324) N/A

325-350) Not Used

351-1950) Sweep Data (400 points * 4 bytes/point = 1600 bytes)
4 bytes for each data point
1. dBm^2 (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

*Spectrum Master Returns (*For invalid sweeps/empty stored sweep locations*):* 11 bytes

1-2) Number of following bytes (9 bytes for invalid sweep recall)

3-4) Model # (unsigned integer, 16h for Spectrum Master model MS2711D)

5-11) Extended Model # (7 bytes in ASCII)

Spectrum Master Returns (Invalid sweep location): 1 byte

1) 224 Parameter Error: Invalid sweep location

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

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

The Spectrum 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 Spectrum Master. It holds the power-on defaults of the Spectrum Master.

Bytes to Follow: 1 byte

1) Location to save system setup parameters:
0 – 10 for Spectrum Analyzer and Transmission Modes (Option 21 Only)
0 – 5 for Power Meter Mode (Option 29 Only)
0 – 5 for T1/E1 Modes (Option 50 Only)

Spectrum 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 Spectrum Analyzer, Spectrum Analyzer setups (1-10) can be recalled. When the current mode is Power Meter, one of the 5 Power Meter setups can be recalled.. When the current mode is T1/E1, one of the T1/E1 setups can be recalled (1-5).

The Spectrum 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 – 10 = Saved setups for Spectrum Analyzer and Transmission modes (Option 21 Only)
   - 1 – 5 = Saved setups for Power Meter mode (Option 29 Only)
   - 1 – 5 = Saved setups for T1/E1 modes (Option 50 Only)
   - 254 = Default setup, current mode
   - 255 = Default setup, all modes

Spectrum 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

***OBSOLETE: Query System Status* – Control Byte #20 (14h)**

This command exists for backward compatibility with the MS2711B To access the new features use Control Byte #29 (1Dh). This command cannot be used with a frequency extension module (option 6 required) attached.

Description: Queries the Spectrum Master for current system settings.

The current state of the Spectrum 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 bytes 4-7, even though no sweep has been performed with that frequency.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 310 bytes

1) Measurement Mode[12]
2-3) Number of Data Points (400)
4) Start Frequency (in Hz) (Highest byte)
5) Start Frequency (in Hz)
6) Start Frequency (in Hz)
7) Start Frequency (in Hz) (Lowest byte)
8) Stop Frequency (in Hz) (Highest byte)
9) Stop Frequency (in Hz)
10) Stop Frequency (in Hz)
11) Stop Frequency (in Hz) (Lowest byte)

[12] See Control Byte #3 for available measurement modes.

12) Center Frequency (in Hz) (Highest byte)
13) Center Frequency (in Hz)
14) Center Frequency (in Hz)
15) Center Frequency (in Hz) (Lowest byte)
16) Frequency Span (in Hz) (Highest byte)
17) Frequency Span (in Hz)
18) Frequency Span (in Hz)
19) Frequency Span (in Hz) (Lowest byte)
20) Minimum Frequency Step Size (in Hz) (Highest byte)
21) Minimum Frequency Step Size (in Hz)
22) Minimum Frequency Step Size (in Hz)
23) Minimum Frequency Step Size (in Hz) (Lowest byte)
24) Ref Level[13] (Highest byte)
25) Ref Level
26) Ref Level
27) Ref Level (Lowest byte)
28) Scale per div[14] (Highest byte)
29) Scale per div
30) Scale per div
31) Scale per div (Lowest byte)
32) Marker 1[15] (Higher byte)
33) Marker 1 (Lower byte)
34) Marker 2 (Higher byte)
35) Marker 2 (Lower byte)
36) Marker 3 (Higher byte)
37) Marker 3 (Lower byte)
38) Marker 4 (Higher byte)
39) Marker 4 (Lower byte)
40) Marker 5 (Higher byte)
41) Marker 5 (Lower byte)
42) Marker 6 (Higher byte)
43) Marker 6 (Lower byte)
44) Spectrum Analyzer Single Limit[16] (Highest byte)
45) Spectrum Analyzer Single Limit
46) Spectrum Analyzer Single Limit
47) Spectrum Analyzer Single Limit (Lowest byte)
48) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
49) Multiple Upper Limit 1 Start X (Frequency in Hz)
50) Multiple Upper Limit 1 Start X (Frequency in Hz)
51) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
52) Multiple Upper Limit 1 Start Y (Power Level[17]) (Highest byte)
53) Multiple Upper Limit 1 Start Y (Power Level)
54) Multiple Upper Limit 1 Start Y (Power Level)
55) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
56) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
57) Multiple Upper Limit 1 End X (Frequency in Hz)
58) Multiple Upper Limit 1 End X (Frequency in Hz)

[13] "value" sent as (value in dBm * 1,000) + 270,000
[14] "value" sent as (value * 1,000)
[15] Display/Data Point
To convert from "point" to frequency:
(span / (#data points-1)) * point + start frequency
where span is stored in bytes 16-19 and #data points is stored in bytes 2-3
[16] "value" sent as (value in dBm * 1,000) + 270,000
[17] "value" sent as (value in dBm * 1,000) + 270,000

59) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
60) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
61) Multiple Upper Limit 1 End Y (Power Level)
62) Multiple Upper Limit 1 End Y (Power Level)
63) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
64-207) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 48-63 for format)
208) RBW Setting[18] (Highest byte)
209) RBW Setting
210) RBW Setting
211) RBW Setting (Lowest byte)
212) VBW Setting[19] (Highest byte)
213) VBW Setting
214) VBW Setting
215) VBW Setting (Lowest byte)
216) OCC BW Method (00h = % of power, 01h = dB down)
217) OCC BW % Value (0-99) (Highest byte)
218) OCC BW % Value (0-99)
219) OCC BW % Value (0-99)
220) OCC BW % Value (0-99) (Lowest byte)
221) OCC BW dBc (0-120) (Highest byte)
222) OCC BW dBc (0-120)
223) OCC BW dBc (0-120)
224) OCC BW dBc (0-120) (Lowest byte)
225) Attentuation[20] (Highest byte)
226) Attentuation
227) Attentuation
228) Attentuation (Lowest byte)
229) Antenna Index (0-14)
230-245) Antenna Name (16 bytes in ASCII)
246) AM/FM Demod Type (00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB/CW)
247) AM/FM Demod Volume (00h = min, FFh = max)
248) Reference Level Offset[21] (Highest byte)
249) Reference Level Offset
250) Reference Level Offset
251) Reference Level Offset (Lowest byte)
252) Impedance[22]
253) Impedance Loss[23] (Highest byte)
254) Impedance Loss
255) Impedance Loss
256) Impedance Loss (Lowest byte)
257) N/A
258) N/A
259) N/A
260) N/A
261) N/A
262) N/A
263) N/A

[18] RBW: 00h = 10 kHz, 01h = 30 kHz, 02h = 100 kHz, 03h = 1 MHz
[19] VBW: 00h = 100 Hz, 01h = 300 Hz, 02h = 1 kHz, 03h = 3 kHz, 04h = 10 kHz, 05h = 30 kHz, 06h = 100 kHz, 07h = 300 kHz
[20] Attenuation: 00h = 0 dB, 01h = 10 dB, 02h = 20 dB, 03h = 30 dB, 04h = 40 dB, 05h = 50 dB
[21] "value" sent as (value in dBm * 1,000) + 270,000
[22] Impedance Adapter: 00h = 50 Ω, 0Ah = 75 Ω, adapter 12N50-75B, 0Ch = 75 Ω, other adapter offset
[23] "value" sent as (value in dBm * 1,000) + 270,000

264) N/A
265) 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
266) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bits 4-7: Not Used
267) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : AM/FM Demod Status On/Off
bit 2 : SPA Cal Status On/Off
bit 3-4 : Logarithmic Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bit 5-6 : Detection Alg (00b = positive peak 10b = negative peak, 11b = RMS averaging)
bit 7 : LCD Back Light On/Off
268) Status Byte 4: (0b = Off, 1b = On)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit Beep On/Off
bit 2 : Single Limit Status On/Off
bit 3 : Single Limit Level (0b = LOWER, 1b = UPPER)
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Limit Level UPPER / LOWER
269) Status Byte 5: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Limit Type UPPER / LOWER
270) Status Byte 6: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Limit Level UPPER / LOWER
271) Status Byte 7: (0b = Off , 1b = On)
(LSB) bit 0 : Serial Port Echo Status On/Off
bit 1 : Return Sweep Time On/Off
bit 2 : RBW Coupling (to span) (1b = auto, 0b = manual)
bit 3 : VBW Coupling (to RBW) (1b = auto, 0b = manual)
bit 4 : Attenuation Coupling (to ref. Level) (1b = auto, 0b = manual)

bit 5 : Channel Power On/Off
bit 6 : Adjacent Channel Power On/Off
bit 7 : Occupied Bandwidth On/Off

272) Printer Type (see control byte #30)

273) Trace A/B Status

(LSB) bit 0-1 : Trace A (00b = A only 01b = A – B 10b = A + B)
bit 2 : Trace B On/Off (0b = Off, 1b = On)
bits 3-7 : Not Used

274) Trace B Trace ID (0 = previous A data, 1-200 = saved trace id, 255 = none)

275) Status Byte 8:

(LSB) bits 0-6 : Number of Sweeps to Average (1-25, 1 implies averaging Off)
bit 7 : Reserved

276) Status Byte 9: (0b = Off , 1b = On)

(LSB) bit 0 : Preamp Hardware Installed (1b = Yes, 0b = No)[12]
bit 1 : Preamp On/Off
bit 2 : N/A
bit 3 : Dynamic Attenuation On/Off
bit 4 : Normalization On/Off
bit 5 : Bias Tee On/Off
bit 6 : Scale Type (0b = Log, 1b = Linear)
bit 7 : Linear Units (0b = Watts, 1b = Volts)

277) N/A
278) N/A
279) N/A
280) N/A
281) N/A
282) N/A
283) N/A
284) N/A
285) SSB/CW BFO Adjustment Value (0-255)
286) N/A
287) N/A
288) N/A
289) N/A
290) RTC Battery Voltage[24] (Higher byte)
291) RTC Battery Voltage (Lower byte)
292) Motherboard PCB ID[25] (Higher byte)
293) Motherboard PCB ID (Lower byte)
294) N/A
295) N/A
296-310) Not Used

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[24] "value" sent as (value in Volts * 10)
[25] "value" sent as (value in Volts * 1000)

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

Description: Triggers a self test on the Spectrum Master.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 12 bytes

1) Self-treport: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Phase Lock Loop
   bit 1 : Integrator
   bit 2 : Battery
   bit 3 : Temperature
   bit 4 : EEPROM read/write
   bit 5 : RTC Battery
   bits 6- 7 : Not Used
2) Self-treport: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Spectrum Analyzer Lock
   bits 1–7 : Not Used
3) Battery Voltage (Higher byte)
4) Battery Voltage (Lower byte)
5) Temperature (Higher byte)
6) Temperature (Lower byte)
7) Spectrum Analyzer Lock Fail Counter (Higher byte)
8) Spectrum Analyzer Lock Fail Counter (Lowest byte)

Notes:
Battery Voltage in 1/10th of a Volt (e.g. 124 = 12.4 Volts)
Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) or degree Fahrenheit (e.g. 934 = 93.4 ^{o}F), depending on the current measurement unit (Metric or English) selected

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

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

Bytes to Follow: 0 bytes

Spectrum Master Returns: 8 bytes

1) Value of SA Lock Fail Counter (Higher byte)
2) Value of SA Lock Fail Counter (Lower byte)
3) Reserved
4) Reserved
5) Value of SA Fatal Error Counter (Higher byte)
6) Value of SA Fatal Error Counter (Lower byte)

***Clear Fail Counters* – Control Byte #23 (17h)**

Description: Resets the Lock Fail Counter and Integrator Fail Counter and spectrum analyzer Fatal Error Counter.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte

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

Description: Returns a list of all saved traces.

Bytes to Follow: 0 bytes

Spectrum 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 Spectrum Master.

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

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte

***OBSOLETE - Upload SPA Sweep Trace* – Control Byte #26 (1Ah)**

This command exists for backward compatibility with the MS2711B. To access the new features use Control Byte #36 (24h). This command cannot be used with a frequency extension module (option 6 required) attached.

Description: Uploads a spectrum analyzer sweep trace to Spectrum Master.

For data formats, refer to the footnotes listed beside the return bytes.

Bytes to Follow: 1930 bytes
- 1-2) # of following bytes (1928)
- 3) Measurement Mode[26]
- 4-7) Time/Date (long integer format)
- 8-17) Date in String Format (mm/dd/yyyy)
- 18-25) Time in String Format (hh:mm:ss)
- 26-41) Reference Number/Trace Name (16 bytes in ASCII)
- 42-43) # of data points (400)
- 44) Start Frequency (in Hz) (Highest byte)
- 45) Start Frequency (in Hz)
- 46) Start Frequency (in Hz)
- 47) Start Frequency (in Hz) (Lowest byte)
- 48) Stop Frequency (in Hz) (Highest byte)
- 49) Stop Frequency (in Hz)
- 50) Stop Frequency (in Hz)

[26] See Control Byte #3 for available measurement modes.

51) Stop Frequency (in Hz) (Lowest byte)
52) Center Frequency (in Hz) (Highest byte)
53) Center Frequency (in Hz)
54) Center Frequency (in Hz)
55) Center Frequency (in Hz) (Lowest byte)
56) Frequency Span (in Hz) (Highest byte)
57) Frequency Span (in Hz)
58) Frequency Span (in Hz)
59) Frequency Span (in Hz) (Lowest byte)
60) Ref Level[27] (Highest byte)
61) Ref Level
62) Ref Level
63) Ref Level (Lowest byte)
64) Scale per div[28] (Highest byte)
65) Scale per div
66) Scale per div
67) Scale per div (Lowest byte)
68) Marker 1[29] (Higher byte)
69) Marker 1 (Lower byte)
70) Marker 2 (Higher byte)
71) Marker 2 (Lower byte)
72) Marker 3 (Higher byte)
73) Marker 3 (Lower byte)
74) Marker 4 (Higher byte)
75) Marker 4 (Lower byte)
76) Marker 5 (Higher byte)
77) Marker 5 (Lower byte)
78) Marker 6 (Higher byte)
79) Marker 6 (Lower byte)
80) Single Limit[30] (Highest byte)
81) Single Limit
82) Single Limit
83) Single Limit (Lowest byte)
84) Multiple Upper Limit 1 Start X (Frequency in Hz) (Highest byte)
85) Multiple Upper Limit 1 Start X (Frequency in Hz)
86) Multiple Upper Limit 1 Start X (Frequency in Hz)
87) Multiple Upper Limit 1 Start X (Frequency in Hz) (Lowest byte)
88) Multiple Upper Limit 1 Start Y (Power Level[31]) (Highest byte)
89) Multiple Upper Limit 1 Start Y (Power Level)
90) Multiple Upper Limit 1 Start Y (Power Level)
91) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
92) Multiple Upper Limit 1 End X (Frequency in Hz) (Highest byte)
93) Multiple Upper Limit 1 End X (Frequency in Hz)
94) Multiple Upper Limit 1 End X (Frequency in Hz)
95) Multiple Upper Limit 1 End X (Frequency in Hz) (Lowest byte)
96) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
97) Multiple Upper Limit 1 End Y (Power Level)

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[27] "value" sent as (value in dBm * 1,000) +270,000
[28] "value" sent as (value * 1,000)
[29] Display/Data Point
To convert from "point" to frequency:
(span / #data points) * point + start frequency
where span is stored in bytes 69-72 and #data points is stored in bytes 55-56
[30] "value" sent as (value in dBm * 1,000) +270,000
[31] "value" sent as (value in dBm * 1,000) +270,000

98) Multiple Upper Limit 1 End Y (Power Level)
99) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
100-243) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 80-95 for format)
244) RBW Setting[32] (Highest byte)
245) RBW Setting
246) RBW Setting
247) RBW Setting (Lowest byte)
248) VBW Setting[33] (Highest byte)
249) VBW Setting
250) VBW Setting
251) VBW Setting (Lowest byte)
252) OCC BW Method (00h = % of power, 01h = dB down)
253) OCC BW % Value (0-99) (Highest byte)
254) OCC BW % Value (0-99)
255) OCC BW % Value (0-99)
256) OCC BW % Value (0-99) (Lowest byte)
257) OCC BW dBc (0-120) (Highest byte)
258) OCC BW dBc (0-120)
259) OCC BW dBc (0-120)
260) OCC BW dBc (0-120) (Lowest byte)
261) Attenuation[34] (Highest byte)
262) Attenuation
263) Attenuation
264) Attenuation (Lowest byte)
265-280) Antenna Name (16 bytes in ASCII)
281) Reference Level Offset[35] (Highest byte)
282) Reference Level Offset
283) Reference Level Offset
284) Reference Level Offset (Lowest byte)
285) Impedance[36]
286) Impedance Loss[37] (Highest byte)
287) Impedance Loss
288) Impedance Loss
289) Impedance Loss (Lowest byte)
290) N/A
291) N/A
292) N/A
293) N/A
294) N/A
295) N/A
296) N/A
297) N/A
298) 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

[32] RBW: Valid frequencies (in Hz) are 10,000, 30,000, 100,000, 1,000000
[33] VBW: Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000
[34] "value" sent as (value * 1,000)
[35] "value" sent as (value in dBm * 1,000) +270,000
[36] Impedance Adapter: 00h = 50 Ω, 0Ah = 75 Ω, adapter 12N50-75B, 0Ch = 75 Ω, other adapter offset
[37] "value" sent as (value * 1,000)

bits 6-7: Not Used

299) 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

300) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection Alg (00b = pos. peak 10b= neg. peak 11b = RMS averaging)
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bit 5 : Channel Power On/Off
bit 6 : ACPR On/Off
bit 7 : Occupied BW On/Off

301) Status Byte 4: (0b = Off/LOWER limit, 1b = On/UPPER limit)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit On/Off
bit 2 : Single Limit Level (0b = LOWER, 1b = UPPER)
bit 3 : Not Used
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Limit Level UPPER / LOWER

302) Status Byte 5: (0b = Off/LOWER limit, 1b =On/UPPER limit)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Lower Segment 5 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Limit Level UPPER / LOWER

303) Status Byte 6: (0b = Off/LOWER limit, 1b =On/UPPER limit)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Limit Level UPPER / LOWER
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Limit Level UPPER / LOWER
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Limit Level UPPER / LOWER
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Limit Level UPPER / LOWER

304) Status Byte 7:
(LSB) bits 0-6 : Number of Sweeps to Average
bit 7 : Reserved

305) Status Byte 8: (0b = Off, 1b =On)
(LSB) bit 0 : Preamp On/Off
bit 1 : Normalization On/Off
bit 2 : Bias Tee On/Off
bit 3 : Scale Type (0b = Linear, 1b = Log)
bit 4 : Linear Units (0b = Watts, 1b = Volts)
bits 5-7 : Date Format (000b = MMDDYYYY, 001b = DDMMYYYY, 010b = YYYYMMDD)

306) N/A

307) N/A

308-330) Not Used

331-1930) Sweep Data (400 points * 4 bytes/point = 1600 bytes)
4 bytes for each data point

1. dBm[38] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

Spectrum Master Returns: 1 byte

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

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

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

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

1) % of memory currently available (0 to 100)

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

This command is new to the MS2711D. Use it, instead of Control Byte #20, to access the new features.

Description: Queries the Spectrum 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 Spectrum 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

Spectrum Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[39]
4) Printer Type[40]
5) Current Language
   (00h = English, 01h = French, 02h = German, 03h = Spanish, 04h = Chinese, 05h = Japanese)
6) LCD Contrast Value (0-255)
7) Date Format (00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD)
8) RTC battery [41] (Higher byte)
9) RTC battery (Lower byte)
10) PC Board Revision [42] (Higher byte)
11) PC Board Revision (Lower byte)
12-13) Digital Mother Board ID. Beginning with motherboard 64968, the hardware includes a 9-bit

[38] Value sent as (Value in dBm * 1000) + 270,000
[39] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[40] See Control Byte #30 for supported printers.
[41] Value sent as Volts * 10. For example, 2.7 V = 27.
[42] This value is for internal use only.

digital ID port. The digital ID will be used together with the PC Board Revision (mother board ID voltage) to identify the board and "dash" number. For boards prior to 64968, bytes 12 and 13 will be 0
14-25) Not Used

For Spectrum Analyzer Mode/Transmission Mode (Option 21):

26) Spectrum Analyzer Mode Data Points (Higher byte)
27) Spectrum Analyzer Mode Data Points (Lower byte)
28) Spectrum Analyzer Start Frequency[43] (Highest byte)
29) Spectrum Analyzer Start Frequency
30) Spectrum Analyzer Start Frequency
31) Spectrum Analyzer Start Frequency (Lowest byte)
32) Spectrum Analyzer Stop Frequency[44] (Highest byte)
33) Spectrum Analyzer Stop Frequency
34) Spectrum Analyzer Stop Frequency
35) Spectrum Analyzer Stop Frequency (Lowest byte)
36) Spectrum Analyzer Center Frequency[45] (Highest byte)
37) Spectrum Analyzer Center Frequency
38) Spectrum Analyzer Center Frequency
39) Spectrum Analyzer Center Frequency (Lowest byte)
40) Spectrum Analyzer Frequency Span[46] (Highest byte)
41) Spectrum Analyzer Frequency Span
42) Spectrum Analyzer Frequency Span
43) Spectrum Analyzer Frequency Span (Lowest byte)
44) Spectrum Analyzer Minimum Frequency Step Size (Highest byte)
45) Spectrum Analyzer Minimum Frequency Step Size
46) Spectrum Analyzer Minimum Frequency Step Size
47) Spectrum Analyzer Minimum Frequency Step Size (Lowest byte)
48) Ref Level (Highest byte)[47]
49) Ref Level
50) Ref Level
51) Ref Level (Lowest byte)
52) Scale per div (Highest byte)[48]
53) Scale per div
54) Scale per div
55) Scale per div (Lowest byte)
56) Spectrum Analyzer Frequency Marker 1 (Higher byte)[49]
57) Spectrum Analyzer Frequency Marker 1 (Lower byte)
58) Spectrum Analyzer Frequency Marker 2 (Higher byte)
59) Spectrum Analyzer Frequency Marker 2 (Lower byte)
60) Spectrum Analyzer Frequency Marker 3 (Higher byte)
61) Spectrum Analyzer Frequency Marker 3 (Lower byte)
62) Spectrum Analyzer Frequency Marker 4 (Higher byte)
63) Spectrum Analyzer Frequency Marker 4 (Lower byte)
64) Spectrum Analyzer Frequency Marker 5 (Higher byte)
65) Spectrum Analyzer Frequency Marker 5 (Lower byte)
66) Spectrum Analyzer Frequency Marker 6 (Higher byte)
67) Spectrum Analyzer Frequency Marker 6 (Lower byte)

[43] Scaled by Frequency Scale Factor (bytes 321-322)
[44] Scaled by Frequency Scale Factor (bytes 321-322)
[45] Scaled by Frequency Scale Factor (bytes 321-322)
[46] Scaled by Frequency Scale Factor (bytes 321-322)
[47] Value sent as (value in dBm * 1000) + 270,000)
[48] Value sent as (value * 1000)
[49] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

68) Spectrum Analyzer Single Limit (Highest byte)[50]
69) Spectrum Analyzer Single Limit
70) Spectrum Analyzer Single Limit
71) Spectrum Analyzer Single Limit (Lowest byte)
72) SPA Multiple Upper Limit 1 Start X[51] (Highest byte)
73) SPA Multiple Upper Limit 1 Start X
74) SPA Multiple Upper Limit 1 Start X
75) SPA Multiple Upper Limit 1 Start X (Lowest byte)
76) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [52]
77) SPA Multiple Upper Limit 1 Start Y (Power Level)
78) SPA Multiple Upper Limit 1 Start Y (Power Level)
79) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
80) SPA Multiple Upper Limit 1 End X[53] (Highest byte)
81) SPA Multiple Upper Limit 1 End X
82) SPA Multiple Upper Limit 1 End X
83) SPA Multiple Upper Limit 1 End X (Lowest byte)
84) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [54]
85) SPA Multiple Upper Limit 1 End Y (Power Level)
86) SPA Multiple Upper Limit 1 End Y (Power Level)
87) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
88-231) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 72-87 for format)
232) RBW Setting (Highest byte)[55]
233) RBW Setting
234) RBW Setting
235) RBW Setting (Lowest byte)
236) VBW Setting (Highest byte)[56]
237) VBW Setting
238) VBW Setting
239) VBW Setting (Lowest byte)
240) OCC BW Method[57]
241) OCC BW % Value (Highest byte)[58]
242) OCC BW % Value
243) OCC BW % Value
244) OCC BW % Value (Lowest byte)
245) OCC BW dBc (Highest byte)[59]
246) OCC BW dBc
247) OCC BW dBc
248) OCC BW dBc (Lowest byte)
249) Attenuation (Highest byte)
250) Attenuation
251) Attenuation
252) Attenuation (Lowest byte)
253) Antenna Index(0-14)
254-269) Antenna Name (16 bytes in ASCII)
270) Status Byte 1: (0b = Off , 1b = On)

[50] Value sent as (value in dBm * 1000) + 270000
[51] Scaled by Frequency Scale Factor (bytes 321-322)
[52] Value sent as (value in dBm * 1000) + 270000
[53] Scaled by Frequency Scale Factor (bytes 321-322)
[54] Value sent as (value in dBm * 1000) + 270000
[55] RBW frequency sent in Hz.
[56] VBW frequency sent in Hz.
[57] 00h = % of power, 01h = dB down
[58] 0 – 99%
[59] 0 – 120 dBc

(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used

271) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off

272) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[60]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

273) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [61]

274) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

275) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : SPA Cal Status On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b =

[60] Beep level is always 1b for upper segmented limit line
[61] Beep level is always 0b for lower segmented limit line

Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

276) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Serial Port Echo Status On/Off
bit 1: Return Sweep Time On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

277) Reference Level Offset[62] (Highest byte)
278) Reference Level Offset
279) Reference Level Offset
280) Reference Level Offset (Lowest byte)
281) External Reference Frequency [63]
282) Signal Standard[64] (Higher byte)
283) Signal Standard (Lower byte)
284) Channel Selection[65] (Higher byte)
285) Channel Selection (Lower byte)
286) Trigger Type[66]
287) Interference Analysis Frequency[67] (Highest byte)
288) Interference Analysis Frequency
289) Interference Analysis Frequency
290) Interference Analysis Frequency (Lowest byte)
291) Trigger Position (0 – 100%)
292) Min Sweep Time (in µs) (Highest byte)
293) Min Sweep Time (in µs)
294) Min Sweep Time (in µs)
295) Min Sweep Time (in µs) (Lowest byte)
296) Video Trigger Level[68] (Highest byte)
297) Video Trigger Level
298) Video Trigger Level
299) Video Trigger Level (Lowest byte)
300) Status Byte 8
(LSB) bit 0: Input Power Status (1b = Input Power Too High, 0b = Input Power Ok)
bit 1: Limit Beep Output (Option 86 Only) (00h = Internal Speaker, 01h = External)
bits 2-7: Not Used
301) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
302) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bits 4-7: Not Used
303) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
304) Impedance Loss[69] (Higher byte)

[62] Value sent as (value in dBm * 1000) + 270,000
[63] 1 byte in MHz (i.e. 20 = 20MHz)
[64] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[65] "No Channel" is sent as FFFEh
[66] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[67] Scaled by Frequency Scale Factor (bytes 321-322)
[68] Value sent as (value in dBm * 1000) + 270,000

305) Impedance Loss (Lower byte)
306) AM/FM Demod Type[70]
307) AM/FM Demod Status (01h = On, 00h = Off)
308) AM/FM Demod Volume (0 to 100)
309) AM/FM Demod Frequency[71] (Highest byte)
310) AM/FM Demod Frequency
311) AM/FM Demod Frequency
312) AM/FM Demod Frequency (Lowest byte)
313) AM/FM Demod Time (in ms) (Highest byte)
314) AM/FM Demod Time (in ms)
315) AM/FM Demod Time (in ms)
316) AM/FM Demod Time (in ms) (Lowest byte)
317) SSB BFO Offset[72] (Highest byte)
318) SSB BFO Offset
319) SSB BFO Offset
320) SSB BFO Offset (Lowest byte)
321) Frequency Scale Factor[73] (Higher byte)
322) Frequency Scale Factor (Lower byte)
323) Frequency Range Minimum[74] (Highest byte)
324) Frequency Range Minimum
325) Frequency Range Minimum
326) Frequency Range Minimum (Lowest byte)
327) Frequency Range Maximum[75] (Highest byte)
328) Frequency Range Maximum
329) Frequency Range Maximum
330) Frequency Range Maximum (Lowest byte)
331) Marker Type[76]
332-355)Signal Standard Name, 24bytes of ASCII
356-400)Not Used

For Power Meter Mode (Option 29 Only):

26) Power Meter Start Freq[77] (Highest byte)
27) Power Meter Start Freq
28) Power Meter Start Freq
29) Power Meter Start Freq (Lowest byte)
30) Power Meter Stop Freq[78] (Highest byte)
31) Power Meter Stop Freq
32) Power Meter Stop Freq
33) Power Meter Stop Freq (Lowest byte)
34) Power Meter Center Freq[79] (Highest byte)
35) Power Meter Center Freq
36) Power Meter Center Freq
37) Power Meter Center Freq (Lowest byte)

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[69] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[70] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[71] Scaled by Frequency Scale Factor (bytes 321-322)
[72] Value sent as ((value in Hz) – 10,000)
[73] In number of Hz
[74] Scaled by Frequency Scale Factor (bytes 321-322)
[75] Scaled by Frequency Scale Factor (bytes 321-322)
[76] 00h = Regular Marker, 01h = Noise Marker
[77] Scaled by Frequency Scale Factor (bytes 59-60)
[78] Scaled by Frequency Scale Factor (bytes 59-60)
[79] Scaled by Frequency Scale Factor (bytes 59-60)

38) Power Meter Span[80] (Highest byte)
39) Power Meter Span
40) Power Meter Span
41) Power Meter Span (Lowest byte)
42) Signal Standard[81] (Higher byte)
43) Signal Standard (Lower byte)
44) Channel Selection[82] (Higher byte)
45) Channel Selection (Lower byte)
46) Power Meter Offset (Highest byte)
47) Power Meter Offset
48) Power Meter Offset
49) Power Meter Offset (Lowest byte)
50) Power Meter Relative (Highest byte)[83]
51) Power Meter Relative
52) Power Meter Relative
53) Power Meter Relative (Lowest byte)
54) Power Meter Status (00h = Off, 01h = On)
55) Power Meter Unit (00h = Watts, 01h = dBm)
56) Power Meter Relative Status (00h = Off, 01h = On)
57) Power Meter Offset Status (00h = Off, 01h = On)
58) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
59) Frequency Scale Factor[84] (Higher byte)
60) Frequency Scale Factor (Lower byte)
61) Frequency Range Minimum[85] (Highest byte)
62) Frequency Range Minimum
63) Frequency Range Minimum
64) Frequency Range Minimum (Lowest byte)
65) Frequency Range Maximum[86] (Highest byte)
66) Frequency Range Maximum
67) Frequency Range Maximum
68) Frequency Range Maximum (Lowest byte)
69) Zero Status (00h = Off, 01h = On)
70) Zero Value[87] (Highest byte)
71) Zero Value
72) Zero Value
73) Zero Value (Lowest byte)
74-97) Signal Standard Name, 24 bytes of ASCII
98-120) Not Used

For T1 Mode (Option 50):
26) T1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
27) T1 Framing Mode (01h: ESF, 02h: D4SF)
28) T1 Line Coding (01h: B8ZS, 02h: AMI)
29) T1 Clock Source (00h: External, 01h: Internal)
30) T1 Tx Level (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
31) T1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
32) T1 Loop Code (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)

[80] Scaled by Frequency Scale Factor (bytes 59-60)
[81] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[82] "No Channel" is sent as FFFEh
[83] Value as ((value in dBm * 1000) + 100)
[84] In number of Hz
[85] Scaled by Frequency Scale Factor
[86] Scaled by Frequency Scale Factor
[87] Value sent as ((value in dBm * 1000) + 100)

33) T1 CRC Method (00h: ANSI CRC, 01h: Japanese CRC)
34) T1 Loop Type (00h: In Band, 01h: Data Link)
35) T1 Pattern (Higher byte)
36) T1 Pattern (Lower byte) 01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
37) T1 Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
38) T1 Display Type (00h: Histogram, 01h: Raw Data)
39) T1 Impedance
40 - 55) First User Defined Loop Code Down (16 bytes)
56 - 71) Second User Defined Loop Code Down (16 bytes)
72 - 87) First User Defined Loop Code Up (16 bytes)
88 - 103) Second User Defined Loop Code Up (16 bytes)
104 - 135) User Defined Pattern (32 bytes)
136) T1 1st User Defined Loop Up (Higher byte)
137) T1 1st User Defined Loop Up (Lower byte)
138) T1 2nd User Defined Loop Up (Higher byte)
139) T1 2nd User Defined Loop Up (Lower byte)
140) T1 1st User Defined Loop Down (Higher byte)
141) T1 1st User Defined Loop Down (Lower byte)
142) T1 2nd User Defined Loop Down (Higher byte)
143) T1 2nd User Defined Loop Down (Lower byte)
144) T1 User Defined Pattern (Highest byte)
145) T1 User Defined Pattern
146) T1 User Defined Pattern
147) T1 User Defined Pattern (Lowest byte)
148) T1 Bit Error Insert Value (1-1000) (Higher byte)
149) T1 Bit Error Insert Value (Lower byte)
150) T1 Frame Error Insert Value (1-1000) (Higher byte)
151) T1 Frame Error Insert Value (Lower byte)
152) T1 BPV Error Insert Value (1-1000) (Higher byte)
153) T1 BPV Error Insert Value (Lower byte)
154) T1 Graph Resolution[88]
155) T1 Measurement Duration[89]
156) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
157) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
158 – 240) Not Used

For E1 Mode (Option 50):
26) E1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
27) E1 Framing Mode (03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
28) E1 Line Coding (02h: AMI, 03h: HDB3)
29) E1 Clock Source (00h: External, 01h: Internal)
30) E1 Tx Level
31) E1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
32) E1 Loop Code
33) E1 CRC Method
34) E1 Loop Type
35) E1 Pattern (Highest byte)
36) E1 Pattern (Lowest byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones,

[88] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[89] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
37) E1 Pattern Invert (00h: Non-Inverted, 01h: Inverted)
38) E1 Display Type (00h: Histogram, 01h: Raw Data)
39) E1 Impedance (01h: 75 Ω, 02h: 120 Ω)
40 - 55) First User Defined Loop Code Down (16 bytes)
56 - 71) Second User Defined Loop Code Down (16 bytes)
72 - 87) First User Defined Loop Code Up (16 bytes)
88 - 103) Second User Defined Loop Code Up (16 bytes)
104 - 135) User Defined Pattern (32 bytes)
136) E1 1st User Defined Loop Up (Highest byte)
137) E1 1st User Defined Loop Up (Lowest byte)
138) E1 2nd User Defined Loop Up (Highest byte)
139) E1 2nd User Defined Loop Up (Lowest byte)
140) E1 1st User Defined Loop Down (Highest byte)
141) E1 1st User Defined Loop Down (Lowest byte)
142) E1 2nd User Defined Loop Down (Highest byte)
143) E1 2nd User Defined Loop Down (Lowest byte)
144) E1 User Defined Pattern (Highest byte)
145) E1 User Defined Pattern
146) E1 User Defined Pattern
147) E1 User Defined Pattern (Lowest byte)
148) E1 Bit Error Insert Value (1-1000) (Higher byte)
149) E1 Bit Error Insert Value (Lower byte)
150) E1 Frame Error Insert Value (1-1000) (Higher byte)
151) E1 Frame Error Insert Value (Lower byte)
152) E1 BPV Error Insert Value (1-1000) (Higher byte)
153) E1 BPV Error Insert Value (Lower byte)
154) E1 Graph Resolution[90]
155) E1 Measurement Duration[91]
156) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
157-240) Not Used

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[90] Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min
[91] Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

***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

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte

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

This command is new to the MS2711D. Use it, instead of Control Byte #17, to access the new features.

Description: Queries the Spectrum 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 Spectrum 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 Spectrum 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)

Spectrum Master Returns:

1-2) # of following bytes (total length - 2)
3) Current Instrument Date Format[92]
4) Not Used
5-11) Model Number (7 bytes in ASCII)
12-15) Software Version (4 bytes ASCII)
16) Measurement Mode[93]
17-20) Time/Date (in Long Integer[94])

[92] 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD
[93] Refer to Control Byte #3 "Select Measurement Mode" for detailed value.
[94] Time/Date long integer representation is in seconds since January 1, 1970

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 Spectrum Analyzer Mode:

57) Start Frequency[95] (Highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (Lowest byte)
61) Stop Frequency[96] (Highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (Lowest byte)
65) Center Frequency[97] (Highest byte)
66) Center Frequency
67) Center Frequency
68) Center Frequency (Lowest byte)
69) Frequency Span[98] (Highest byte)
70) Frequency Span
71) Frequency Span
72) Frequency Span (Lowest byte)
73) Minimum Frequency Step Size (Highest byte)
74) Minimum Frequency Step Size
75) Minimum Frequency Step Size
76) Minimum Frequency Step Size (Lowest byte)
77) Ref Level[99] (Highest byte)
78) Ref Level
79) Ref Level
80) Ref Level (Lowest byte)
81) Scale per div[100] (Highest byte)
82) Scale per div
83) Scale per div
84) Scale per div (Lowest byte)
85) Frequency Marker 1[101] (Higher byte)
86) Frequency Marker 1 (Lower byte)
87) Frequency Marker 2 (Higher byte)
88) Frequency Marker 2 (Lower byte)
89) Frequency Marker 3 (Higher byte)
90) Frequency Marker 3 (Lower byte)
91) Frequency Marker 4 (Higher byte)
92) Frequency Marker 4 (Lower byte)
93) Frequency Marker 5 (Higher byte)
94) Frequency Marker 5 (Lower byte)
95) Frequency Marker 6 (Higher byte)
96) Frequency Marker 6 (Lower byte)
97) Single Limit[102] (Highest byte)

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[95] Scaled by Frequency Scale Factor (bytes 335-336)
[96] Scaled by Frequency Scale Factor (bytes 335-336)
[97] Scaled by Frequency Scale Factor (bytes 335-336)
[98] Scaled by Frequency Scale Factor (bytes 335-336)
[99] Value sent as (Value in dBm * 1000) + 270,000
[100] Value sent as (Value * 1000)
[101] Value sent as data point on display. Freq = (Point * Span / (Total Data Points – 1)) + Start Freq
[102] Value sent as (Value in dBm * 1000) + 270,000

98) Single Limit
99) Single Limit
100) Single Limit (Lowest byte)
101) Multiple Upper Limit 1 Start X[103] (Highest byte)
102) Multiple Upper Limit 1 Start X
103) Multiple Upper Limit 1 Start X
104) Multiple Upper Limit 1 Start X (Lowest byte)
105) Multiple Upper Limit 1 Start Y (Power Level[104]) (Highest byte)
106) Multiple Upper Limit 1 Start Y (Power Level)
107) Multiple Upper Limit 1 Start Y (Power Level)
108) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
109) Multiple Upper Limit 1 End X[105] (Highest byte)
110) Multiple Upper Limit 1 End X
111) Multiple Upper Limit 1 End X
112) Multiple Upper Limit 1 End X (Lowest byte)
113) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
114) Multiple Upper Limit 1 End Y (Power Level)
115) Multiple Upper Limit 1 End Y (Power Level)
116) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
117-260) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 101-116 for format)
261) RBW Setting (Frequency in Hz) (Highest byte)
262) RBW Setting (Frequency in Hz)
263) RBW Setting (Frequency in Hz)
264) RBW Setting (Frequency in Hz) (Lowest byte)
265) VBW Setting (Frequency in Hz) (Highest byte)
266) VBW Setting (Frequency in Hz)
267) VBW Setting (Frequency in Hz)
268) VBW Setting (Frequency in Hz) (Lowest byte)
269) OCC BW Method (0b = % of power, 1b = dB down)
270) OCC BW % Value[106]
271) OCC BW dBc [107]
272) Attenuation[108] (Highest byte)
273) Attenuation
274) Attenuation
275) Attenuation (Lowest byte)
276-291) Antenna Name(16 bytes in ASCII)
292) 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
293) Status Byte 2: (0b = Off , 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off

[103] Scaled by Frequency Scale Factor (bytes 335-336)
[104] Value sent as (value in dBm * 1000) + 270,000
[105] Scaled by Frequency Scale Factor (bytes 335-336)
[106] % value is 0-99
[107] dBc value 0 – 120 dBc
[108] Value sent as (value in dB * 1000)

bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off

294) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = RMS average 10b = neg. peak 11b = sampling mode)
bits 3-4 : Amplitude Units (Log) - (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
(Linear) – (00b = Watts 01b = Volts)
bit 5 : Channel Power On/Off
bit 6 : Adjacent Channel Power On/Off
bit 7 : Units Type (0b = Log 1b = Linear)

295) Status Byte 4[109]
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Not Used
bit 2 : Single Limit On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[110]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

296) Status Byte 5
(0b = Off/Beep if data is below line, 1b = On/Beep if data is above line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW[111]

297) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

298) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used

299) Reference Level Offset [112](Highest byte)
300) Reference Level Offset
301) Reference Level Offset
302) Reference Level Offset (Lowest byte)
303) External Reference Frequency [113]

[109] For bits 2, 1 and 0 (“X” is “don’t care): 0X0=no limit, 1X0=single limit, 0X1=multiple limit, 1X1=multiple limit.
[110] Upper limits always trigger an error beep if data is ABOVE the limit segment, for example, this bit is always 1b.
[111] Lower limits always trigger an error beep if data is BELOW the limit segment, for example, this bit is always 0b.
[112] Value sent as (value in dBm * 1000) + 270,000

304) Signal Standard[114] (Higher byte)
305) Signal Standard (Lower byte)
306) Channel Selection[115] (Higher byte)
307) Channel Selection (Lower byte)
308) Interference Analysis Cellular Standard[116]
309) Interference Analysis Estimated Bandwidth (Highest byte)
310) Interference Analysis Estimated Bandwidth
311) Interference Analysis Estimated Bandwidth
312) Interference Analysis Estimated Bandwidth (Lowest byte)
313) Interference Analysis Frequency[117] (Highest byte)
314) Interference Analysis Frequency
315) Interference Analysis Frequency
316) Interference Analysis Frequency (Lowest byte)
317-320) Reserved
321) Trigger Type[118]
322) Trigger Position (0 – 100%)
323) Min Sweep Time (in µs) (Highest byte)
324) Min Sweep Time (in µs)
325) Min Sweep Time (in µs)
326) Min Sweep Time (in µs) (Lowest byte)
327) Video Trigger Level[119] (Highest byte)
328) Video Trigger Level
329) Video Trigger Level
330) Video Trigger Level (Lowest byte)
331) Status Byte 8 (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: Transmission Calibration On/Off (Option 21 Only)
bit 5: Bias Tee On/Off (Option 10 Only)
bit 6: Occupied BW Measurement On/Off
bit 7: Not Used
332) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
333) Impedance Loss[120] (Higher byte)
334) Impedance Loss (Lower byte)
335) Frequency Scale Factor[121] (Higher byte)
336) Frequency Scale Factor (Lower byte)
337) Frequency Range Minimum[122] (Highest byte)
338) Frequency Range Minimum
339) Frequency Range Minimum
340) Frequency Range Minimum (Lowest byte)
341) Frequency Range Maximum[123] (Highest byte)
342) Frequency Range Maximum

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[113] 1 byte in MHz (i.e. 20 = 20MHz)
[114] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[115] "No Channel" is sent as FFFEh
[116] 4 Standards – 00h = 1250kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[117] Scaled by Frequency Scale Factor (bytes 335-336)
[118] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[119] Value sent as (value in dBm * 1000) + 270,000
[120] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[121] In number of Hz
[122] Scaled by Frequency Scale Factor
[123] Scaled by Frequency Scale Factor

343) Frequency Range Maximum
344) Frequency Range Maximum (Lowest byte)
345) Linked Trace Number (1-200)
346) Status Byte 9 (0b = Off, 1b = On)
(LSB) bit 0: C/I Measurement On/Off
bits 1-3: C/I Carrier Trace/Signal Type[124]
bits 4-7: Not Used
347) C/I Calculated Power[125] (Carrier or Interference – NB FHSS[126]) (Highest byte)
348) C/I Calculated Power (Carrier or Interference – NB FHSS)
349) C/I Calculated Power (Carrier or Interference – NB FHSS)
350) C/I Calculated Power (Carrier or Interference – NB FHSS) (Lowest byte)
351) C/I Calculated Power [127] (Interference – WB FHSS[128]) (Highest byte)
352) C/I Calculated Power (Interference – WB FHSS)
353) C/I Calculated Power (Interference – WB FHSS)
354) C/I Calculated Power (Interference – WB FHSS) (Lowest byte)
355) C/I Calculated Power [129] (Interference – Broadband[130]) (Highest byte)
356) C/I Calculated Power (Interference – Broadband)
357) C/I Calculated Power (Interference – Broadband)
358) C/I Calculated Power (Interference – Broadband) (Lowest byte)
359) Occupied Bandwidth Power(Highest byte)[131]
360) Occupied Bandwidth Power
361) Occupied Bandwidth Power
362) Occupied Bandwidth Power (Lowest byte)
363) Marker Type[132]
364-367) GPS Position – Latitude (long integer)[133]
368-371) GPS Position – Longitude (long integer)
372-373) GPS Position – Altitude (short integer)
374) Signal Standard Link Type[134]
375-398) Signal Standard Name, 24 bytes in ASCII
399) Measure Offset Status (00h = Off, 01h = On)
400-431) Not Used
432-2035) Sweep Data (401 points * 4 bytes/point= 1604 bytes)
4 bytes for each data point
1. dBm[135] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

[124] 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference
[125] Value sent as (value in dBm * 1000) + 270,000
[126] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes represent the calculated Carrier power.
[127] Value sent as (value in dBm * 1000) + 270,000
[128] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – WB FHSS trace. Otherwise, these bytes should be ignored.
[129] Value sent as (value in dBm * 1000) + 270,000
[130] If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – Broadband trace. Otherwise, these bytes should be ignored.
[131] If Method is % of power then the value is db Down * 1000. If the method is db down, then the value is %
[132] 00h = Regular Marker, 01h = Noise Marker
[133] 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
[134] 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link
[135] Value sent as (value in dBm * 1000) + 270,000

For Power Meter Mode (Option 29 Only):

57) Power Monitor Mode (00h = Off, 01h = On)
58) Power Meter Unit (00h = dBm, 01h = Watts)
59) Start Frequency[136] (Highest byte)
60) Start Frequency
61) Start Frequency
62) Start Frequency (Lowest byte)
63) Stop Frequency[137] (Highest byte)
64) Stop Frequency
65) Stop Frequency
66) Stop Frequency (Lowest byte)
67) Center Frequency[138] (Highest byte)
68) Center Frequency
69) Center Frequency
70) Center Frequency (Lowest byte)
71) Frequency Span[139] (Highest byte)
72) Frequency Span
73) Frequency Span
74) Frequency Span (Lowest byte)
75) Power Offset Status (00h = Off, 01h = On)
76) Power Offset[140] (Highest byte)
77) Power Offset
78) Power Offset
79) Power Offset (Lowest byte)
80) Power Relative Status (00h = Off, 01h = On
81) Power Relative Value[141] (Highest byte)
82) Power Relative Value
83) Power Relative Value
84) Power Relative Value (Lowest byte)
85) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
86) Power Zero Status (00h = Off, 01h = On)
87) External Reference Status (00h = Off, 01h = On)
88) External Reference Frequency (in Hz) (Highest byte)
89) External Reference Frequency (in Hz)
90) External Reference Frequency (in Hz)
91) External Reference Frequency (in Hz) (Lowest byte)
92) Signal Standard[142] (Highest byte)
93) Signal Standard (Lowest byte)
94) Channel Selection[143] (Highest byte)
95) Channel Selection (Lowest byte)
96) Frequency Scale Factor[144] (Higher byte)
97) Frequency Scale Factor (Lower byte)
98) Frequency Range Minimum[145] (Highest byte)
99) Frequency Range Minimum
100) Frequency Range Minimum

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[136] Scaled by Frequency Scale Factor (bytes 96-97)
[137] Scaled by Frequency Scale Factor (bytes 96-97)
[138] Scaled by Frequency Scale Factor (bytes 96-97)
[139] Scaled by Frequency Scale Factor (bytes 96-97)
[140] Value sent as (value in dB * 1000), valid values are 0 to 60 dB
[141] Value sent as (value in dBm * 1000)
[142] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[143] "No Channel" is sent as FFFEh
[144] In number of Hz
[145] Scaled by Frequency Scale Factor

101) Frequency Range Minimum (Lowest byte)
102) Frequency Range Maximum[146] (Highest byte)
103) Frequency Range Maximum
104) Frequency Range Maximum
105) Frequency Range Maximum (Lowest byte)
106 – 150) Not Used
151) Power Meter Reading[147] (Highest byte)
152) Power Meter Reading
153) Power Meter Reading
154) Power Meter Reading (Lowest byte)
155) Measure Offset Status (00h = Off, 01h = On)

For Channel Scanner Mode:

57) Reference Level (Highest Byte)
58) Reference Level
59) Reference Level
60) Reference Level (Lowest Byte)
61) Scale Division (Highest Byte)
62) Scale Division
63) Scale Division
64) Scale Division (Lowest Byte)
65) Start Frequency (Highest Byte)
66) Start Frequency
67) Start Frequency
68) Start Frequency (Lowest Byte)
69) Span Frequency (Highest Byte)
70) Span Frequency
71) Span Frequency
72) Span Frequency (Lowest Byte)
73) Channel Step (Highest Byte)
74) Channel Step (Lowest Byte)
75) Channel Frequency Step (Highest Byte)
76) Channel Frequency Step
77) Channel Frequency Step
78) Channel Frequency Step (Lowest Byte)
79) Number of Channels Displayed
80) External Reference Frequency[148]
81) Display Type Channels or Frequencies[149]
82) Display Type Graph or Text[150]
83) Signal Standard (Highest Byte)
84) Signal Standard
85) Signal Standard
86) Signal Standard (Lowest Byte)
87-90) GPS Position – Latitude (long integer)[151]
91-94) GPS Position – Longitude (long integer)
95-96) GPS Position – Altitude (short integer)
97) Start Channel (Highest Byte)

[146] Scaled by Frequency Scale Factor
[147] Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.
[148] Frequency in MHz, OFF if 0
[149] 0 – Channel, 1 - Frequency
[150] 0 – Graph, 1 - Text
[151] 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

98) Start Channel
99) Start Channel
100) Start Channel (Lowest Byte)
101 – 124) Signal Standard Name, 24 bytes in ASCII
125 – 152) Reserved
153 – 272) Channel Scanner Data[152]

For Interference Analyzer RSSI Mode

57) Center Frequency (Highest Byte)
58) Center Frequency
59) Center Frequency
60) Center Frequency (Lowest Byte)
61) Reference Level (Highest Byte)
62) Reference Level
63) Reference Level
64) Reference Level (Lowest Byte)
65) Scale (Highest Byte)
66) Scale
67) Scale
68) Scale (Lowest Byte)
69) RBW (Highest Byte)
70) RBW
71) RBW
72) RBW (Lowest Byte)
73) VBW (Highest Byte)
74) VBW
75) VBW
76) VBW (Lowest Byte)
77) Status Byte 1
    Bit 0 - Detection Algorithm (Lowest Bit)[153]
    Bit 1 - Detection Algorithm
    Bit 2 - Detection Algorithm (Highest Bit)
    Bit 3 - Not Used
    Bit 4 - Not Used
    Bit 5 - Not Used
    Bit 6 - Not Used
78) Reference Level Offset (Highest Byte)
79) Reference Level Offset
80) Reference Level Offset
81) Reference Level Offset (Lowest Byte)
82) External Reference Frequency[154]
83) Signal Standard (Highest Byte)
84) Signal Standard (Lowest Byte)
85) Channel (Highest Byte)[155]
86) Channel (Lowest Byte)
87) Min RSSI Measured (Highest Byte)
88) Min RSSI Measured
89) Min RSSI Measured
90) Min RSSI Measured (Lowest Byte)
91) Max RSSI Measured (Highest Byte)

[152] 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as (value in dBm) * 1000 + 270,000
[153] 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode
[154] Frequency in MHz, OFF if 0
[155] Invalid channels are sent as 0xFFFF

92) Max RSSI Measured
93) Max RSSI Measured
94) Max RSSI Measured (Lowest Byte)
95) Measure Duration (Highest Byte)[156]
96) Measure Duration
97) Measure Duration
98) Measure Duration (Lowest Byte)
99) Sweep Point Interval(Highest Byte)[157]
100) Sweep Point Interval
101) Sweep Point Interval
102) Sweep Point Interval (Lowest Byte)
103 – 106) GPS Position – Latitude (long integer)[158]
107 – 110) GPS Position – Longitude (long integer)
111 – 112) GPS Position – Altitude (short integer)
113) Signal Standard
114 – 117) Start GPS Position – Latitude (long integer)[159]
118 – 121) Start GPS Position – Longitude (long integer)
122 – 123) Start GPS Position – Altitude (short integer)
124) Attenuation (Highest Byte)[160]
125) Attenuation
126) Attenuation
127) Attenuation (Lowest Byte)
128 – 151) Signal Standard Name, 24 bytes in ASCII
152) Measure Offset Status (00h = Off, 01h = On)
153 – 207) Reserved
208 – 3415) RSSI Sweep data[161]

For High Accuracy Power Meter Mode

57) Center Frequency(Highest Byte)[162]
58) Center Frequency
59) Center Frequency
60) Center Frequency(Lowest Byte)
61) Power Reading(Highest Byte)[163]
62) Power Reading(Lowest Byte)
63) Max Hold Status (00h = Off, 01h = On)
64) Offset Status (00h = Off, 01h = On)
65) Offset Value(Highest Byte) [164]
66) Offset Value(Lowest Byte)
67) Measure Offset Status (00h = Off, 01h = On)
68) Measure Offset Value(Highest Byte) [165]

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[156] Measure Duration time in minutes
[157] Sweep Point Interval time in milliseconds
[158] 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
[159] 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
[160] Attenuation is sent as (Att in dB * 1000)
[161] Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPS position.
[162] in kHz
[163] in 2-complement and in dBm
[164] in 2-complement and in dB

69) Measure Offset Value(Lowest Byte)
70) Relative Value(Highest Byte) [166]
71) Relative Value(Lowest Byte)
72) Relative Status (00h = Off, 01h = On)
73) Running Averages Number(Highest Byte)
74) Running Averages Number(Lowest Byte)
75 – 76) Signal Standard ID
77 – 100) Signal Standard Name
101) Zero Status (00h = Off, 01h = On)
102) Limit Status (00h = Off, 01h = On)
103) Upper Limit dBm(Highest Byte) [167]
104) Upper Limit dBm(Lowest Byte)
105) Lower Limit dBm(Highest Byte) [168]
106) Lower Limit dBm(Lowest Byte)
107) Limit Unit Display
108) Error Message Status[169]
109 – 112) GPS Position – Latitude (long integer)[170]
113 – 116) GPS Position – Longitude (long integer)
117 – 118) GPS Position – Altitude (short integer)
119 – 128) UTC Time, 10 bytes in ASCII
129 – 256) Reserved Byte

*Spectrum Master Returns (*For invalid sweeps/empty stored sweep locations)*:* 11 bytes
1-2) Number of following bytes (9 bytes for invalid sweep recall)
3) Current Instrument Date Format[171]
4) Model # (unsigned integer, 16h for Spectrum Master model MS2711D)
5-11) Extended Model # (7 bytes in ASCII)

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

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[165] in 2-complement and in dB
[166] in 2-complement and in dBm
[167] in 2-complement
[168] in 2-complement
[169] Bit 0: set to 1 if there is power supply error in the power sensor module. Bit 1: set to 1 if there is too much RF power going into the sensor module. Bit 2: set to 1 if zeroing is done incorrectly. Bit 3: set to 1 if power sensor's operating temperature range is exceeded. Bit 4: set to 1 if temperature has drifted by more than specified degree since the last zeroing.
[170] 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
[171] 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD

OBSOLETE: Set A/B Trace – Control Byte #34 (22h)

This command is included for compatibility with the MS2711B. To access the new features, use Control Byte #35.

Description: Defines traces "A" and "B".

Trace A is always the currently measured data (with or without trace math). It is always visible.

Trace B is always stored data and may come from a saved sweep or a previous "A" trace. There is no default for trace B. Trace B can be ON (visible) or OFF.

Bytes to Follow: 3 bytes

1) "A" trace display (00h = A only, 01h = A-B, 02h = A+B)
2) "B" trace status (00h = OFF, 01h = ON)
3) "B" trace number
   0 = save current "A" data into "B" buffer, use that as "B"
   1-200 = trace number
   255 = no "B" trace defined

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Incorrect "A" or "B" trace, "B" trace requested to be used in calculations or displayed, but no trace or invalid trace specified
   238 (EEh) Time-out Error

Set SPA A/B Trace – Control Byte #35 (23h)

This command is new to the MS2711D. Use it, instead of Control Byte #34, to access the new features.

Description: Defines traces "A" and "B" for Spectrum Analyzer mode.

Trace A is always the currently measured data (with or without trace math). It is always visible.

Trace B is always stored data and may come from a saved sweep or a previous "A" trace. There is no default for trace B. Trace B can be ON (visible) or OFF.

Bytes to Follow: 3 bytes

1) "A" trace display (00h = A only, 01h = A-B, 02h = A+B)
2) "B" trace status (00h = Off, 01h = On)
3) "B" trace number
   0 = save current "A" data into "B" buffer, use that as "B"
   1-200 = trace number
   255 = no "B" trace defined

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Not enough bytes transferred, "B" trace requested to be used in calculations or displayed, but no trace or invalid trace specified
   238 (EEh) Time-out Error

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

This command is new to the MS2711D. Use it, instead of Control Byte #26, to access the new features.

Description: Uploads a sweep trace to the Spectrum Master.

Bytes to Follow:

For All Modes:

1-2) # of following bytes
3) Measurement Mode[172]
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 (401)

For Spectrum Analyzer Mode:

44) Start Frequency[173] (Highest byte)
45) Start Frequency
46) Start Frequency
47) Start Frequency (Lowest byte)
48) Stop Frequency[174] (Highest byte)
49) Stop Frequency
50) Stop Frequency
51) Stop Frequency (Lowest byte)
52) Center Frequency[175] (Highest byte)
53) Center Frequency
54) Center Frequency
55) Center Frequency (Lowest byte)
56) Frequency Span[176] (Highest byte)
57) Frequency Span
58) Frequency Span
59) Frequency Span (Lowest byte)
60) Ref Level[177] (Highest byte)
61) Ref Level
62) Ref Level
63) Ref Level (Lowest byte)
64) Scale per div[178] (Highest byte)
65) Scale per div
66) Scale per div
67) Scale per div (Lowest byte)
68) Marker 1[179] (Higher byte)
69) Marker 1 (Lower byte)
70) Marker 2 (Higher byte)
71) Marker 2 (Lower byte)
72) Marker 3 (Higher byte)
73) Marker 3 (Lower byte)

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[172] See Control Byte #3 "Set Measurement Mode" for available measurement modes.
[173] Scaled by Frequency Scale Factor (bytes 318-319)
[174] Scaled by Frequency Scale Factor (bytes 318-319)
[175] Scaled by Frequency Scale Factor (bytes 318-319)
[176] Scaled by Frequency Scale Factor (bytes 318-319)
[177] Value sent as (value in dBm * 1000) + 270,000
[178] Value sent as (value * 1000)
[179] Marker values are sent as # of data point on display.
See Control Byte #102, "Set Spectrum Analyzer Marker" for calculation of data point.

74) Marker 4 (Higher byte)
75) Marker 4 (Lower byte)
76) Marker 5 (Higher byte)
77) Marker 5 (Lower byte)
78) Marker 6 (Higher byte)
79) Marker 6 (Lower byte)
80) Single Limit[180] (Highest byte)
81) Single Limit
82) Single Limit
83) Single Limit (Lowest byte)
84) Multiple Upper Limit 1 Start X[181] (Highest byte)
85) Multiple Upper Limit 1 Start X
86) Multiple Upper Limit 1 Start X
87) Multiple Upper Limit 1 Start X (Lowest byte)
88) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte)
89) Multiple Upper Limit 1 Start Y (Power Level)
90) Multiple Upper Limit 1 Start Y (Power Level)
91) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
92) Multiple Upper Limit 1 End X[182] (Highest byte)
93) Multiple Upper Limit 1 End X
94) Multiple Upper Limit 1 End X
95) Multiple Upper Limit 1 End X (Lowest byte)
96) Multiple Upper Limit 1 End Y (Power Level) (Highest byte)
97) Multiple Upper Limit 1 End Y (Power Level)
98) Multiple Upper Limit 1 End Y (Power Level)
99) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
100-243) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 84-99 for format)
244) RBW Setting[183] (Highest byte)
245) RBW Setting
246) RBW Setting
247) RBW Setting (Lowest byte)
248) VBW Setting[184] (Highest byte)
249) VBW Setting
250) VBW Setting
251) VBW Setting (Lowest byte)
252) OCC BW Method (00h = % of power, 01h = dB down)
253) OCC BW % Value (0-99)
254) OCC BW dBc (0-120)
255) Attenuation[185] (Highest byte)
256) Attenuation
257) Attenuation
258) Attenuation (Lowest byte)
259-274) Antenna Name (16 bytes in ASCII)

[180] All amplitude values are sent as (value in dBm * 1000) + 270,000
[181] Scaled by Frequency Scale Factor (bytes 318-319)
[182] Scaled by Frequency Scale Factor (bytes 318-319)
[183] Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000, 1,000,000
[184] Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000
[185] Value sent as (value * 1000)

275) 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

276) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off

277) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = RMS Averaging 10b= neg. peak, 11 = Sampling Mode)
bits 3-4 : Amplitude Units (log) (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
(Linear) – (00b = Watts 01b = Volts)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power Ratio On/Off
bit 7 : Units Type (0b = Log 1b = Linear)

278) Status Byte 4
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit On/Off
bit 2 : Single Limit Beep Level (0b = beep when data is below line 1b = above)
bit 3 : Not Used
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

279) Status Byte 5
(0b = Off/Beep if data is BELOW line, 1b =On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW

280) Status Byte 6
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

281) Status Byte 7
(LSB) bits 0-6: Number of Sweeps to Average (1-25, 1 implies averaging OFF)
bit 7 : Not Used
282) Reference Level Offset[186] (Highest byte)
283) Reference Level Offset
284) Reference Level Offset
285) Reference Level Offset (Lowest byte)
286) External Reference Frequency[187]
287) Signal Standard[188] (Higher byte)
288) Signal Standard (Lower byte)
289) Channel Selection[189] (Higher byte)
290) Channel Selection (Lower byte)
291) Interference Analysis Cellular Standard[190]
292) Interference Analysis Estimated Bandwidth (Highest byte)
293) Interference Analysis Estimated Bandwidth
294) Interference Analysis Estimated Bandwidth
295) Interference Analysis Estimated Bandwidth (Lowest byte)
296) Interference Analysis Frequency[191] (Highest byte)
297) Interference Analysis Frequency
298) Interference Analysis Frequency
299) Interference Analysis Frequency (Lowest byte)
300-303) Reserved
304) Trigger Type[192]
305) Trigger Position (0 – 100%)
306) Min Sweep Time (in µs) (Highest byte)
307) Min Sweep Time (in µs)
308) Min Sweep Time (in µs)
309) Min Sweep Time (in µs) (Lowest byte)
310) Video Trigger Level[193] (Highest byte)
311) Video Trigger Level
312) Video Trigger Level
313) Video Trigger Level (Lowest byte)
314) Status Byte 8 (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: Transmission Calibration Status (Option 21 Only)
bit 5: Bias Tee On/Off (Option 10 Only)
bit 6: Occupied BW Measurement On/Off
bit 7: Not Used
315) Impedance (00h = 50Ω, 0Ah = 75Ω Anritsu Adapter, 0Ch = 75Ω Other Adapter)
316) Impedance Loss[194] (Higher byte)
317) Impedance Loss (Lower byte)
318) Frequency Scale Factor[195] (Higher byte)

[186] Value sent as (Value in dBm * 1000) + 270,000
[187] byte in MHz (i.e. 20 = 20MHz)
[188] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh.
[189] "No Channel" is sent as FFFEh.
[190] 4 Standards – 00h = 1250kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown FFh = Interference Analysis Measurement OFF
[191] Scaled by Frequency Scale Factor (bytes 318-319)
[192] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[193] Value sent as (Value in dBm * 1000) + 270,000
[194] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[195] In number of Hz

319) Frequency Scale Factor (Lower byte)
320) Frequency Range Minimum[196] (Highest byte)
321) Frequency Range Minimum
322) Frequency Range Minimum
323) Frequency Range Minimum (Lowest byte)
324) Frequency Range Maximum[197] (Highest byte)
325) Frequency Range Maximum
326) Frequency Range Maximum
327) Frequency Range Maximum (Lowest byte)
328) Linked Trace Number (1-200)
329) Status Byte 9 (0b = Off, 1b = On)
(LSB) bit 0: C/I Measurement On/Off
bits 1-3: C/I Carrier Trace/Signal Type[198]
bits 4-7: Not Used
330) C/I Calculated Power[199] (Carrier or Interference – NB FHSS[200]) (Highest byte)
331) C/I Calculated Power (Carrier or Interference – NB FHSS)
332) C/I Calculated Power (Carrier or Interference – NB FHSS)
333) C/I Calculated Power (Carrier or Interference – NB FHSS) (Lowest byte)
334) C/I Calculated Power [201] (Interference – WB FHSS[202]) (Highest byte)
335) C/I Calculated Power (Interference – WB FHSS)
336) C/I Calculated Power (Interference – WB FHSS)
337) C/I Calculated Power (Interference – WB FHSS) (Lowest byte)
338) C/I Calculated Power [203] (Interference – Broadband[204]) (Highest byte)
339) C/I Calculated Power (Interference – Broadband)
340) C/I Calculated Power (Interference – Broadband)
341) C/I Calculated Power (Interference – Broadband) (Lowest byte)
342) Marker Type[205]
343-346) GPS Position – Latitude (long integer)[206]
347-350) GPS Position – Longitude (long integer)
351-352) GPS Position – Altitude (short integer)
353) Reserved
354-377) Signal Standard Name, 24 bytes in ASCII
378) Measure Offset Status (00h = Off, 01h = On)
379-400) Not Used

[196] Scaled by Frequency Scale Factor
[197] Scaled by Frequency Scale Factor
[198] 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference
[199] Value sent as (value in dBm * 1000) + 270,000
[200] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes represent the calculated Carrier power.
[201] Value sent as (value in dBm * 1000) + 270,000
[202] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – WB FHSS trace. Otherwise, these bytes should be ignored.
[203] Value sent as (value in dBm * 1000) + 270,000
[204] If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference – Broadband trace. Otherwise, these bytes should be ignored.
[205] 00h = Regular Marker, 01h = Noise Marker
[206] 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

401-2004) Sweep Data (401 points * 4 bytes/point = 1604 bytes)
4 bytes for each data point
1. dBm[207] (Highest byte)
2. dBm
3. dBm
4. dBm (Lowest byte)

For Power Meter Mode (Option 29 Only):

57) Power Monitor Mode (00h = Off, 01h = On)
58) Power Meter Unit (00h = dBm, 01h = Watts)
59) Start Frequency[208] (Highest byte)
60) Start Frequency
61) Start Frequency
62) Start Frequency (Lowest byte)
63) Stop Frequency[209] (Highest byte)
64) Stop Frequency
65) Stop Frequency
66) Stop Frequency (Lowest byte)
67) Center Frequency[210] (Highest byte)
68) Center Frequency
69) Center Frequency
70) Center Frequency (Lowest byte)
71) Frequency Span[211] (Highest byte)
72) Frequency Span
73) Frequency Span
74) Frequency Span (Lowest byte)
75) Power Offset Status (00h = Off, 01h = On)
76) Power Offset[212] (Highest byte)
77) Power Offset
78) Power Offset
79) Power Offset (Lowest byte)
80) Power Relative Status (00h = Off, 01h = On
81) Power Relative Value[213] (Highest byte)
82) Power Relative Value
83) Power Relative Value
84) Power Relative Value (Lowest byte)
85) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
86) Power Zero Status (00h = Off, 01h = On)
87) External Reference Status (00h = Off, 01h = On)
88) External Reference Frequency (in Hz) (Highest byte)
89) External Reference Frequency (in Hz)
90) External Reference Frequency (in Hz)
91) External Reference Frequency (in Hz) (Lowest byte)
92) Signal Standard[214] (Higher byte)
93) Signal Standard (Lower byte)
94) Channel Selection[215] (Higher byte)

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[207] Value sent as (Value in dBm * 1000) + 270,000
[208] Scaled by Frequency Scale Factor (bytes 96-97)
[209] Scaled by Frequency Scale Factor (bytes 96-97)
[210] Scaled by Frequency Scale Factor (bytes 96-97)
[211] Scaled by Frequency Scale Factor (bytes 96-97)
[212] Value sent as (value in dB * 1000), valid values are 0 to 60 dB
[213] Value sent as (value in dBm * 1000)
[214] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[215] "No Channel" is sent as FFFEh

95) Channel Selection (Lower byte)
96) Frequency Scale Factor[216] (Higher byte)
97) Frequency Scale Factor (Lower byte)
98) Frequency Range Minimum[217] (Highest byte)
99) Frequency Range Minimum
100) Frequency Range Minimum
101) Frequency Range Minimum (Lowest byte)
102) Frequency Range Maximum[218] (Highest byte)
103) Frequency Range Maximum
104) Frequency Range Maximum
105) Frequency Range Maximum (Lowest byte)
96 – 150) Not Used
151) Power Meter Reading[219] (Highest byte)
152) Power Meter Reading
153) Power Meter Reading
154) Power Meter Reading (Lowest byte)
155) Measure Offset Status (00h = Off, 01h = On)

For Channel Scanner Mode:
44) Reference Level (Highest Byte)
45) Reference Level
46) Reference Level
47) Reference Level (Lowest Byte)
48) Scale Division (Highest Byte)
49) Scale Division
50) Scale Division
51) Scale Division (Lowest Byte)
52) Start Frequency (Highest Byte)
53) Start Frequency
54) Start Frequency
55) Start Frequency (Lowest Byte)
56) Span Frequency (Highest Byte)
57) Span Frequency
58) Span Frequency
59) Span Frequency (Lowest Byte)
60) Channel Step (Highest Byte)
61) Channel Step (Lowest Byte)
62) Channel Frequency Step (Highest Byte)
63) Channel Frequency Step
64) Channel Frequency Step
65) Channel Frequency Step (Lowest Byte)
66) Number of Channels Displayed
67) External Reference Frequency[220]
68) Display Type Channels or Frequencies[221]
69) Display Type Graph or Text[222]
70) Signal Standard (Highest Byte)
71) Signal Standard (Lowest Byte)

[216] In number of Hz
[217] Scaled by Frequency Scale Factor
[218] Scaled by Frequency Scale Factor
[219] Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.
[220] Frequency in MHz, OFF if 0
[221] 0 – Channel, 1 - Frequency
[222] 0 – Graph, 1 - Text

72-75) GPS Position – Latitude (long integer)[223]
76-79) GPS Position – Longitude (long integer)
80-81) GPS Position – Altitude (short integer)
82) Start Channel (Highest Byte)
83) Start Channel
84) Start Channel
85) Start Channel (Lowest Byte)
86 – 109) Signal Standard Name, 24bytes in ASCII
110 – 137) Reserved
138 – 257) Channel Scanner Data[224]

For Interference Analyzer RSSI Mode

44) Center Frequency (Highest Byte)
45) Center Frequency
46) Center Frequency
47) Center Frequency (Lowest Byte)
48) Reference Level (Highest Byte)
49) Reference Level
50) Reference Level
51) Reference Level (Lowest Byte)
52) Scale (Highest Byte)
53) Scale
54) Scale
55) Scale (Lowest Byte)
56) RBW (Highest Byte)
57) RBW
58) RBW
59) RBW (Lowest Byte)
60) VBW (Highest Byte)
61) VBW
62) VBW
63) VBW (Lowest Byte)
64) Status Byte 1
    Bit 0 - Detection Algorithm (Lowest Bit)[225]
    Bit 1 - Detection Algorithm
    Bit 2 - Detection Algorithm (Highest Bit)
    Bit 3 - Not Used
    Bit 4 - Not Used
    Bit 5 - Not Used
    Bit 6 - Not Used
65) Reference Level Offset (Highest Byte)
66) Reference Level Offset
67) Reference Level Offset
68) Reference Level Offset (Lowest Byte)
69) External Reference Frequency[226]
70) Signal Standard (Highest Byte)
71) Signal Standard (Lowest Byte)

[223] 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
[224] 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as (value in dBm) * 1000 + 270,000
[225] 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode
[226] Frequency in MHz, OFF if 0

72) Channel (Highest Byte)[227]
73) Channel (Lowest Byte)
74) Min RSSI Measured (Highest Byte)
75) Min RSSI Measured
76) Min RSSI Measured
77) Min RSSI Measured (Lowest Byte)
78) Max RSSI Measured (Highest Byte)
79) Max RSSI Measured
80) Max RSSI Measured
81) Max RSSI Measured (Lowest Byte)
82) Measure Duration (Highest Byte)[228]
83) Measure Duration
84) Measure Duration
85) Measure Duration (Lowest Byte)
86) Sweep Point Interval(Highest Byte)[229]
87) Sweep Point Interval
88) Sweep Point Interval
89) Sweep Point Interval (Lowest Byte)
90 - 93) GPS Position – Latitude (long integer)[230]
94 - 97) GPS Position – Longitude (long integer)
98 - 99) GPS Position – Altitude (short integer)
100) Signal Standard
101-104) Start GPS Position – Latitude (long integer)[231]
105-108) Start GPS Position – Longitude (long integer)
109-110) Start GPS Position – Altitude (short integer)
111) Attenuation (Highest Byte)[232]
112) Attenuation
113) Attenuation
114) Attenuation (Lowest Byte)
115– 138) Signal Standard Name, 24bytes in ASCII
139) Measure Offset Status (00h = Off, 01h = On)
140– 194) Reserved
195 – 3402) RSSI Sweep data[233]

Spectrum Master Returns: 1 byte

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

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[227] Invalid channels are sent as 0xFFFF
[228] Measure Duration time in minutes
[229] Sweep Point Interval time in milliseconds
[230] 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
[231] 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
[232] Attenuation is sent as (Att in dB * 1000)
[233] Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPS position.

***Get Options* – Control Byte #37 (25h)**

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

Bytes to Follow: 0 bytes

Spectrum Master Returns: Depends on the option(s) installed
Maximum string: "3/6/10A/19/21/25/27/28/29/31"
If NO options are installed: "None"

***Query Power Level* – Control Byte #39 (27h)**

This command is available with Option 29 and/or Option 5.

Description: Return Power Level at the RF In port. Also returns power meter settings.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 30 bytes
1) Status Byte #1 (0b = Off, 1b = On)
(LSB) bit 0 : Unit (0b - Watt/%, 1b – dBm/dBr)
bit 2 : Relative Mode On/Off
bit 3: Offset Mode On/Off
bit 4: Zero Mode On/Off
bits 5-7: Not Used
2) RMS Averaging Status[234]
3 - 6) Relative Mode Reference Power Level in dBm
7 - 10) Offset Mode Power Level
11 - 14) Zero Mode Power Level
15 - 18) Absolute Power Level
19 - 22) Power
23 -–26) Center Frequency (scaled by frequency scale factor)
27 - 30) Span Frequency (scaled by frequency scale factor)

Notes:
Power is returned as (dBm * 1000)
Relative power is returned as (dB * 1000)
Offset is returned as (dB * 1000)

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[234] RMS Averaging – 00h = Off, 01h = Low, 02h = Medium, 03h = High

***Set Power Meter Units* – Control Byte #40 (28h)**

This command is available with Option 29 and/or Option 5.

Description: Set Power Meter units to watts or dBm.

Bytes to Follow: 1 byte

1) Units
   - 00h = Watt (% if in relative mode)
   - 01h = dBm (dB if in relative mode)

Spectrum Master Returns: 1 byte

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

***Power Meter Relative Mode On/Off* – Control Byte #41 (29h)**

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter 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)

Spectrum Master Returns: 1 byte

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

***Power Meter Offset Mode On/Off* – Control Byte #42 (2Ah)**

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter Offset Mode.

Bytes to Follow: 5 bytes

1) On/Off (01h = On, 00h = Off)
2 - 5) Offset Power Level in dB (Multiplied by 1000)

Spectrum 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 Meter Zero Mode On/Off* – Control Byte #43 (2Bh)**

This command is available with Option 29 and/or Option 5.

Description: Enable or disable Power Meter 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)

Spectrum Master Returns: 1 byte

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

***Power Meter RMS Averaging On/Off* – Control Byte #44 (2Ch)**

This command is available with Option 29 only.

Description: Disable/enable Power Meter RMS Averaging. Enabling can be set to 3 different levels.

Bytes to Follow: 1 byte

1) RMS Averaging State
   00h = Off
   01h = On (Low) with trigger (current power level is referenced as -80 dBm)
   02h = On (Medium)
   03h = On (High)

Spectrum Master Returns: 1 byte

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

***Power Meter Center Frequency and Span Setup* – Control Byte #45 (2Dh)**

This command is available with Option 29 only.

Description: Sets the center frequency and span frequency for the Power Meter mode.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 8 bytes

1) Center Frequency (Highest byte)
2) Center Frequency
3) Center Frequency
4) Center Frequency (Lowest byte)
5) Span (Highest byte)
6) Span
7) Span
8) Span (Lowest byte)

Spectrum Master Returns: 1 byte

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

***Trigger Sweep* – Control Byte #48 (30h)**

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

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

Note: The "Sweep Complete Byte" is not returned unless serial echo status is turned on using command #10.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

1) 192 (C0h) Sweep Complete Byte (at the end of the sweep)

***Sweep Data Echo On/Off* – Control Byte #49 (31h)**

Description: Sets the sweep data echo mode On/Off.

Sweep Data Echo Mode behaves much like the Serial Port Echo Mode (see Control Byte #10). It automatically puts the unit into single sweep mode. At the end of each sweep cycle, the Spectrum Master sends a Sweep Complete Byte #192 (C0h) to the serial port. At this time, sweep data can be queried (see Control Byte #33) without having to enter remote mode first or exit remote mode when done. Depending on the value of the second following byte, the next sweep can be automatically triggered after the sweep data has been sent.

This mode activates once the Spectrum Master exits from the remote mode. Sweep Data Echo status can't be saved to or recalled from saved setups. Cycling power resets the Sweep Data Echo status to Off.

The Sweep Data Echo Mode allows run-time handshaking between the Spectrum Master and computer by doing the following:

1) Enter remote mode. Set Sweep Data Echo Mode On. Exit remote mode.
2) The Spectrum Master sweeps once and then sends the Sweep Complete Byte.
3) After you receive it: Recall sweep 0 (last sweep trace in RAM).
4) If using auto triggering, repeat steps 2-3. If using manual triggering, go to step 5.
5) Send Sweep Triggering Byte #48 (30h) and wait for the next sweep cycle.
6) Repeat steps 2-5.

Note: To execute commands other than #33, you must use the traditional Enter Remote, Send Commands, Exit Remote communication sequence.

Bytes to Follow: 2 bytes

1) Sweep Data Echo Status
   00h : Off
   01h : On
2) Next Sweep Trigger
   00h : Manual
   01h : Automatic

Spectrum Master Returns: 1 byte

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

***Check Battery Status* – Control Byte #50 (32h)**

Description: Return Smart Battery status.

Bytes to Follow: 0 bytes

Spectrum 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

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Set SPA Minimum Sweep Time – Control Byte #53 (35h)

Description: Sets the minimum sweep time (in µs) for the spectrum analyzer when the span is 0.

Valid range is 50 to 200,000,000.

Bytes to Follow: 4 bytes

1) Minimum Sweep Time (in µs) (Highest byte)
2) Minimum Sweep Time (in µs)
3) Minimum Sweep Time (in µs)
4) Minimum Sweep Time (in µs) (Lowest byte)

Spectrum Master Returns: 1 byte

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

Set Trigger Position – Control Byte #54 (36h)

Description: Sets the trigger position (in percent) for the spectrum analyzer when the span is 0.

Bytes to Follow: 1 byte

1) Trigger Position (0 – 100%)

Spectrum Master Returns: 1 byte

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

Set Video Trigger Level – Control Byte #55 (37h)

Description: Sets the trigger level (-120 - +20 dBm) for the spectrum analyzer when the span is 0 and trigger mode is video.

The trigger level should be sent as (value in dBm * 1000) + 120,000.

Bytes to Follow: 4 bytes

1) Trigger Level (Highest byte)
2) Trigger Level
3) Trigger Level
4) Trigger Level (Lowest byte)

Spectrum Master Returns: 1 byte

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

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 Spectrum Master. It returns to its default value when the unit is turned off. The default value is (0), DO NOT automatically save the runtime setup.

Bytes to Follow: 1 byte

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

Spectrum Master Returns: 1 byte

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

Download Saved Setup – Control Byte #65 (41h)

Description: Returns parameters associated with the specified setup number. Since different modes have different numbers of setup locations available, the command requires the mode be specified as well as the setup number.

Bytes to Follow: 2 bytes

1) Measurement Mode[235]
2) Setup Number
   0 = Run time setup
   1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
   1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Spectrum Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[236]

5-20) Not Used

For Spectrum Analyzer Mode:

21) Spectrum Analyzer Start Frequency[237] (Highest byte)
22) Spectrum Analyzer Start Frequency
23) Spectrum Analyzer Start Frequency
24) Spectrum Analyzer Start Frequency (Lowest byte)
25) Spectrum Analyzer Stop Frequency[238] (Highest byte)
26) Spectrum Analyzer Stop Frequency
27) Spectrum Analyzer Stop Frequency
28) Spectrum Analyzer Stop Frequency (Lowest byte)
29) Spectrum Analyzer Center Frequency[239] (Highest byte)
30) Spectrum Analyzer Center Frequency
31) Spectrum Analyzer Center Frequency
32) Spectrum Analyzer Center Frequency (Lowest byte)
33) Spectrum Analyzer Frequency Span[240] (Highest byte)

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[235] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[236] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[237] Scaled by Frequency Scale Factor (bytes 301-302)
[238] Scaled by Frequency Scale Factor (bytes 301-302)
[239] Scaled by Frequency Scale Factor (bytes 301-302)
[240] Scaled by Frequency Scale Factor (bytes 301-302)

34) Spectrum Analyzer Frequency Span
35) Spectrum Analyzer Frequency Span
36) Spectrum Analyzer Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[241]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[242]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Spectrum Analyzer Frequency Marker 1 (Higher byte)[243]
46) Spectrum Analyzer Frequency Marker 1 (Lower byte)
47) Spectrum Analyzer Frequency Marker 2 (Higher byte)
48) Spectrum Analyzer Frequency Marker 2 (Lower byte)
49) Spectrum Analyzer Frequency Marker 3 (Higher byte)
50) Spectrum Analyzer Frequency Marker 3 (Lower byte)
51) Spectrum Analyzer Frequency Marker 4 (Higher byte)
52) Spectrum Analyzer Frequency Marker 4 (Lower byte)
53) Spectrum Analyzer Frequency Marker 5 (Higher byte)
54) Spectrum Analyzer Frequency Marker 5 (Lower byte)
55) Spectrum Analyzer Frequency Marker 6 (Higher byte)
56) Spectrum Analyzer Frequency Marker 6 (Lower byte)
57) Spectrum Analyzer Single Limit (Highest byte)[244]
58) Spectrum Analyzer Single Limit
59) Spectrum Analyzer Single Limit
60) Spectrum Analyzer Single Limit (Lowest byte)
61) SPA Multiple Upper Limit 1 Start X[245] (Highest byte)
62) SPA Multiple Upper Limit 1 Start X
63) SPA Multiple Upper Limit 1 Start X
64) SPA Multiple Upper Limit 1 Start X (Lowest byte)
65) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [246]
66) SPA Multiple Upper Limit 1 Start Y (Power Level)
67) SPA Multiple Upper Limit 1 Start Y (Power Level)
68) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) SPA Multiple Upper Limit 1 End X[247] (Highest byte)
70) SPA Multiple Upper Limit 1 End X
71) SPA Multiple Upper Limit 1 End X
72) SPA Multiple Upper Limit 1 End X (Lowest byte)
73) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [248]
74) SPA Multiple Upper Limit 1 End Y (Power Level)
75) SPA Multiple Upper Limit 1 End Y (Power Level)
76) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[249]

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[241] Value sent as (value in dBm * 1000) + 270,000)
[242] Value sent as (value * 1000)
[243] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[244] Value sent as (value in dBm * 1000) + 270000
[245] Scaled by Frequency Scale Factor (bytes 301-302)
[246] Value sent as (value in dBm * 1000) + 270000
[247] Scaled by Frequency Scale Factor (bytes 301-302)
[248] Value sent as (value in dBm * 1000) + 270000
[249] RBW frequency sent in Hz.

222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[250]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) OCC BW Method[251]
230) OCC BW % Value[252]
231) OCC BW dBc[253]
232) Attenuation
233) Antenna Index (0-14)
234-249) Antenna Name (16 bytes in ASCII)
250) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
251) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off
252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[254]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

[250] VBW frequency sent in Hz.
[251] 00h = % of power, 01h = dB down
[252] 0 – 99%
[253] 0 – 120 dBc
[254] Beep level is always 1b for upper segmented limit line

253) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [255]

254) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

255) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

257) Reference Level Offset[256] (Highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (Lowest byte)
261) External Reference Frequency [257]
262) Signal Standard[258] (Higher byte)
263) Signal Standard (Lower byte)
264) Channel Selection[259] (Higher byte)
265) Channel Selection (Lower byte)
266) Trigger Type[260]
267) Interference Analysis Frequency[261] (Highest byte)

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[255] Beep level is always 0b for lower segmented limit line
[256] Value sent as (value in dBm * 1000) + 270,000
[257] 1 byte in MHz (i.e. 20 = 20MHz)
[258] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[259] "No Channel" is sent as FFFEh
[260] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[261] Scaled by Frequency Scale Factor (bytes 301-302)

268) Interference Analysis Frequency
269) Interference Analysis Frequency
270) Interference Analysis Frequency (Lowest byte)
271) Trigger Position (0 – 100%)
272) Min Sweep Time (in µs) (Highest byte)
273) Min Sweep Time (in µs)
274) Min Sweep Time (in µs)
275) Min Sweep Time (in µs) (Lowest byte)
276) Video Trigger Level[262] (Highest byte)
277) Video Trigger Level
278) Video Trigger Level
279) Video Trigger Level (Lowest byte)
280) Status Byte 8
(LSB) bit 0: Limit Beep Output (Option 86 Only) (00h = Internal Speaker, 01h = External)
bits 2-7: Not Used
281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off
bit 5: External Reference Frequency On/Off
bits 6-7: Not Used
283) Impedance (00h = 50Ω, 10h = 75Ω Anritsu Adapter, 12h = 75Ω Other Adapter)
284) Impedance Loss[263] (Higher byte)
285) Impedance Loss (Lower byte)
286) AM/FM Demod Type[264]
287) AM/FM Demod Status (01h = On, 00h = Off)
288) AM/FM Demod Volume (0 to 100)
289) AM/FM Demod Frequency[265] (Highest byte)
290) AM/FM Demod Frequency
291) AM/FM Demod Frequency
292) AM/FM Demod Frequency (Lowest byte)
293) AM/FM Demod Time (in ms) (Highest byte)
294) AM/FM Demod Time (in ms)
295) AM/FM Demod Time (in ms)
296) AM/FM Demod Time (in ms) (Lowest byte)
297) SSB BFO Offset[266] (Highest byte)
298) SSB BFO Offset
299) SSB BFO Offset
300) SSB BFO Offset (Lowest byte)
301) Frequency Scale Factor[267] (Higher byte)
302) Frequency Scale Factor (Lower byte)
303) Frequency Range Minimum[268] (Highest byte)
304) Frequency Range Minimum

[262] Value sent as (value in dBm * 1000) + 270,000
[263] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[264] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[265] Scaled by Frequency Scale Factor (bytes 301-302)
[266] Value sent as ((value in Hz) – 10,000)
[267] In number of Hz
[268] Scaled by Frequency Scale Factor (bytes 301-302)

305) Frequency Range Minimum
306) Frequency Range Minimum (Lowest byte)
307) Frequency Range Maximum[269] (Highest byte)
308) Frequency Range Maximum
309) Frequency Range Maximum
310) Frequency Range Maximum (Lowest byte)
311) Marker Type[270]
312) Channel Power Int BW[271] (Highest byte)
313) Channel Power Int BW
314) Channel Power Int BW
315) Channel Power Int BW (Lowest byte)
316) ACPR Main Channel BW[272] (Highest byte)
317) ACPR Main Channel BW
318) ACPR Main Channel BW
319) ACPR Main Channel BW (Lowest byte)
320) ACPR Adjacent Channel BW[273] (Highest byte)
321) ACPR Adjacent Channel BW
322) ACPR Adjacent Channel BW
323) ACPR Adjacent Channel BW (Lowest byte)
324) ACPR Channel Spacing[274] (Highest byte)
325) ACPR Channel Spacing
326) ACPR Channel Spacing
327) ACPR Channel Spacing (Lowest byte)
328) Interference Analysis Cell Std[275]
329) Interference Analysis Est. BW[276] (Highest byte)
330) Interference Analysis Est. BW
331) Interference Analysis Est. BW
332) Interference Analysis Est. BW (Lowest byte)
333) Trace B Trace Id[277]
334-500) Not Used

For Transmission Mode (Option 21):
21) Start Frequency[278] (Highest byte)
22) Start Frequency
23) Start Frequency
24) Start Frequency (Lowest byte)
25) Stop Frequency[279] (Highest byte)
26) Stop Frequency
27) Stop Frequency
28) Stop Frequency (Lowest byte)
29) Center Frequency[280] (Highest byte)
30) Center Frequency

[269] Scaled by Frequency Scale Factor (bytes 301-302)
[270] 00h = Regular Marker, 01h = Noise Marker
[271] Scaled by Frequency Scale Factor (bytes 301-302)
[272] Scaled by Frequency Scale Factor (bytes 301-302)
[273] Scaled by Frequency Scale Factor (bytes 301-302)
[274] Scaled by Frequency Scale Factor (bytes 301-302)
[275] 4 Standards – 00h = 1250 kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[276] Frequency in Hz
[277] FFh indicates no trace selected
[278] Scaled by Frequency Scale Factor (bytes 244-245)
[279] Scaled by Frequency Scale Factor (bytes 244-245)
[280] Scaled by Frequency Scale Factor (bytes 244-245)

31) Center Frequency
32) Center Frequency (Lowest byte)
33) Frequency Span[281] (Highest byte)
34) Frequency Span
35) Frequency Span
36) Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[282]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[283]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Frequency Marker 1 (Higher byte)[284]
46) Frequency Marker 1 (Lower byte)
47) Frequency Marker 2 (Higher byte)
48) Frequency Marker 2 (Lower byte)
49) Frequency Marker 3 (Higher byte)
50) Frequency Marker 3 (Lower byte)
51) Frequency Marker 4 (Higher byte)
52) Frequency Marker 4 (Lower byte)
53) Frequency Marker 5 (Higher byte)
54) Frequency Marker 5 (Lower byte)
55) Frequency Marker 6 (Higher byte)
56) Frequency Marker 6 (Lower byte)
57) Single Limit (Highest byte)[285]
58) Single Limit
59) Single Limit
60) Single Limit (Lowest byte)
61) Multiple Upper Limit 1 Start X[286] (Highest byte)
62) Multiple Upper Limit 1 Start X
63) Multiple Upper Limit 1 Start X
64) Multiple Upper Limit 1 Start X (Lowest byte)
65) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [287]
66) Multiple Upper Limit 1 Start Y (Power Level)
67) Multiple Upper Limit 1 Start Y (Power Level)
68) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) Multiple Upper Limit 1 End X[288] (Highest byte)
70) Multiple Upper Limit 1 End X
71) Multiple Upper Limit 1 End X
72) Multiple Upper Limit 1 End X (Lowest byte)
73) Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [289]
74) Multiple Upper Limit 1 End Y (Power Level)
75) Multiple Upper Limit 1 End Y (Power Level)

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[281] Scaled by Frequency Scale Factor (bytes 244-245)
[282] Value sent as (value in dBm * 1000) + 270,000)
[283] Value sent as (value * 1000)
[284] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[285] Value sent as (value in dBm * 1000) + 270000
[286] Scaled by Frequency Scale Factor (bytes 244-245)
[287] Value sent as (value in dBm * 1000) + 270000
[288] Scaled by Frequency Scale Factor (bytes 244-245)
[289] Value sent as (value in dBm * 1000) + 270000

76) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[290]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[291]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) Attenuation
230) 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
231) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Not Used
232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit Beep On/Off
bit 2 : Single Limit Status On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[292]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
233) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [293]

[290] RBW frequency sent in Hz.
[291] VBW frequency sent in Hz.
[292] Beep level is always 1b for upper segmented limit line
[293] Beep level is always 0b for lower segmented limit line

234) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

235) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : External Reference Freq On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

236) External Reference Frequency [294]

237) Signal Standard[295] (Higher byte)

238) Signal Standard (Lower byte)

239) Channel Selection[296] (Higher byte)

240) Channel Selection (Lower byte)

241) Trigger Type[297]

242) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used

243) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: RBW Coupling (1b = Auto, 0b = Manual)
bit 5: VBW Coupling (1b = Auto, 0b = Manual)
bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 7: View B On/Off

244) Frequency Scale Factor[298] (Higher byte)

245) Frequency Scale Factor (Lower byte)

246) Frequency Range Minimum[299] (Highest byte)

247) Frequency Range Minimum

248) Frequency Range Minimum

249) Frequency Range Minimum (Lowest byte)

250) Frequency Range Maximum[300] (Highest byte)

251) Frequency Range Maximum

252) Frequency Range Maximum

253) Frequency Range Maximum (Lowest byte)

254) Marker Type[301]

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[294] 1 byte in MHz (i.e. 20 = 20MHz)
[295] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[296] "No Channel" is sent as FFFEh
[297] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[298] In number of Hz
[299] Scaled by Frequency Scale Factor (bytes 244-245)
[300] Scaled by Frequency Scale Factor (bytes 244-245)
[301] 00h = Regular Marker, 01h = Noise Marker

255) Trace B Trace Id[302]
256) Status Byte 9
(LSB) bit 0: Limit Beep Output (Option 86 Only) (00h = Internal Speaker, 01h = External)
bits 1-7: Not Used
257-400) Not Used

For Power Meter Mode (Option 29 Only):
21) Power Meter Start Freq[303] (Highest byte)
22) Power Meter Start Freq
23) Power Meter Start Freq
24) Power Meter Start Freq[304] (Lowest byte)
25) Power Meter Stop Freq (Highest byte)
26) Power Meter Stop Freq
27) Power Meter Stop Freq
28) Power Meter Stop Freq (Lowest byte)
29) Power Meter Center Freq[305] (Highest byte)
30) Power Meter Center Freq
31) Power Meter Center Freq
32) Power Meter Center Freq (Lowest byte)
33) Power Meter Span[306] (Highest byte)
34) Power Meter Span
35) Power Meter Span
36) Power Meter Span (Lowest byte)
37) Signal Standard[307] (Higher byte)
38) Signal Standard (Lower byte)
39) Channel Selection[308] (Higher byte)
40) Channel Selection (Lower byte)
41) Power Meter Offset[309] (Highest byte)
42) Power Meter Offset
43) Power Meter Offset
44) Power Meter Offset (Lowest byte)
45) Power Meter Relative (Highest byte)[310]
46) Power Meter Relative
47) Power Meter Relative
48) Power Meter Relative (Lowest byte)
49) Not Used
50) Power Meter Unit (00h = Watts, 01h = dBm)
51) Power Meter Relative Status (00h = Off, 01h = On)
52) Power Meter Offset Status (00h = Off, 01h = On)
53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
54) Frequency Scale Factor[311] (Higher byte)
55) Frequency Scale Factor (Lower byte)
56) Frequency Range Minimum[312] (Highest byte)
57) Frequency Range Minimum

[302] FFh indicates no trace selected
[303] Scaled by Frequency Scale Factor (bytes 54-55)
[304] Scaled by Frequency Scale Factor (bytes 54-55)
[305] Scaled by Frequency Scale Factor (bytes 54-55)
[306] Scaled by Frequency Scale Factor (bytes 54-55)
[307] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[308] "No Channel" is sent as FFFEh
[309] Value sent as (value in dB * 1000)
[310] Value sent as ((value in dBm * 1000) + 100)
[311] In number of Hz
[312] Scaled by Frequency Scale Factor

58) Frequency Range Minimum
59) Frequency Range Minimum (Lowest byte)
60) Frequency Range Maximum[313] (Highest byte)
61) Frequency Range Maximum
62) Frequency Range Maximum
63) Frequency Range Maximum (Lowest byte)
64) Zero Status (00h = Off, 01h = On)
65) Zero Value[314] (Highest byte)
66) Zero Value
67) Zero Value
68) Zero Value (Lowest byte)
69-120) Not Used

Upload Setup – Control Byte #66 (42h)

Description: Returns parameters associated with the specified setup number. Since different modes have different numbers of setup locations available, the command requires the mode be specified as well as the setup number.

Setup numbers as follows:

0 = Run time setup
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 2 bytes

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[315]
4) Setup Number in which to store setup
5-20) Not Used

For Spectrum Analyzer Mode:

21) Spectrum Analyzer Start Frequency[316] (Highest byte)
22) Spectrum Analyzer Start Frequency
23) Spectrum Analyzer Start Frequency
24) Spectrum Analyzer Start Frequency (Lowest byte)
25) Spectrum Analyzer Stop Frequency[317] (Highest byte)
26) Spectrum Analyzer Stop Frequency
27) Spectrum Analyzer Stop Frequency
28) Spectrum Analyzer Stop Frequency (Lowest byte)
29) Spectrum Analyzer Center Frequency[318] (Highest byte)
30) Spectrum Analyzer Center Frequency
31) Spectrum Analyzer Center Frequency
32) Spectrum Analyzer Center Frequency (Lowest byte)
33) Spectrum Analyzer Frequency Span[319] (Highest byte)
34) Spectrum Analyzer Frequency Span
35) Spectrum Analyzer Frequency Span
36) Spectrum Analyzer Frequency Span (Lowest byte)

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[313] Scaled by Frequency Scale Factor
[314] Value sent as ((value in dBm * 1000) + 100)
[315] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[316] Scaled by Frequency Scale Factor (bytes 301-302)
[317] Scaled by Frequency Scale Factor (bytes 301-302)
[318] Scaled by Frequency Scale Factor (bytes 301-302)
[319] Scaled by Frequency Scale Factor (bytes 301-302)

37) Ref Level (Highest byte)[320]
38) Ref Level
39) Ref Level
40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[321]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Spectrum Analyzer Frequency Marker 1 (Higher byte)[322]
46) Spectrum Analyzer Frequency Marker 1 (Lower byte)
47) Spectrum Analyzer Frequency Marker 2 (Higher byte)
48) Spectrum Analyzer Frequency Marker 2 (Lower byte)
49) Spectrum Analyzer Frequency Marker 3 (Higher byte)
50) Spectrum Analyzer Frequency Marker 3 (Lower byte)
51) Spectrum Analyzer Frequency Marker 4 (Higher byte)
52) Spectrum Analyzer Frequency Marker 4 (Lower byte)
53) Spectrum Analyzer Frequency Marker 5 (Higher byte)
54) Spectrum Analyzer Frequency Marker 5 (Lower byte)
55) Spectrum Analyzer Frequency Marker 6 (Higher byte)
56) Spectrum Analyzer Frequency Marker 6 (Lower byte)
57) Spectrum Analyzer Single Limit (Highest byte)[323]
58) Spectrum Analyzer Single Limit
59) Spectrum Analyzer Single Limit
60) Spectrum Analyzer Single Limit (Lowest byte)
61) SPA Multiple Upper Limit 1 Start X[324] (Highest byte)
62) SPA Multiple Upper Limit 1 Start X
63) SPA Multiple Upper Limit 1 Start X
64) SPA Multiple Upper Limit 1 Start X (Lowest byte)
65) SPA Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [325]
66) SPA Multiple Upper Limit 1 Start Y (Power Level)
67) SPA Multiple Upper Limit 1 Start Y (Power Level)
68) SPA Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) SPA Multiple Upper Limit 1 End X[326] (Highest byte)
70) SPA Multiple Upper Limit 1 End X
71) SPA Multiple Upper Limit 1 End X
72) SPA Multiple Upper Limit 1 End X (Lowest byte)
73) SPA Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [327]
74) SPA Multiple Upper Limit 1 End Y (Power Level)
75) SPA Multiple Upper Limit 1 End Y (Power Level)
76) SPA Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
221) RBW Setting (Highest byte)[328]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)

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[320] Value sent as (value in dBm * 1000) + 270,000)
[321] Value sent as (value * 1000)
[322] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[323] Value sent as (value in dBm * 1000) + 270000
[324] Scaled by Frequency Scale Factor (bytes 301-302)
[325] Value sent as (value in dBm * 1000) + 270000
[326] Scaled by Frequency Scale Factor (bytes 301-302)
[327] Value sent as (value in dBm * 1000) + 270000
[328] RBW frequency sent in Hz.

225) VBW Setting (Highest byte)[329]
226) VBW Setting
227) VBW Setting
228) VBW Setting (Lowest byte)
229) OCC BW Method[330]
230) OCC BW % Value[331]
231) OCC BW dBc[332]
232) Attenuation
233) Antenna Index (0-14)
234-249) Antenna Name (16 bytes in ASCII)
250) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
251) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization On/Off
252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[333]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
253) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [334]

[329] VBW frequency sent in Hz.
[330] 00h = % of power, 01h = dB down
[331] 0 – 99%
[332] 0 – 120 dBc
[333] Beep level is always 1b for upper segmented limit line
[334] Beep level is always 0b for lower segmented limit line

254) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

255) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)

256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off

257) Reference Level Offset[335] (Highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (Lowest byte)
261) External Reference Frequency [336]
262) Signal Standard[337] (Higher byte)
263) Signal Standard (Lower byte)
264) Channel Selection[338] (Higher byte)
265) Channel Selection (Lower byte)
266) Trigger Type[339]
267) Interference Analysis Frequency[340] (Highest byte)
268) Interference Analysis Frequency
269) Interference Analysis Frequency
270) Interference Analysis Frequency (Lowest byte)
271) Trigger Position (0 – 100%)
272) Min Sweep Time (in µs) (Highest byte)
273) Min Sweep Time (in µs)
274) Min Sweep Time (in µs)
275) Min Sweep Time (in µs) (Lowest byte)
276) Video Trigger Level[341] (Highest byte)
277) Video Trigger Level

[335] Value sent as (value in dBm * 1000) + 270,000
[336] 1 byte in MHz (i.e. 20 = 20MHz)
[337] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[338] "No Channel" is sent as FFFEh
[339] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[340] Scaled by Frequency Scale Factor (bytes 301-302)
[341] Value sent as (value in dBm * 1000) + 270,000

278) Video Trigger Level
279) Video Trigger Level (Lowest byte)
280) Status Byte 8
(LSB) bit 0: Limit Beep Output (Option 86 Only) (00h = Internal Speaker, 01h = External)
bits 1-7: Not Used
281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off
bit 5: External Reference Frequency On/Off
bits 6-7: Not Used
283) Impedance (00h = 50Ω, 10h = 75Ω Anritsu Adapter, 12h = 75Ω Other Adapter)
284) Impedance Loss[342] (Higher byte)
285) Impedance Loss (Lower byte)
286) AM/FM Demod Type[343]
287) AM/FM Demod Status (01h = On, 00h = Off)
288) AM/FM Demod Volume (0 to 100)
289) AM/FM Demod Frequency[344] (Highest byte)
290) AM/FM Demod Frequency
291) AM/FM Demod Frequency
292) AM/FM Demod Frequency (Lowest byte)
293) AM/FM Demod Time (in ms) (Highest byte)
294) AM/FM Demod Time (in ms)
295) AM/FM Demod Time (in ms)
296) AM/FM Demod Time (in ms) (Lowest byte)
297) SSB BFO Offset[345] (Highest byte)
298) SSB BFO Offset
299) SSB BFO Offset
300) SSB BFO Offset (Lowest byte)
301) Frequency Scale Factor[346] (Higher byte)
302) Frequency Scale Factor (Lower byte)
303) Frequency Range Minimum[347] (Highest byte)
304) Frequency Range Minimum
305) Frequency Range Minimum
306) Frequency Range Minimum (Lowest byte)
307) Frequency Range Maximum[348] (Highest byte)
308) Frequency Range Maximum
309) Frequency Range Maximum
310) Frequency Range Maximum (Lowest byte)
311) Marker Type[349]
312) Channel Power Int BW[350] (Highest byte)

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[342] Value sent as (value in dB * 1000), valid values are 0 to 20 dB
[343] AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[344] Scaled by Frequency Scale Factor (bytes 301-302)
[345] Value sent as ((value in Hz) – 10,000)
[346] In number of Hz
[347] Scaled by Frequency Scale Factor (bytes 301-302)
[348] Scaled by Frequency Scale Factor (bytes 301-302)
[349] 00h = Regular Marker, 01h = Noise Marker
[350] Scaled by Frequency Scale Factor (bytes 301-302)

313) Channel Power Int BW
314) Channel Power Int BW
315) Channel Power Int BW (Lowest byte)
316) ACPR Main Channel BW[351] (Highest byte)
317) ACPR Main Channel BW
318) ACPR Main Channel BW
319) ACPR Main Channel BW (Lowest byte)
320) ACPR Adjacent Channel BW[352] (Highest byte)
321) ACPR Adjacent Channel BW
322) ACPR Adjacent Channel BW
323) ACPR Adjacent Channel BW (Lowest byte)
324) ACPR Channel Spacing[353] (Highest byte)
325) ACPR Channel Spacing
326) ACPR Channel Spacing
327) ACPR Channel Spacing (Lowest byte)
328) Interference Analysis Cell Std[354]
329) Interference Analysis Est. BW[355] (Highest byte)
330) Interference Analysis Est. BW
331) Interference Analysis Est. BW
332) Interference Analysis Est. BW (Lowest byte)
333) Trace B Trace Id[356]
334-500) Not Used

For Transmission Mode (Option 21 Only):
21) Start Frequency[357] (Highest byte)
22) Start Frequency
23) Start Frequency
24) Start Frequency (Lowest byte)
25) Stop Frequency[358] (Highest byte)
26) Stop Frequency
27) Stop Frequency
28) Stop Frequency (Lowest byte)
29) Center Frequency[359] (Highest byte)
30) Center Frequency
31) Center Frequency
32) Center Frequency (Lowest byte)
33) Frequency Span[360] (Highest byte)
34) Frequency Span
35) Frequency Span
36) Frequency Span (Lowest byte)
37) Ref Level (Highest byte)[361]
38) Ref Level
39) Ref Level

[351] Scaled by Frequency Scale Factor (bytes 301-302)
[352] Scaled by Frequency Scale Factor (bytes 301-302)
[353] Scaled by Frequency Scale Factor (bytes 301-302)
[354] 4 Standards – 00h = 1250 kHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF
[355] Frequency in Hz
[356] FFh indicates to trace selected
[357] Scaled by Frequency Scale Factor (bytes 244-245)
[358] Scaled by Frequency Scale Factor (bytes 244-245)
[359] Scaled by Frequency Scale Factor (bytes 244-245)
[360] Scaled by Frequency Scale Factor (bytes 244-245)
[361] Value sent as (value in dBm * 1000) + 270,000)

40) Ref Level (Lowest byte)
41) Scale per div (Highest byte)[362]
42) Scale per div
43) Scale per div
44) Scale per div (Lowest byte)
45) Frequency Marker 1 (Higher byte)[363]
46) Frequency Marker 1 (Lower byte)
47) Frequency Marker 2 (Higher byte)
48) Frequency Marker 2 (Lower byte)
49) Frequency Marker 3 (Higher byte)
50) Frequency Marker 3 (Lower byte)
51) Frequency Marker 4 (Higher byte)
52) Frequency Marker 4 (Lower byte)
53) Frequency Marker 5 (Higher byte)
54) Frequency Marker 5 (Lower byte)
55) Frequency Marker 6 (Higher byte)
56) Frequency Marker 6 (Lower byte)
57) Single Limit (Highest byte)[364]
58) Single Limit
59) Single Limit
60) Single Limit (Lowest byte)
61) Multiple Upper Limit 1 Start X[365] (Highest byte)
62) Multiple Upper Limit 1 Start X
63) Multiple Upper Limit 1 Start X
64) Multiple Upper Limit 1 Start X (Lowest byte)
65) Multiple Upper Limit 1 Start Y (Power Level) (Highest byte) [366]
66) Multiple Upper Limit 1 Start Y (Power Level)
67) Multiple Upper Limit 1 Start Y (Power Level)
68) Multiple Upper Limit 1 Start Y (Power Level) (Lowest byte)
69) Multiple Upper Limit 1 End X[367] (Highest byte)
70) Multiple Upper Limit 1 End X
71) Multiple Upper Limit 1 End X
72) Multiple Upper Limit 1 End X (Lowest byte)
73) Multiple Upper Limit 1 End Y (Power Level) (Highest byte) [368]
74) Multiple Upper Limit 1 End Y (Power Level)
75) Multiple Upper Limit 1 End Y (Power Level)
76) Multiple Upper Limit 1 End Y (Power Level) (Lowest byte)
77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 67-82 for format)
221) RBW Setting (Highest byte)[369]
222) RBW Setting
223) RBW Setting
224) RBW Setting (Lowest byte)
225) VBW Setting (Highest byte)[370]
226) VBW Setting
227) VBW Setting

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[362] Value sent as (value * 1000)
[363] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[364] Value sent as (value in dBm * 1000) + 270000
[365] Scaled by Frequency Scale Factor (bytes 244-245)
[366] Value sent as (value in dBm * 1000) + 270000
[367] Scaled by Frequency Scale Factor (bytes 244-245)
[368] Value sent as (value in dBm * 1000) + 270000
[369] RBW frequency sent in Hz.
[370] VBW frequency sent in Hz.

228) VBW Setting (Lowest byte)
229) Attenuation
230) 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
231) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Not Used
232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
bit 1 : Single Limit Beep On/Off
bit 2 : Single Limit Status On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[371]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
233) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [372]
234) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

[371] Beep level is always 1b for upper segmented limit line
[372] Beep level is always 0b for lower segmented limit line

235) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : External Reference Frequency On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)
236) External Reference Frequency [373]
237) Signal Standard[374] (Higher byte)
238) Signal Standard (Lower byte)
239) Channel Selection[375] (Higher byte)
240) Channel Selection (Lower byte)
241) Trigger Type[376]
242) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
243) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: RBW Coupling (1b = Auto, 0b = Manual)
bit 5: VBW Coupling (1b = Auto, 0b = Manual)
bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 7: View B On/Off
244) Frequency Scale Factor[377] (Higher byte)
245) Frequency Scale Factor (Lower byte)
246) Frequency Range Minimum[378] (Highest byte)
247) Frequency Range Minimum
248) Frequency Range Minimum
249) Frequency Range Minimum (Lowest byte)
250) Frequency Range Maximum[379] (Highest byte)
251) Frequency Range Maximum
252) Frequency Range Maximum
253) Frequency Range Maximum (Lowest byte)
254) Marker Type[380]
255) Trace B Trace Id[381]
256) Status Byte 9
(LSB) bit 0: Limit Beep Output (Option 86 Only) (00h = Internal Speaker, 01h = External)
bits 1-7: Not Used
257-400) Not Used

[373] 1 byte in MHz (i.e. 20 = 20MHz)
[374] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[375] "No Channel" is sent as FFFEh
[376] Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External
[377] In number of Hz
[378] Scaled by Frequency Scale Factor (bytes 244-245)
[379] Scaled by Frequency Scale Factor (bytes 244-245)
[380] 00h = Regular Marker, 01h = Noise Marker
[381] FFh indicates no trace selected

For Power Meter Mode (Option 29 Only):

21) Power Meter Start Freq[382] (Highest byte)
22) Power Meter Start Freq
23) Power Meter Start Freq
24) Power Meter Start Freq[383] (Lowest byte)
25) Power Meter Stop Freq (Highest byte)
26) Power Meter Stop Freq
27) Power Meter Stop Freq
28) Power Meter Stop Freq (Lowest byte)
29) Power Meter Center Freq[384] (Highest byte)
30) Power Meter Center Freq
31) Power Meter Center Freq
32) Power Meter Center Freq (Lowest byte)
33) Power Meter Span[385] (Highest byte)
34) Power Meter Span
35) Power Meter Span
36) Power Meter Span (Lowest byte)
37) Signal Standard[386] (Higher byte)
38) Signal Standard (Lower byte)
39) Channel Selection[387] (Higher byte)
40) Channel Selection (Lower byte)
41) Power Meter Offset[388] (Highest byte)
42) Power Meter Offset
43) Power Meter Offset
44) Power Meter Offset (Lowest byte)
45) Power Meter Relative (Highest byte)[389]
46) Power Meter Relative
47) Power Meter Relative
48) Power Meter Relative (Lowest byte)
49) Not Used
50) Power Meter Unit (00h = Watts, 01h = dBm)
51) Power Meter Relative Status (00h = Off, 01h = On)
52) Power Meter Offset Status (00h = Off, 01h = On)
53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
54) Frequency Scale Factor[390] (Higher byte)
55) Frequency Scale Factor (Lower byte)
56) Frequency Range Minimum[391] (Highest byte)
57) Frequency Range Minimum
58) Frequency Range Minimum
59) Frequency Range Minimum (Lowest byte)
60) Frequency Range Maximum[392] (Highest byte)
61) Frequency Range Maximum
62) Frequency Range Maximum
63) Frequency Range Maximum (Lowest byte)

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[382] Scaled by Frequency Scale Factor (bytes 54-55)
[383] Scaled by Frequency Scale Factor (bytes 54-55)
[384] Scaled by Frequency Scale Factor (bytes 54-55)
[385] Scaled by Frequency Scale Factor (bytes 54-55)
[386] Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh
[387] "No Channel" is sent as FFFEh
[388] Value sent as (value in dB * 1000)
[389] Value sent as ((value in dBm * 1000) + 100)
[390] In number of Hz
[391] Scaled by Frequency Scale Factor
[392] Scaled by Frequency Scale Factor

64) Zero Status (00h = Off, 01h = On)
65) Zero Value[393] (Highest byte)
66) Zero Value
67) Zero Value
68) Zero Value (Lowest byte)
69-120) Not Used

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

Read Parameter Limits – Control Byte #67 (43h)

Description: Returns limits (minimum and maximum values) associated with each parameter defined for the specified measurement mode.

"Frequency Parameters" are start, stop, and center frequencies, multiple limit "x" parameters and AM/FM demod frequency parameters.

Send this command twice. The first time, send it for the frequency parameter limits then send it for all other parameter limits.

Bytes to Follow: 2 bytes
1) Measurement Mode[394]
2) Limits to Read (00h = Frequency Parameter Limits, 01h = Available RBWs, 02h = Available VBWs, FFh = All Other Parameter Limits)

Spectrum Master Returns:
For All Modes:
1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Measurement Mode[395]
5-20) Not Used

For All Modes, Frequency Parameter Limits:
21) Number of Valid Frequency Ranges

For each range:
1) Range Scale Factor[396] (Higher byte)
2) Range Scale Factor (Lower byte)
3) Range Start Frequency[397] (Highest byte)
4) Range Start Frequency
5) Range Start Frequency
6) Range Start Frequency (Lowest byte)
7) Range Stop Frequency[398] (Highest byte)
8) Range Stop Frequency
9) Range Stop Frequency
10) Range Stop Frequency (Lowest byte)

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[393] Value sent as ((value in dBm * 1000) + 100)
[394] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[395] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[396] Scale Factor in number of Hz
[397] Scaled by Span Scale Factor
[398] Scaled by Span Scale Factor

For Spectrum Analyzer, Transmission Measurement Modes, Available RBWS:

21) Number of Valid RBWs

For each RBW:

1) RBW Frequency (in Hz) (Highest byte)
2) RBW Frequency (in Hz)
3) RBW Frequency (in Hz)
4) RBW Frequency (in Hz) (Lowest byte)

For Spectrum Analyzer, Transmission Measurement Modes, Available VBWS:

21) Number of Valid VBWs

For each VBW:

1) VBW Frequency (in Hz) (Highest byte)
2) VBW Frequency (in Hz)
3) VBW Frequency (in Hz)
4) VBW Frequency (in Hz) (Lowest byte)

For Spectrum Analyzer Mode, All Other Parameter Limits:

21) Frequency Scale Factor Minimum[399] (Higher byte)
22) Frequency Scale Factor Minimum (Lower byte)
23) Frequency Scale Factor Maximum[400] (Higher byte)
24) Frequency Scale Factor Maximum (Lower byte)
25) Span Minimum[401] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[402] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Reference Level Minimum[403] (Highest byte)
34) Reference Level Minimum
35) Reference Level Minimum
36) Reference Level Minimum (Lowest byte)
37) Reference Level Maximum[404] (Highest byte)
38) Reference Level Maximum
39) Reference Level Maximum
40) Reference Level Maximum (Lowest byte)
41) Scale Minimum[405] (Highest byte)
42) Scale Minimum
43) Scale Minimum
44) Scale Minimum (Lowest byte)
45) Scale Maximum[406] (Highest byte)
46) Scale Maximum
47) Scale Maximum

[399] Scale Factor in number of Hz
[400] Scale Factor in number of Hz
[401] Scaled by Span Scale Factor
[402] Scaled by Span Scale Factor
[403] Value sent as (value * 1000) + 270,000
[404] Value sent as (value * 1000) + 270,000
[405] Value sent as (value * 1000)
[406] Value sent as (value * 1000)

48) Scale Maximum (Lowest byte)
49) Marker Minimum[407] (Higher byte)
50) Marker Minimum (Lower byte)
51) Marker Maximum[408] (Higher byte)
52) Marker Maximum (Lower byte)
53) Limit Y Minimum[409] (Highest byte)
54) Limit Y Minimum
55) Limit Y Minimum
56) Limit Y Minimum (Lowest byte)
57) Limit Y Maximum[410] (Highest byte)
58) Limit Y Maximum
59) Limit Y Maximum
60) Limit Y Maximum (Lowest byte)
61) OBW Method Minimum
62) OBW Method Maximum
63) OBW % of Power Minimum
64) OBW % of Power Maximum
65) OBW dBc Minimum
66) OBW dBc Maximum
67) Attenuation Minimum
68) Attenuation Maximum
69) Amplitude Units Minimum
70) Amplitude Units Maximum
71) Detection Algorithm Minimum
72) Detection Algorithm Maximum
73) RL Offset Minimum[411] (Highest byte)
74) RL Offset Minimum
75) RL Offset Minimum
76) RL Offset Minimum (Lowest byte)
77) RL Offset Maximum[412] (Highest byte)
78) RL Offset Maximum
79) RL Offset Maximum
80) RL Offset Maximum (Lowest byte)
81) External Reference Frequency Minimum[413] (Highest byte)
82) External Reference Frequency Minimum
83) External Reference Frequency Minimum
84) External Reference Frequency Minimum (Lowest byte)
85) External Reference Frequency Maximum[414] (Highest byte)
86) External Reference Frequency Maximum
87) External Reference Frequency Maximum
88) External Reference Frequency Maximum (Lowest byte)
89) Trigger Type Minimum
90) Trigger Type Maximum
91) Minimum Sweep Type (in µs) Minimum (Highest byte)
92) Minimum Sweep Type (in µs) Minimum

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[407] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[408] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[409] Value sent as (value * 1000) + 270,000
[410] Value sent as (value * 1000) + 270,000
[411] Value sent as (value * 1000) + 270,000
[412] Value sent as (value * 1000) + 270,000
[413] Reference frequency in Hz
[414] Reference frequency in Hz

93) Minimum Sweep Type (in µs) Minimum
94) Minimum Sweep Type (in µs) Minimum (Lowest byte)
95) Minimum Sweep Type (in µs) Maximum (Highest byte)
96) Minimum Sweep Type (in µs) Maximum
97) Minimum Sweep Type (in µs) Maximum
98) Minimum Sweep Type (in µs) Maximum (Lowest byte)
99) Video Trigger Level Minimum[415] (Highest byte)
100) Video Trigger Level Minimum
101) Video Trigger Level Minimum
102) Video Trigger Level Minimum (Lowest byte)
103) Video Trigger Level Maximum[416] (Highest byte)
104) Video Trigger Level Maximum
105) Video Trigger Level Maximum
106) Video Trigger Level Maximum (Lowest byte)
107) Sweep Average Minimum
108) Sweep Average Maximum
109) Trace Math Minimum
110) Trace Math Maximum
111) Impedance Loss Minimum[417] (Highest byte)
112) Impedance Loss Minimum
113) Impedance Loss Minimum
114) Impedance Loss Minimum (Lowest byte)
115) Impedance Loss Maximum[418] (Highest byte)
116) Impedance Loss Maximum
117) Impedance Loss Maximum
118) Impedance Loss Maximum (Lowest byte)
119) Demod Type Minimum
120) Demod Type Maximum
121) Demod Volume Minimum
122) Demod Volume Maximum
123) Demod Time Minimum (in ms) (Highest byte)
124) Demod Time Minimum (in ms)
125) Demod Time Minimum (in ms)
126) Demod Time Minimum (in ms) (Lowest byte)
127) Demod Time Maximum (in ms) (Highest byte)
128) Demod Time Maximum (in ms)
129) Demod Time Maximum (in ms)
130) Demod Time Maximum (in ms) (Lowest byte)
131) SSB BFO Offset Minimum[419] (Highest byte)
132) SSB BFO Offset Minimum
133) SSB BFO Offset Minimum
134) SSB BFO Offset Minimum (Lowest byte)
135) SSB BFO Offset Maximum[420] (Highest byte)
136) SSB BFO Offset Maximum
137) SSB BFO Offset Maximum
138) SSB BFO Offset Maximum (Lowest byte)
139) ACPR Main Channel BW Minimum (in Hz) (Highest byte)
140) ACPR Main Channel BW Minimum (in Hz)
141) ACPR Main Channel BW Minimum (in Hz)

[415] Value sent as (value * 1000) + 270,000
[416] Value sent as (value * 1000) + 270,000
[417] Value sent as (value in dB * 1000)
[418] Value sent as (value in dB * 1000)
[419] Value sent as ((value in Hz) – 10,000)
[420] Value sent as ((value in Hz) – 10,000)

142) ACPR Main Channel BW Minimum (in Hz) (Lowest byte)
143) ACPR Main Channel BW Maximum (in Hz) (Highest byte)
144) ACPR Main Channel BW Maximum (in Hz)
145) ACPR Main Channel BW Maximum (in Hz)
146) ACPR Main Channel BW Maximum (in Hz) (Lowest byte)
147) ACPR Adjacent Channel BW Minimum (in Hz) (Highest byte)
148) ACPR Adjacent Channel BW Minimum (in Hz)
149) ACPR Adjacent Channel BW Minimum (in Hz)
150) ACPR Adjacent Channel BW Minimum (in Hz) (Lowest byte)
151) ACPR Adjacent Channel BW Maximum (in Hz) (Highest byte)
152) ACPR Adjacent Channel BW Maximum (in Hz)
153) ACPR Adjacent Channel BW Maximum (in Hz)
154) ACPR Adjacent Channel BW Maximum (in Hz) (Lowest byte)
155) ACPR Channel Spacing Minimum (in Hz) (Highest byte)
156) ACPR Channel Spacing Minimum (in Hz)
157) ACPR Channel Spacing Minimum (in Hz)
158) ACPR Channel Spacing Minimum (in Hz) (Lowest byte)
159) ACPR Channel Spacing Maximum (in Hz) (Highest byte)
160) ACPR Channel Spacing Maximum (in Hz)
161) ACPR Channel Spacing Maximum (in Hz)
162) ACPR Channel Spacing Maximum (in Hz) (Lowest byte)
163) Channel Power Integration BW Minimum (in Hz) (Highest byte)
164) Channel Power Integration BW Minimum (in Hz)
165) Channel Power Integration BW Minimum (in Hz)
166) Channel Power Integration BW Minimum (in Hz) (Lowest byte)
167) Channel Power Integration BW Maximum (in Hz) (Highest byte)
168) Channel Power Integration BW Maximum (in Hz)
169) Channel Power Integration BW Maximum (in Hz)
170) Channel Power Integration BW Maximum (in Hz) (Lowest byte)
171-300) Not Used

For Transmission Measurement Mode (Option 21 Only), All Other Parameter Limits:

21) Span Scale Factor Minimum[421] (Higher byte)
22) Span Scale Factor Minimum (Lower byte)
23) Span Scale Factor Maximum[422] (Higher byte)
24) Span Scale Factor Maximum (Lower byte)
25) Span Minimum[423] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[424] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Reference Level Minimum[425] (Highest byte)
34) Reference Level Minimum
35) Reference Level Minimum
36) Reference Level Minimum (Lowest byte)
37) Reference Level Maximum[426] (Highest byte)

[421] Scale Factor in number of Hz
[422] Scale Factor in number of Hz
[423] Scaled by Span Scale Factor
[424] Scaled by Span Scale Factor
[425] Value sent as (value * 1000) + 270,000
[426] Value sent as (value * 1000) + 270,000

38) Reference Level Maximum
39) Reference Level Maximum
40) Reference Level Maximum (Lowest byte)
41) Scale Minimum[427] (Highest byte)
42) Scale Minimum
43) Scale Minimum
44) Scale Minimum (Lowest byte)
45) Scale Maximum[428] (Highest byte)
46) Scale Maximum
47) Scale Maximum
48) Scale Maximum (Lowest byte)
49) Marker Minimum[429] (Higher byte)
50) Marker Minimum (Lower byte)
51) Marker Maximum[430] (Higher byte)
52) Marker Maximum (Lower byte)
53) Limit Y Minimum[431] (Highest byte)
54) Limit Y Minimum
55) Limit Y Minimum
56) Limit Y Minimum (Lowest byte)
57) Limit Y Maximum[432] (Highest byte)
58) Limit Y Maximum
59) Limit Y Maximum
60) Limit Y Maximum (Lowest byte)
61) Attenuation Minimum
62) Attenuation Maximum
63) Amplitude Units Minimum
64) Amplitude Units Maximum
65) Detection Algorithm Minimum
66) Detection Algorithm Maximum
67) External Reference Frequency Minimum[433] (Highest byte)
68) External Reference Frequency Minimum
69) External Reference Frequency Minimum
70) External Reference Frequency Minimum (Lowest byte)
71) External Reference Frequency Maximum[434] (Highest byte)
72) External Reference Frequency Maximum
73) External Reference Frequency Maximum
74) External Reference Frequency Maximum (Lowest byte)
75) Trigger Type Minimum
76) Trigger Type Maximum
77) Sweep Average Minimum
78) Sweep Average Maximum
79) Trace Math Minimum
80) Trace Math Maximum
81-200) Not Used

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[427] Value sent as (value * 1000)
[428] Value sent as (value * 1000)
[429] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[430] Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.
[431] Value sent as (value * 1000) + 270,000
[432] Value sent as (value * 1000) + 270,000
[433] Reference frequency in MHz
[434] Reference frequency in MHz

For Power Meter Mode (Option 29 Only), All Other Parameter Limits:

21) Span Scale Factor Minimum[435] (Higher byte)
22) Span Scale Factor Minimum (Lower byte)
23) Span Scale Factor Maximum[436] (Higher byte)
24) Span Scale Factor Maximum (Lower byte)
25) Span Minimum[437] (Highest byte)
26) Span Minimum
27) Span Minimum
28) Span Minimum (Lowest byte)
29) Span Maximum[438] (Highest byte)
30) Span Maximum
31) Span Maximum
32) Span Maximum (Lowest byte)
33) Power Meter Offset Minimum (Highest byte)
34) Power Meter Offset Minimum
35) Power Meter Offset Minimum
36) Power Meter Offset Minimum (Lowest byte)
37) Power Meter Offset Maximum (Highest byte)
38) Power Meter Offset Maximum
39) Power Meter Offset Maximum
40) Power Meter Offset Maximum (Lowest byte)
41) Power Meter Relative Minimum[439] (Highest byte)
42) Power Meter Relative Minimum
43) Power Meter Relative Minimum
44) Power Meter Relative Minimum (Lowest byte)
45) Power Meter Relative Maximum[440] (Highest byte)
46) Power Meter Relative Maximum
47) Power Meter Relative Maximum
48) Power Meter Relative Maximum (Lowest byte)
49-150) Not Used

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[435] Scale Factor in number of Hz
[436] Scale Factor in number of Hz
[437] Scaled by Span Scale Factor
[438] Scaled by Span Scale Factor
[439] Value sent as ((value in dBm + 100) * 1000)
[440] Value sent as ((value in dBm + 100) * 1000)

Query Saved Setups – Control Byte #68 (44h)

Description: Returns a list of setups saved for the specified measurement mode. Modes that are stored in the same table (i.e. Spectrum Analyzer and Transmission Measurement modes) will be returned by this command when either mode is specified.

Frequency Scale Factor is defined as the number of Hz.
Start and Stop frequencies are sent scaled by the Frequency Scale Factor.

Bytes to Follow: 1 byte

1) Measurement Mode[441]

Spectrum Master Returns:

For All Modes:

1) Number of Following Bytes (Higher byte)
2) Number of Following Bytes (Lower byte)
3) Number of Setups

For Each Setup:

1) Setup Number
2) Attributes
   bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
   bits 1-7: Not Used
3) Measurement Mode[442]
4) Cal Status (Transmission Mode Setup Only, 00h = Off, 01h = On)
5) Frequency Scale Factor (Higher byte)
6) Frequency Scale Factor (Lower byte)
7) Start Frequency (Highest byte)
8) Start Frequency
9) Start Frequency
10) Start Frequency (Lowest byte)
11) Stop Frequency (Highest byte)
12) Stop Frequency
13) Stop Frequency
14) Stop Frequency (Lowest byte)

15-20) Not Used

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[441] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.
[442] Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

***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 Spectrum Master and waits for response.

Since the Spectrum Master polls its serial port buffer at the end of each sweep, the computer must wait until the Spectrum 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 Spectrum Master does not respond as expected.

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

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

Bytes to Follow: 0 bytes

Spectrum Master Returns: 13 bytes

1-2) Model # (unsigned integer, 16h for Spectrum Master MS2711D)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version - 4 bytes (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 Spectrum 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 Spectrum Master stops sweeping. A Remote Mode Indicator appears on the LCD.

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

Bytes to Follow: 0 bytes

Spectrum Master Returns: 13 bytes

1-2) Model # (unsigned integer, 16h for Spectrum Master MS2711D)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version (4 bytes in ASCII)

***Write Protect Setup* – Control Byte #71 (47h)**

Description: Makes a saved setup either read-only or write-able.

Setup numbers as follows:

255 = All Setups in the Specified Mode
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 3 bytes

1) Measurement Mode[443]
2) Setup Number
3) Write-Protect Status (00h = Allow Writes (default), 01h = Lock Setup (i.e. "read only"))

Spectrum Master Returns: 1 byte

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

***Clear Setup Memory Location* – Control Byte #72 (48h)**

Description: Clears a setup memory location such that it appears as "<EMPTY>" in the Recall Setup list.

Setup numbers as follows:

255 = All Setups in the Specified Mode
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for Power Meter mode (Option 29 Only)

Bytes to Follow: 2 byte

1) Measurement Mode[444]
2) Setup Number

Spectrum Master Returns: 1 byte

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

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[443] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.
[444] Refer to Control Byte #3 "Select Measurement Mode" for valid measurement modes.

***Write Antenna* – Control Byte #82 (52h)**

Description: Receives an antenna to the Spectrum Master via the serial port.

An antenna is described with an index into the list (1-10) and an ASCII name that appears in the list on the Spectrum Master. Each antenna can have up to 60 antenna factors. Each antenna factor has an associated frequency and value. These are specified one at a time.

Frequencies are sent in Hz scaled by the Scale Factor.

The value of the antenna factor should be sent as (value * 100).

Bytes to Follow: 26 – 380, depending on the number of antenna factors

1) Antenna List Index (1-10)
2-17) Antenna Name (in ASCII)
18) Number of Antenna Factors (max = 60)
19-20) Frequency Scale Factor (in Hz)

For each antenna factor:

1) Frequency (scaled by Scale Factor) (Highest byte)
2) Frequency (scaled by Scale Factor)
3) Frequency (scaled by Scale Factor)
4) Frequency (scaled by Scale Factor) (Lowest byte)
5) Antenna Factor (Higher byte)
6) Antenna Factor (Lower byte)

Spectrum Master Returns: 1 byte

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

***Recall Antenna* – Control Byte #83 (53h)**

Description: Sends an antenna from the Spectrum Master via the serial port.

An antenna is described with an index into the list (1-10) and an ASCII name that appears in the list on the Spectrum Master. Each antenna can have up to 60 antenna factors. The number of antenna factors will be sent before the actual values are sent. Each antenna factor has an associated frequency and value. These are specified one at a time.

Frequencies are sent in Hz scaled by the Scale Factor.

The value of the antenna factor should be sent as (value * 100).

Bytes to Follow: 1 byte
1) Antenna List index (1-10)

Spectrum Master Returns: (28-382 bytes, depending on the number of antenna factors)
1) Maximum Antenna Number (10)
2-17) Antenna Name (in ASCII)
18) Number of Antenna Factors (max = 60)
19-20) Frequency Scale Factor (in Hz)
21-22) Number of Following Bytes
For each antenna factor:
1) Frequency (scaled by Scale Factor) (Highest byte)
2) Frequency (scaled by Scale Factor)
3) Frequency (scaled by Scale Factor)
4) Frequency (scaled by Scale Factor) (Lowest byte)
5) Antenna Factor (Higher byte)
6) Antenna Factor (Lower byte)

***Set Field Strength Measurement* – Control Byte #84 (54h)**

Description: Sets the state of the measurement (ON or OFF) and the antenna index for the field strength measurement. Antennas 1-10 are custom antennas. Antennas 11-15 are the standard antennas. The standard antennas are as follows:

11. Anritsu #2000-1030 (MAXRAD MPA1750) – 1710-1880 MHz
12. Anritsu #2000-1031 (MAXRAD MPA1850) – 1850-1990 MHz
13. Anritsu #2000-1032 (MAXRAD MPA2450) – 2400-2483.5 MHz
14. Anritsu #2000-1200 (Centurion EXCSM806) – 806-899 MHz
15. Anritsu #2000-1035 (Centurion EXE-902-SM) – 896-941 MHz

If the FCN4760 frequency converter module is attached, the standard antenna is:

11. Anritsu #2000-1361 – 5725-5825 MHz

Note that if the field strength measurement is turned ON, all other measurements (channel power, adjacent channel power) are turned OFF.

Bytes to Follow: 2 bytes
1) Field Strength Measurement State (On/Off)
2) Antenna List index (1-15)

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid state or index
238 (EEh) Time Out Error

***Set Channel Power* – Control Byte #85 (55h)**

Description: Sets the state of the measurement (ON or OFF), and the setup parameters to perform the channel power measurement.

Send a 0 (zero) following the command to set the channel power measurement in the current setup.

Send a 1 (one) to set the channel power associated with the trace that was most recently uploaded by command #36, Upload Sweep Trace.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Note that if the channel power measurement is turned ON, all other measurements (field strength, adjacent channel power) are turned OFF.

Bytes to Follow: 14 bytes

1) Channel Power Location (0 = current setup, 1 = last uploaded trace)
2) Channel Power Measurement State (On/Off)
3-6) Center Frequency
7-10) Integration Bandwidth
11-14) Span Frequency

Spectrum Master Returns: 1 byte

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

***Read Channel Power* – Control Byte #86 (56h)**

Description: Read the current channel power or the channel power of a stored trace.

Send a 0 (zero) following the command to read the current channel power measurement (i.e. the one that is updated as the unit is sweeping).

Send 1-200 to read the channel power associated with a stored trace (use Query Trace Names, #24, to obtain trace numbers).

If option 6 is installed and the frequency converter module is attached, the frequencies will be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Channel Power Location (0 = current measured value, 1-200 = value in stored trace)

Spectrum Master Returns: 21 bytes

1) Channel Power On/Off
2-5) Channel Center Frequency
6-9) Integration Bandwidth
10-13) Channel Span Frequency
14-17) Channel Power (= (power in *dBm* * 100) + 270000)
18-21) Channel Power Density (= (density in *dBm/Hz* * 100) + 270000)

Set Adjacent Channel Power Ratio (ACPR) – Control Byte #87 (57h)

Description: Sets the state of the measurement (ON or OFF), the center frequency, the main channel bandwidth, the adjacent channel bandwidth and the channel spacing.

Send a 0 (zero) following the command to set the channel power measurement in the current setup.

Send a 1 (one) to set the adjacent channel power associated with the trace that was most recently uploaded by command #36, Upload Sweep Trace.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Note that if the ACPR measurement is turned ON, all other measurements (field strength, channel power) are turned OFF.

Bytes to Follow: 18 bytes

1) Adjacent Channel Power Location (0 = current setup, 1 = last uploaded trace)
2) Adjacent Channel Power Measurement State (On/Off)
3-6) Center Frequency
7-10) Main Channel Bandwidth
11-14) Adjacent Channel Bandwidth
15-18) Channel Spacing

Spectrum Master Returns: 1 byte

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

Read Adjacent Channel Power (ACPR) – Control Byte #88 (58h)

Description: Read the current adjacent channel power or the adjacent channel power of a stored trace.

Send a 0 (zero) following the command to read the current adjacent channel power measurement (i.e. the one that is updated as the unit is sweeping).

Send 1-200 to read the channel power associated with a stored trace (use Query Trace Names, #24, to obtain trace numbers).

If option 6 is installed and the frequency extension module is attached, the frequencies will be scaled by the scale factor of the module. If the module is not attached, frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Adjacent Channel Power Ratio Location (0 = current measured value, 1-200 = value in stored trace)

Spectrum Master Returns: 29 bytes

1) ACPR On/Off
2-5) Main Channel Center Frequency
6-9) Main Channel Bandwidth
10-13) Adjacent Channel Bandwidth
14-17) Channel Spacing
18-21) Main Channel Power (= (power in *dBm* * 100) + 270000)
22-25) Lower Adjacent Channel Power (= (power in *dBm* * 100) + 270000)
26-29) Upper Adjacent Channel Power (= (power in *dBm* * 100) + 270000)

Select Signal Standard – Control Byte #89 (59h)

Description: Select signal standard and the link direction.

Bytes to Follow: 2 bytes

1) Signal Standard Index (0-199) – See "Signal Standards" for details.
2) Link direction (1= Uplink, 2=Downlink, 3=Uplink and downlink)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid signal standard
238 (EEh) Time Out Error

Select Channel in Current Standard – Control Byte #90 (5Ah)

Description: Selects a channel within the range of the currently selected signal standard. Use this command only in Spectrum Analyzer mode, Power Meter mode, CDMA mode and GSM mode.

See the section "Signal Standards" for a list of valid channels for the selected channel.

Bytes to Follow: 2 bytes

1) Channel (Higher byte)
2) Channel (Lower byte)

Cell Master Returns: 1 byte

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

Read Current Settings of Signal Standard – Control Byte #91 (5Bh)

Description: Read the current settings of signal standard. This command can be used in any measurement mode.
Bytes to follow: none
Cell Master Returns: 44 bytes

1) Signal Standard ID (0-199) – See "Signal Standards" for detail.
2) Link direction (0= N/A, 1= Uplink, 2=Downlink, 3=Uplink and downlink)
3 – 4) Channel Number (high - low)
5 – 30) Standard Name in ASCII

Upload User's Signal Standard Table – Control Byte #92 (5Ch)

Description: Upload user's signal standard table to Cell Master.

Bytes to Follow: Variable (64 bytes * n) where n is the total record of the signal standards.
Each record has the following data field.

1– 2):	Record type (Record type = 0xffff means last record)
3- 42):	Signal Standard Name (maximum 40 bytes)
43-46):	Center Frequency of first channel of uplink(in Hz)
47-50):	Center Frequency of first channel of downlink (in Hz)
51-52):	Start Channel Number
53-54):	Stop Channel Number
55-58):	Channel Band width (in Hz)
59-62):	Channel Spacing (in Hz)
63-64):	Channel Step.
65-128):	2nd record.
129-192):	3rd record.

Etc.

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid signal standard
238 (EEh) Time Out Error

***Measure OCC BW % of Power* – Control Byte #96 (60h)**

Description: Measure OCC BW with % of Power method.

If option 6 is installed and the frequency extension module is attached, the OBW frequencies will be scaled by the scale factor of the module. If the module is not attached, the OBW frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 4 bytes
1) % of Power (Highest byte)
2) % of Power
3) % of Power
4) % of Power (Lowest byte) (in 100th of %, 9123 = 91.23%)

Spectrum Master Returns: 16 bytes
1-4) Occupied Bandwidth (in Hz)
5-8) Measure dB down (dB * 100,000)
9-12) Low Frequency OCC BW
13-16) High Frequency OCC BW

***Measure OCC BW dB Down* – Control Byte #97 (61h)**

Description: Measure OCC BW with dB down method.

If option 6 is installed and the frequency converter module is attached, the OBW frequencies will be scaled by the scale factor of the module. If the module is not attached, the OBW frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 4 bytes
1-4) dB down (in 100^{th} of dB, 1234 = 12.34dB)

Spectrum Master Returns: 16 bytes
1-4) Occupied Bandwidth (in Hz)
5-8) Measure % of Power (% of power * 100)
9-12) Low Frequency OCC BW
13-16) High Frequency OCC BW

***Set Bias Tee Function* - Control Byte #98 (62h)**

This command is available only with Option 10.

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

Bytes to Follow: 1 byte
00h – Turns the Bias Tee Off
01h – Turns the Bias Tee On

Spectrum Master Returns:
If bias tee is turned Off (1 byte)
1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Invalid state
238 (EEh) Time-out Error

If bias tee is turned On (10 bytes)
1) Bias Tee Board Indicator (00h = No Hardware Installed, 01h = Hardware Installed)
2) Bias Tee Current (Highest byte)
3) Bias Tee Current
4) Bias Tee Current
5) Bias Tee Current (Lowest byte)
6) 10 * Bias Tee Voltage (Highest byte) : voltage value is in volt/10
7) 10 * Bias Tee Voltage
8) 10 * Bias Tee Voltage
9) 10 * Bias Tee Voltage (Lowest byte)
10) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error
238 (EEh) Time-out Error

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

***Set Spectrum Analyzer Start/Stop Frequency* – Control Byte #99 (63h)**

Description: Sets the spectrum analyzer start and stop frequencies.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

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)

Spectrum Master Returns: 1 byte

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

***Set Spectrum Analyzer Center Freq./Span* – Control Byte #100 (64h)**

Description: Sets the spectrum analyzer center frequency and span.

If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 8 bytes

1) Center Frequency (Highest byte)
2) Center Frequency
3) Center Frequency
4) Center Frequency (Lowest byte)
5) Frequency Span (Highest byte)
6) Frequency Span
7) Frequency Span
8) Frequency Span (Lowest byte)

Spectrum Master Returns: 1 byte

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

***Set Spectrum Analyzer Scale* – Control Byte #101 (65h)**

Description: Sets the reference level and the number of dB represented by each graph division.

Ref Level will be the "top" scale of the graph, and there are total of 10 division, so bottom scale can be determined by : Ref level + 10 x dB/div.

Bytes to Follow: 8 bytes

1) Ref Level (Highest byte)
2) Ref Level
3) Ref Level
4) Ref Level (lowebyte)
5) dB/div (Highest byte)
6) dB/div
7) dB/div
8) dB/div (Lowest byte)

Spectrum Master Returns: 1 byte

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

Notes:
Ref Level is sent as the (Ref Level * 1000) + 270,000 (0 dBm = 270,000, 20 dBm = 290000, -120 dBm = 150,000)
Scale should be sent as (dBm * 1000) (e.g. -12.34 dBm = -12340)

***Set Spectrum Analyzer Marker* – Control Byte #102 (66h)**

Description: Sets an individual Spectrum Analyzer marker.

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 Status On/Off (01h = On, 00h = Off)
4) Marker Value (Higher byte)
5) Marker Value (Lower byte)

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid marker number, status or position
   238 (EEh) Time Out Error

Note:
Marker Value is between 0 and 400, inclusive: Point = (400 * (marker freq - start freq)) / span

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***Set Spectrum Analyzer Single Limit* – Control Byte #103 (67h)**

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

Bytes to Follow: 6 bytes

1) Limit Number (1 for Spectrum Master)
2) Limit Line On/Off (01h = On, 00h = Off)
3) Beep at Limit On/Off (01h = On, 00h = Off)
4) Limit Value (Highest byte)
5) Limit Value
6) Limit Value
7) Limit Value (Lowest byte)

Spectrum Master Returns: 1 byte

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

Note:
Limit Value is sent as the (Limit Value * 1000) + 270,000 (0 dBm=270,000, 20 dBm=290000, -120 dBm=150,000)

***Set Spectrum Analyzer Peak Hold* – Control Byte #105 (69h)**

Description: Sets the max hold and min hold settings on the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Peak Hold State
   00h – Peak Hold Off
   01h – Max Hold On
   02h – Min Hold On

Spectrum Master Returns: 1 byte

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

***OBSOLETE: Set SPA Resolution Bandwidth* – Control Byte #106 (6Ah)**

This command exists for backward compatibility with the MS2711B. To access new video bandwidths use Control Byte #141 (8Dh).

Description: Sets the resolution BW frequency for the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Resolution Bandwidth Index
   00h – 10 kHz BW
   01h – 30 kHz BW
   02h – 100 kHz BW
   03h – 1 MHz BW

Spectrum Master Returns: 1 byte

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

OBSOLETE: Set Spectrum Analyzer Video Bandwidth – Control Byte #107 (6Bh)

This command exists for backward compatibility with the MS2711B. To access new video bandwidths use Control Byte #142 (8Eh).

Description: Sets the video BW frequency for the Spectrum Analyzer.

Bytes to Follow: 1 byte

1) Video Bandwidth Index
   - 00h – 100 Hz BW
   - 01h – 300 Hz BW
   - 02h – 1 kHz BW
   - 03h – 3 kHz BW
   - 04h – 10 kHz BW
   - 05h – 30 kHz BW
   - 06h – 100 kHz BW
   - 07h – 300 kHz BW

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Sweep Mode – Control Byte #108 (6Ch)

Description: Enables or disables the Single Sweep Mode during Spectrum Analyzer mode of operation.

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

For Single Sweep Mode during Spectrum Master VNA modes of operation see control byte #11 (0Bh).

Bytes to Follow: 1 byte

1) Sweep Mode
   - 00h – Single Sweep
   - 01h – Continuous Sweep
   - 02h – Video Trigger (span must be 0)
   - 03h – External Trigger (span must be 0)

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Marker to Peak – Control Byte #109 (6Dh)

Description: Sets the specified marker to the peak value of the sweep.

Bytes to Follow: 1 byte

1) Marker Number (1-6)

Spectrum Master Returns: 1 byte

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

***Set Spectrum Analyzer Marker to Center* – Control Byte #110 (6Eh)**

Description: Sets the center frequency equal to the frequency of the specified marker.

Bytes to Follow: 1 byte

1) Marker Number (1-4)

Spectrum Master Returns: 1 byte

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

***OBSOLETE: Set Spectrum Analyzer Attenuation* – Control Byte #111 (6Fh)**

This command exists for backward compatibility with the MS2711B. For future development, use Control Byte #143 (8Fh).

Description: Sets the attenuation for the Spectrum Master Spectrum Analyzer mode. Send a value of 255 (FFh) to enable dynamic attenuation.

Automatic control couples the attenuation to the reference level. Note that setting the attenuation using this command automatically sets the attenuation coupling to "MANUAL", thereby allowing it to be defined independently of the reference level.

Bytes to Follow: 1 byte

1) 00h – 0 dB
   01h – 10 dB
   02h – 20 dB
   03h – 30 dB
   04h – 40 dB
   05h – 50 dB
   FFh – Dynamic Attenuation

Spectrum Master Returns: 1 byte

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

***Set Spectrum Analyzer Multiple Limit* – Control Byte #113 (71h)**

Description: Sets the position and On/Off Status of a limit segment.

Multiple limits are defined by multiple limit segments, each with a different finite slope. The single limit is a single, horizontal line that can be defined to act as an upper limit or as a lower limit. See control byte #103 for information about the single limit.

The limit types are mutually exclusive. That is, you cannot have both single and multiple limits at the same time. Note that setting a limit segment ON automatically makes the limit type "MULTIPLE".

One segment is defined each time this command is sent to the Spectrum Master. The first two bytes of the command specify which segment is being defined. There are 5 upper limits and 5 lower limits available in Spectrum Analyzer mode. Byte 1 selects the segment number. Byte 2 specifies whether it is an upper limit or a lower limit. Byte 3 turns the segment ON or OFF. Byte 4 specifies whether the error beep sounds when the bound set by the segment is exceeded by the measured data.

The segment location is defined by its endpoints. The "Start" endpoint must appear to the left of the "End" endpoint on the graph. That is, Start X < End X. If Start X = End X then Start Y must equal End Y. Vertical segments are not allowed.

Bytes to Follow: 20 bytes

1) Segment number (1-5)
2) Segment type (00h = LOWER limit, 01h = UPPER limit)
3) Limit Line On/Off (01h = On, 00h = Off)
4) Limit Beep On/Off (01h = On, 00h = Off)
5) Limit Value Start X [445](Highest byte)
6) Limit Value Start X
7) Limit Value Start X
8) Limit Value Start X (Lowest byte)
9) Limit Value Start Y [446](Highest byte)
10) Limit Value Start Y
11) Limit Value Start Y
12) Limit Value Start Y (Lowest byte)
13) Limit Value End X [447](Highest byte)
14) Limit Value End X
15) Limit Value End X
16) Limit Value End X (Lowest byte)
17) Limit Value End Y [448](Highest byte)
18) Limit Value End Y
19) Limit Value End Y
20) Limit Value End Y (Lowest byte)

Spectrum 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

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[445] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[446] (Value in dBm * 1000) + 270,000
[447] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[448] (Value in dBm * 1000) + 270,000

***Set Return Spectrum Analyzer Sweep Time* – Control Byte #114 (72h)**

Description: If this is enabled, the duration of the current sweep (in milliseconds) will be returned as 4 bytes via the serial port at the end of the sweep. If Serial Echo Status is enabled, the 4 bytes will be returned AFTER the sweep complete byte.

Bytes to Follow: 1 byte

1) Return SPA Sweep Time flag state
   00h = Don't Return Sweep Time
   01h = Return Sweep Time

Spectrum Master Returns: 1 byte

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

***Set Reference Level Offset* – Control Byte #115 (73h)**

Description: Set the value of the reference level offset.

The reference level offset allows the user to view the result of trace math (A+B, A-B) even if it is greater than +20 dBm or less than –120 dBm. The offset is a constant that is subtracted from the reference level.

Note that the valid range is –100 to +100 dB.
Send the value as (value in dB * 1000) + 270,000.
For example, to compensate for a 30 dB attenuator, the reference level offset should be -30 dB. That value would be sent over the serial port as (-30 * 1000) + 270,000 = 240,000.

Bytes to Follow: 4 bytes

1) Reference Level Offset (Highest byte)
2) Reference Level Offset
3) Reference Level Offset
4) Reference Level Offset (Lowest byte)

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Impedance – Control Byte #116 (74h)

Description: Set the impedance and the loss value due to an adapter.

The MS2711D can automatically compensate for the effects of impedance adapters. The impedance of the MS2711D is 50Ω, so there is no need for an adapter in this case. The loss for the Anritsu 75Ω adapter 12N50-75B is known by the MS2711D.

This control byte also allows for the specification of the impedance and the loss due to an adapter the system does not know. In either case, 5 bytes must be sent to the unit. If the impedance is 50Ω or one of the known adapters is specified, bytes 2-5 are ignored. If an unknown adapter is specified, the unit uses bytes 2-5 to correct for the adapter.

Bytes to Follow: 5 bytes

1) Impedance Adapter[449]
2) Impedance Loss[450] (Highest byte)
3) Impedance Loss
4) Impedance Loss
5) Impedance Loss (Lowest byte)

Spectrum Master Returns: 1 byte

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

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[449] Impedance Adapter: 00h = 50 Ω 0Ah = 75Ω, adapter 12N50-75B 0Ch = 75Ω, other adapter offset
[450] Send the loss value as value in dB* 1,000

***Read Marker Value* – Control Byte #117 (75h)**

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

If option 6 is installed and the frequency converter module is attached, the frequency will be scaled by the scale factor of the module. If the module is not attached, the frequency is sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.

Bytes to Follow: 1 byte

1) Marker number (1-6)

Spectrum Master Returns: 8 bytes (1 byte if an error occurs)

1) Frequency (Highest byte)
2) Frequency
3) Frequency
4) Frequency (Lowest byte)
5) Value at Marker (Highest byte)
6) Value at Marker
7) Value at Marker
8) Value at Marker (Lowest byte)

OR

1) 224 (E0h) Parameter Error: Invalid marker number
   238 (EEh) Time-out Error

Note:
Marker value sent as (value in dBm * 1,000) +270,000
If markers are set to be noise markers, convert the returned dBm value to dBm/Hz using this formula (only if detection method is RMS Average):

marker (in dBm/Hz) = marker value (in dBm) - 10 * log10(RBW) - 0.13

***Set Sweep Averaging* – Control Byte #118 (76h)**

Description: Sets the number of sweeps to average. The maximum number is 25. Sending a 1 turns averaging off.

Bytes to Follow: 1 byte

1) Number of sweeps to average (1-25, 1 turns averaging OFF)

Spectrum Master Returns: 1 byte

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

***Normalize SPA* – Control Byte #130 (82h)**

Description: Performs Normalization of SPA graph.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

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

***Set SPA Normalization Status* – Control Byte #131 (83h)**

Description: Turns Normalization ON/OFF

Bytes to Follow: 1 bytes

1) Normalization Status (00h = Off, 01h = On)

Spectrum Master Returns: 1 byte

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

Spectrum Master Returns: 1 byte

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

***Check Spectrum Analyzer External Reference* – Control Byte #134 (86h)**

Description: Checks to see if Spectrum Analyzer external reference is present. If it is, it then checks to see if it is at the correct frequency for PLL locking.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

On Success:

1) 00h – Reference present and at the correct frequency (PLL functioning)
   01h – Reference is not present
   02h – Reference is present, but internal PLL and external frequency do not match up.

OR

On Error:

1) 224 (E0h) Parameter Error – Not in External reference mode
   238 (EEh) Time-out Error.

Set SA Preamp State (On/Off/Auto) – Control Byte #136 (88h)

Description: Sets the state of Spectrum Analyzer preamplifier.

Setting the preamp state to ON or OFF sets the preamp coupling to manual. That is, the preamplifier state is controlled independently of all other parameters.

Setting the preamp state to AUTO couples the preamp state to the reference level and the attenuation. If the attenuation is automatically coupled to the reference level, the preamp will turn on when the reference level is set less than -26 dBm. If the attenuation is manually coupled to the reference level, the preamp will turn on when the value of (attenuation – reference level) >= 51.

Bytes to Follow: 1 byte

1) Mode (00h = Off, 01h = On, 02h = Auto)

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Units – Control Byte #140 (8Ch)

Description: Sets the scale type (logarithmic or linear) and the units.

Linear units can be:
- 01h = Volts
- 02h = Watts

Logarithmic units can be:
- 03h = dBm
- 04h = dBV
- 05h = dBmV
- 06h = dBµV

Bytes to Follow: 2 bytes

1) Scale Type (00h = Linear, 01h = Logarithmic)
2) Units

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Resolution Bandwidth – Control Byte #141 (8Dh)

This command is new to the MS2711D. Use it instead of Control Byte #106 to access the new RBWs.

Description: Sets the resolution BW frequency for the Spectrum Analyzer.

Bytes to Follow: 4 bytes

1) Resolution Bandwidth (frequency in Hz) (Highest byte)
2) Resolution Bandwidth (frequency in Hz)
3) Resolution Bandwidth (frequency in Hz)
4) Resolution Bandwidth (frequency in Hz) (Lowest byte)

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Video Bandwidth – Control Byte #142 (8Eh)

This command is new to the MS2711D. Use it instead of Control Byte #107 to access the new VBWs.

Description: Sets the video BW frequency for the Spectrum Analyzer.

Bytes to Follow: 4 bytes

1) Video Bandwidth (frequency in Hz) (Highest byte)
2) Video Bandwidth (frequency in Hz)
3) Video Bandwidth (frequency in Hz)
4) Video Bandwidth (frequency in Hz) (Lowest byte)

Spectrum Master Returns: 1 byte

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

Set Spectrum Analyzer Attenuation – Control Byte #143 (8Fh)

This command is new to the MS2711D. Use it instead of Control Byte #111 to access the new attenuations.

Description: Sets the attenuation of the Spectrum Analyzer. Send a value of 255 (FFh) to enable dynamic attenuation.

Automatic control couples the attenuation to the reference level. Note that setting the attenuation using this command automatically sets the attenuation coupling to "MANUAL", thereby allowing it to be defined independently of the reference level.

Bytes to Follow: 1 byte

1) Attenuation (0 – 51)

Spectrum Master Returns: 1 byte

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

***Set AM/FM Demodulation* – Control Byte #145 (91h)**

Description: Sets the AM/FM/SSB Demodulation state. This command is also used to set the type of Modulation, volume, Demodulation Frequency, BFO Adjust (SSB only) and the Demodulation time. On turning demodulation ON, after exiting remote, at the end of every sweep, demodulation is performed at the Demodulation frequency for a period of time specified in the Demod Time.

Bytes to Follow: 16 bytes

1) Set AM/FM/SSB Demod On/Off[451]
2) Demodulation Type[452]
3) Speaker Volume (Higher byte)[453]
4) Speaker Volume (Lower byte)
5) Demodulation Time[454] (Highest byte)
6) Demodulation Time
7) Demodulation Time
8) Demodulation Time (Lowest byte)
9) Demodulation Frequency[455] (Highest byte)
10) Demodulation Frequency
11) Demodulation Frequency
12) Demodulation Frequency (Lowest byte)
13) SSB BFO Adjust[456] (Highest byte)
14) SSB BFO Adjust
15) SSB BFO Adjust
16) SSB BFO Adjust (Lowest byte)

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error
   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

Spectrum Master Returns: 1 byte

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

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[451] 00h = Off, 01h = On
[452] 00h = FM Wideband, 01h = FM Narrowband, 02h = AM, 03h = SSB Lower, 04h = SSB Upper
[453] Speaker Volume is from 0 to 100 in steps of 10
[454] Demodulation time in milliseconds from 100 millisec to 500 seconds
[455] If option 6 is installed and the frequency converter module is attached, the frequencies should be scaled by the scale factor of the module. If the module is not attached, the frequencies are sent in Hz. Use Control Word A203 to determine whether a module is attached and the appropriate scale factor.
[456] BFO Valid Values are -10 kHz to +10 kHz. Send value as BFO(in Hz) + 10,000. For Example -10 kHz would be sent as 0, 0 would be sent as 10000 and +10 kHz would be 20000

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

Description: Set the Spectrum Master display language.

Bytes to Follow: 1 byte

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

Spectrum 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 Spectrum Master for the current time in ASCII format.

Bytes to Follow: 0 bytes

Spectrum 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

Spectrum 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 Spectrum 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 = T1/E1 Serial Number

Spectrum Master Returns: 8 bytes
1-8) Serial Number (in ASCII)

***GPS Power* – Control Byte #237 (EDh)**

Description: Turn On/Off power of GPS module.

Bytes to Follow: 1 bytes
Power Switch (1=ON, others=OFF)

Cell 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)**

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

Bytes to Follow: 0 byte
Cell Master Returns: 13 byte (if Ok)
1-2) Number of satellites in use (< 3 if not locked)
3-6) GPS Position – Latitude (long integer)[457] (=-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

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[457] 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

***Automatic Cal Disable* – Control Byte #240 (F1h)**

Description: Disable automatic calibration.

Bytes to Follow: 1 byte
1: to disable automatic calibration
0: to enable automatic calibration

Cell Master Returns: 1 byte
255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error : Invalid Parameter
238 (Eeh) Time-out Error

***Recall Sweep Trace* – Control Byte #243 (F3h)**

Description: This command is similar to another recall sweep trace with control byte #33 (21h). The only thing difference between this command and command #33 (21h) is that this command requires 2 bytes to follow whereas command #33 (21h) requires 1 byte. This makes it possible to recall traces whose indices are bigger than 255, which is not possible with command #33 (21h).

Bytes to Follow: 2 bytes
0 = Last sweep trace before entering remote mode (sweep trace in RAM)
1- 300 = Specific saved sweep number (stored sweeps in Flash memory)

1) Trace index (Lower byte)
2) Trace index (Higher byte)

Cell Master Returns:
Exactly like command #33 (21h), so please refer to that section.

***Exit Remote Mode* – Control Byte #255 (FFh)**

Description: Spectrum Master exits remote mode.

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

You may also press the "ESCAPE" key on the Spectrum Master key pad to exit from remote mode (given that the serial communication is still in sync). In this case, the Spectrum 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

Spectrum Master Returns: 1 byte
1) 255 (FFh) Operation Complete

***Select SPA/Power Meter Signal Standard* – Control Word (A103h)**

Description: Selects a Signal Standard. Use this command for both Spectrum Analyzer and Power Meter modes.

Bytes to Follow: 1 byte

1) Signal Standard – See the section "Signal Standards" for a list of standards and their indices.

Spectrum Master Returns: 1 byte

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

***Select SPA/Power Meter Channel* – Control Word (A104h)**

Description: Selects a channel within the range of the currently selected signal standard. Use this command for both Spectrum Analyzer and Power Meter modes.

See the section "Signal Standards" for a list of valid channels for the selected channel.

Bytes to Follow: 2 bytes

1) Channel (Higher byte)
2) Channel (Lower byte)

Spectrum Master Returns: 1 byte

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

***Read External Module Name* – Control Word (A201h)**

This command is available only with option 6.

Description: Returns the name of the attached frequency converter module (option 6).

For example, module name "FCN4760" will be received as:

c,46,43,4e,34,37,36,30,0,0,0,0,0,ff

Bytes to Follow: 0 bytes

Spectrum Master Returns: 14 bytes (success) OR 1 byte (failure)

1) Length of Name (12)
2-13) Module Name
14) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Module not attached
   238 (EEh) Time Out Error

OR

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Module not attached
   238 (EEh) Time Out Error

***Read External Module Serial Number* – Control Word (A202h)**

This command is available only with option 6.

Description: Sets the serial number of the attached frequency converter module (option 6).

For example, serial number 12345678 will be received as:
8,1,2,3,4,5,6,7,8,ff

Bytes to Follow: 0 bytes

Spectrum Master Returns: 10 bytes
1) Length of Serial Number (8)
2-9) Serial Number
10) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

OR

1) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

***Read External Module Frequency Range* – Control Word (A203h)**

This command is available only with option 6.

Description: Sets the frequency range of the attached frequency converter module (option 6). Frequency values are scaled by the scale factor value.

For example, the frequency range of the FCN4760 is as follows:
Scale factor: 10
Input Start Frequency: 4700 MHz (scaled, this number is 470 MHz)
Input End Frequency: 6000 MHz (scaled, this number is 600 MHz)
Output Start Frequency: 450 MHz (scaled, this number is 45 MHz)
Output End Frequency: 1750 MHz (scaled, this number is 600 MHz)
So the response will look like:
12,0,a,1c,3,a1,80,23,c3,46,0,2,ae,a5,40,a,6e,49,c0,ff

Bytes to Follow: 0 bytes

Spectrum Master Returns: 20 bytes (success) OR 1 byte (failure)
1) Length of Frequency Data (18)
2-3) Scale Factor (in Hz)
4-7) Input Start Frequency (scaled by Scale Factor)
8-11) Input End Frequency (scaled by Scale Factor)
12-15) Output Start Frequency (scaled by Scale Factor)
16-19) Output End Frequency (scaled by Scale Factor)
20) 255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

OR

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Read Module Fail Counter – Control Word (A204h)

This command is available only with option 6.

Description: Returns the value of the module lock fail counter.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 3 bytes (success) OR 1 byte (failure)

1) Fail Counter (Higher byte)
2) Fail Counter (Lower byte)
3) 255 (FFh) Operation Complete Byte

OR

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Module not attached
   238 (EEh) Time Out Error

Clear Module Fail Counter – Control Word (A205h)

This command is available only with option 6.

Description: Sets the module lock fail counter to 0.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Module not attached
   238 (EEh) Time Out Error

Perform Transmission Mode Calibration – Control Word (A301h)

This command is available only with option 21.

Description: Perform Transmission Mode Calibration.

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

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

Turn OFF Transmission Mode Calibration – Control Word (A302h)

This command is available only with option 21.

Description: Turn OFF Transmission Mode Calibration

Bytes to Follow: 0 bytes

Spectrum Master Returns: 1 byte

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

Get Signal Standard Name – Control Word (A501h)

Description: Get the ASCII signal standard corresponding to a specified Index. This command can be used in any measurement mode.
Bytes to follow: 2

1) Index (Highest Byte)
2) Index (Lowest Byte)

Cell Master Returns: 20 bytes

1 – 20) Standard Name in ASCII

Perform Noise Diode Cal – Control Word (A505h)

Description: Performs noise diode calibration on SPA board
Bytes to follow: 0

Cell Master Returns: 1 byte

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

Set Bias T Voltage – Control Word (A506h)

Description: Motherboards beginning with 64968 have a programmable Bias T. This command sets the Bias T voltage between 12 and 24 volts.
Bytes to follow: 1

1) Bias T Voltage

Cell Master Returns: 1 byte

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

Select Function in IA Measurement Mode – Control Word (A700h)

This command is available only with option 25.

Description: Selects measurement function in Interference Analysis mode.

Bytes to Follow: 1 bytes

1) Function ID (0:Spectrum; 1:Spectrogram; 2: Signal strength; 3: RSSI; 4: Signal ID)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Set Sweep Interval – Control Word (A721h)

This command is available only with option 25.

Description: Sets the sweep interval in spectrogram mode.

Bytes to Follow: 2 bytes

a. Sweep interval in seconds (MSB)
b. Sweep interval in seconds (LSB)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Set Time Span of Measurement – Control Word (A722h)

This command is available only with option 25.

Description: Sets the time span of spectrogram measurement. Maximum time span is 72 hours (4320 minutes) when "Auto Save" is turned on. Minimum time span is 0 which means the fastest sweep time of current setting is used.

Bytes to Follow: 2 bytes

1) Time span in minutes (MSB)
2) Time span in minutes (LSB)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Turn On/Off Auto Save – Control Word (A723h)

This command is available only with option 25.

Description: Turns On or Off Auto Save switch of spectrogram mode. When Auto Save is turned on, the first 5 screens of records are saved automatically into 5 memory slots. Once all 5 memory slots have been occupied, Auto Save is going to be turned off.

Bytes to Follow: 1 bytes

On/Off Switch (0:Off; 1:On)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte
224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Get Trace Name – Control Word (A724h)

This command is available only with option 25.

Description: Get the Trace names saved in five spectrogram memory slots. The name is composed with Time & Date when the trace is saved. If the memory slot is empty, the date field is set with "--/--/----" and the time field is set with "--:--:--".

Bytes to Follow: 0 bytes

Cell Master Returns:

When control word is received correctly: 101 bytes

1-2) Index of trace (from 0 to 4)
3-12) Date of save in ASCII string, format: "--/--/----"
13-20) Time of save in ASCII string, format: "--:--:--"
21-100) Repeat the information of 1) to 20) four times
101) FFh

When error occurs: 1 byte

224 (E0h) Parameter Error: Module not attached
238 (EEh) Time Out Error

Spectrogram: Recall Trace – Control Word (A725h)

This command is available only with option 25.

Description: Recall a spectrogram trace by sending the trace index (0-4) of the memory slots.

Bytes to Follow: 1 bytes

1) Index of memory slots (0-4)

Cell Master Returns:

When control word is received correctly: 32448 bytes

1-10)	Date of save (ASCII, format: "--/--/----")
11-18)	Time of save (ASCII , format: "--:--:--")
19-22)	Center Frequency (Integer – MSB to LSB)
23-26)	Span (Integer – MSB to LSB)
27-30)	RBW (Integer – MSB to LSB)
31-34)	VBW (Integer – MSB to LSB)
35-38)	Reference level (Integer – MSB to LSB)
39-42)	Scale (Integer – MSB to LSB)
43-46)	Time Span (Integer – MSB to LSB)
47-48)	Sweep Interval (Integer – MSB to LSB)
49-52)	GPS Position – Latitude (long integer)[458]
53-56)	GPS Position – Longitude (long integer)
57-58)	GPS Position – Altitude (short integer)
59-32458)	80 records of spectrogram data. Each record has the following format:

1-401) Color indices of 401 sweep data points, The formula of color index is as following:

Color Index = (Ref Level - SaMeasData) * 255 / (Division * 10)

402-405) Time Stamp of the record being generated.

Status byte: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error: Module not attached

238 (EEh) Time Out Error

Set Frequency in CW GENERATOR MODE - CODE WORD(A801h)

Description: This command tells the Cell Master to set its frequency to the specified value.

Bytes to Follow: 4 bytes

1) Frequency value Byte[3]
2) Frequency value Byte[2]
3) Frequency value Byte[1]
4) Frequency value Byte[0]

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error: Invalid frequency point

238 (EEh) Time Out Error

---

[458] 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

Retrieve Power in CW GENERATOR MODE - CODE WORD(A802h)

Description: This command tells the Cell Master to return the power value in dBM. The value returned will be an unsigned. The values under -0 dB will be made positive and multiplied by 1000. e.g. -73.12dBm will become 731200

Bytes to Follow: 0 bytes

Cell Master Returns: 5 bytes

1.) highest byte of the power value
2.) second byte of the power value
3.) third byte of the power value
4.) lowest byte of the power value
5.) 255 (FFh) Operation Complete Byte

Remote Self Test – Control Word (AA15h)

Description: Trigger the equivalent of a "key press" selftest.

Note: The response bytes will not all be returned immediately. The first 12 will be returned, then there will be a slight delay before the next 14 are returned, then a final delay while the T1/E1 selftest is performed and the final 12 bytes are returned.

Bytes to Follow: 0 bytes

Spectrum Master Returns:

No Options or Option 10 and/or Option 29: 22 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) Reserved
8) Reserved
9) Reserved
10) Reserved
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
20) SPA LO Test - Failed data point #
21) SPA LO Test - Failed LO #
22) End of Data (FFh)

Option 21 (+ Option 10 and/or Option 29): 28 bytes

1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)

7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)
21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
26) SPA LO Test - Failed data point #
27) SPA LO Test - Failed LO #
28) End of Data (FFh)

Option 6 (+ Option 10 and/or Option 29): 27 bytes
1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)
3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) Reserved
8) Reserved
9) Reserved
10) Reserved
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
20) SPA LO Test - Failed data point #
21) SPA LO Test - Failed LO #
22) Module PLD Version
23) Module Attached
24) Module Lock (01h = Locked, 00h = Not Locked)
25) Module Lock Fail Counter (Higher byte)
26) Module Lock Fail Counter (Lower byte)
27) End of Data (FFh)

Option 6 + Option 21 (+ Option 10 and/or Option 29): 33 bytes
1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Higher byte)
2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 ^{o}C) (Lower byte)

3) Memory Check (01h: Pass, 00h: Fail)
4) RTC Voltage Check (01h: Pass, 00h: Fail)
5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Higher byte)
6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (Lower byte)
7) VNA Lock Failure Counter (Higher byte)
8) VNA Lock Failure Counter (Lower byte)
9) VNA Integrator Failure Counter (Higher byte)
10) VNA Integrator Failure Counter (Lower byte)
11) SPA LO Failure Counter (Higher byte)
12) SPA LO Failure Counter (Lower byte)
13) H/W Config - Mother Board ID
14) H/W Config - SPA Board ID
15) H/W Config - T1E1 Board ID
16) H/W Config - PLD1 ID
17) H/W Config - PLD2 ID
18) H/W Config – T1E1 COLD ID
19) VNA PLL Lock Failure Test - Status (01h: Pass, 00h: Fail)
20) VNA PLL Lock Failure Test - Failed data point # (Ignore this byte if the Lock Fail Test Status was Pass)
21) VNA PLL Lock Failure Test - Failed PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
22) VNA Integration Test - Status (01h: Pass, 00h: Fail)
23) VNA Integration Test - Failed data point # (Ignore this byte if the Integration Test Status was Pass)
24) VNA Integration Test - Reserved
25) SPA LO Test - Status (01h: Pass, 00h: Fail, FFh: SPA board not installed)
26) SPA LO Test - Failed data point #
27) SPA LO Test - Failed LO #
28) Module PLD Version
29) Module Attached
30) Module Lock (01h = Locked, 00h = Not Locked)
31) Module Lock Fail Counter (Higher byte)
32) Module Lock Fail Counter (Lower byte)
33) End of Data (FFh)

Trigger Sweep – Control Word (AA30h)

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

This command works only when the Spectrum 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.

Note: The "Sweep Complete Byte" is not returned unless serial echo status is turned on using command #10.

Bytes to Follow: 0 bytes

Spectrum 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)

Parameter Definitions

Parameter	# of bytes	Step	Example / Description
Frequency	**4 bytes unsigned**	**1 Hz**	**1000.3 MHz = 1000300000**
Scale (RL, CL)	**2 bytes unsigned**	**1 / 1000 dB**	**51.3 dB = 51300**
(SWR)	**2 bytes unsigned**	**1 / 1000 (ratio)**	**65.53 = 65530**
Limit (RL, CL)	**2 bytes unsigned**	**1 / 1000 dB**	**51.3 dB = 51300**
(SWR)	**2 bytes unsigned**	**1 / 1000 (ratio)**	**65.53 = 65530**
Markers (Frequency & distance marker)	**2 bytes unsigned**	**1 sweep point**	**Marker Values are given in relative position of the graph. The lowest value is 0, while the highest is (# of data points - 1).**
Distan–e	**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 com Port, enter and exit remote mode, and set the reference level of the spectrum analyzer.

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 SetSPAScale(unsigned long ReferenceLevel,        */
/*                        unsigned long dBScale, BYTE *ResponseBytes)  */
/*    Description: This function implements control byte #101, Set   */
/*                 Spectrum Analyzer Scale.  It sets the spectrum    */
/*                 analyzer reference level and scale (dB/div).      */
/*    Inputs :     RefLevel = reference level value                  */
/*                 dBScale = 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 SetSPAScale(unsigned long RefLevel,
                          unsigned long dBScale, BYTE *ResponseBytes)
{
      BYTE  *SendScalePointer;      // Data to send
      BYTE  SendBytes[9];
      BYTE  SerialCommand;


      // Serial Command to Set Scale on the SPA.
      SerialCommand = 101;

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

      // First byte to send is the serial command, #101.
      SendBytes[0] = SerialCommand;

      // Convert the reference level and scale into 8 bytes
      // (4 bytes each) for the SPA.  Put the bytes in the
      // SendBytes variable, starting with byte 1 (leave byte 0
      // as the command byte).
      Get8Bytes(RefLevel, Scale, &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;
            }
```

```
	}
} /* SetSPAScale */


/*****************************************************************/
/*    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 -
            BOO- SetCommTimeouts(
              HANDLE hFile,                  // handle to comm dev omm.
LPCOMMTIMEOUTS lpCommTimeouts  /* pointer to comm tim omm.t 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 Succesfully"
    ElseIf Asc(strInputBuf) = 238 Then
        MsgBox "SiteMaster Timed out"
        GoTo SetSMBaud_err_handler

    ElseIf Asc(strInputBuf) = 224 Then
        MsgBox "Invalid Baud Rate - ERR 22-"
        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

Rev.	Date	Description	By
1.0	9/1/03	Initial revision based on Spectrum Master Internal Programming Manual.doc rev 1.36.	Jennifer Burns
1.01	9/3/03	Completed conversion to MS2711D document. Left commands for option 21, 29 and 50. Still needs AM/FM demod and normalization commands.	Jennifer Burns
1.02	9/3/03	Added Control Word A216 – Set module cal points.	Jennifer Burns
1.03	9/3/03	Copied normalization and AM/FM demod commands from Cell Master doc.	Jennifer Burns
1.04	9/9/03	Added Transmission mode to Set Model/Option command.	Jennifer Burns
1.05	9/12/03	Changed S21 to Transmission	Calvin Carter
1.06	9/16/03	Fixed case of TRANSMISSION throughout the document.	Jennifer Burns
1.07	9/18/03	Added frequency range min and max to #29, #33 and #36.	Jennifer Burns
1.08	9/19/03	Added commands to read and clear module fail counter.	Jennifer Burns
1.09	9/24/03	Changes to signal standards. Added Programming Examples. Miscellaneous changes based on S33xD PM editing.	Jennifer Burns
1.10	10/1/03	Added info to commands that require box to be unlocked before executing.	Jennifer Burns
1.11	10/8/03	Added error for module/SPA cal freq mismatch to #104.	Jennifer Burns
1.12	10/9/03	Changed 139 to catch more attenuator failures earlier in production	Derek Truesdale
1.13	10/10/03	Added C/I data to #33 and #36.	Jennifer Burns
1.14	10/17/03	Remote Selftest 0xAA15 is no longer an internal command. Added option 6 results.	Jennifer Burns

1.15	10/21/03	Added ADC_OTR_ERROR to #104, changed error numbering for MODULE_FREQUENCY_ERROR.	Jennifer Burns
1.16	10/21/03	Added OBW status bit to #29, #33 and #36.	Jennifer Burns
1.17	10/27/03	Added reference to frequency scale factor and option 6 in appropriate commands. Added scale factor and frequency range min/max to power meter versions of #33, #36 and #29.	Jennifer Burns
1.18	10/27/03	Added "End of Data" to Option 6 Remote Selftest (AA15h).	Jennifer Burns
1.19	10/31/03	Added frequency scale factor to command #82 and #83 (write/recall antenna). Added freq mismatch error to #19. Added FEh as possible argument to #19 to recall the current mode's defaults only.	Jennifer Burns
1.20	11/11/03	Added command #116 – Set SPA Impedance.	Jennifer Burns
1.21	11/11/03	Fixed numbering in AA15h (Remote Selftest).	Jennifer Burns
1.22	11/13/03	Added operation complete byte to A204.	Jennifer Burns
1.23	11/20/03	Added OCC BW measured power in SPA for Control Byte #33	Vaidya Venugopal
1.24	11/24/03	Added Set One External Module Cal Point (A217).	Jennifer Burns
1.25	12/3/03	Cleanup during review for tech pubs.	Jennifer Burns
1.26	12/10/03	Added T1/E1 COLD ID to command AA15.	Jennifer Burns
1.27	1/15/04	Added Download Setup, Upload Setup, Read Parameter Limits and Query Saved Setups.	Jennifer Burns
1.28	1/16/04	Added ability to get a list of available RBWs and VBWs from Read Parameter Limits (#67). Added channel power and ACPR parameters to SPA portion of #67.	Jennifer Burns

1.29	1/20/04	Fixed numbering on #65. Added marker type to #29, 33, 36, 65 and 66. Added zero status and zero value to #29, 65 and 66. Added channel power, ACPR and IA parameters to #65 and 66. Added external reference frequency status, view b status, IA status and C/I status to #65 and 66.	Jennifer Burns
1.30	1/22/04	Both log and linear units must be sent and received, regardless of which scale type is selected (#65 and 66). This required moving the bit that represents the external reference frequency status. Added trace B id to #65 and 66. Added format of PM offset to #65 and 66.	Jennifer Burns
1.31	1/23/04	Added Write Protect Setup #71.	Jennifer Burns
1.32	2/4/04	Merge changes from S33xD PM: Add T1E1 Read Frequency, Set T1E1 Frequency Cal, and Read T1E1 Frequency Cal commands (A017, A018, A019). Added Set Filter Linearity Cal Values – Control Word (BB01h). Add T1/E1 Vpp, dBdsx and Frequency to commands 33 and 36. Added Appendix A : BSL Serial Commands. Added DMB to SPA signal standard table. Added #72 Clear Setup Memory Locations	Jennifer Burns
1.33	2/23/04	Added noise marker conversion to #117.	Jennifer Burns
1.34	2/26/04	Fixed numbering on AA15h.	Jennifer Burns
1.35	3/5/04	Modifications to #67 (Parameter Limits).	Jennifer Burns
1.36	3/11/04	Removed default setup from #65. Need unproven. Added attributes, cal status to #68 (query saved setups).	Jennifer Burns
1.37	3/18/04	Added error to ref level cal #104	Derek Truesdale
1.38	3/19/04	Fixed impedance adapter indices in #29, #33 and #36.	Jennifer Burns

1.39	4/9/04	Added limit beep output to #29, #65 and #66. This is a “special” option so these bytes should not ship in standard documentation.	Jennifer Burns
1.40	4/21/04	Added #49 – Sweep Data Echo.	Jennifer Burns
1.41	6/23/04	In #86 and #88, channel power values are scaled by 100, not 1000.	Jennifer Burns
1.42	7/16/04	Fixed secret key in #219 (debug mode).	Jennifer Burns
1.44	1/22/07	Updated various areas of the document in attempt to bring it up to date from the last release.	Maximilian Maung
1.45	5/8/2007	Added new measurement modes in command byte #3 (03h).	Maximilian Maung
1.45	5/8/2007	Added new data information fields in command byte #29 (1Dh).	Maximilian Maung
1.45	5/8/2007	Updated command byte #33 (21h) and #36 (24h) to reflect new data fields available for each measurement mode.	Maximilian Maung
1.45	5/8/2007	Updated command byte #37 (25h) for the maximum string the instrument can return.	Maximilian Maung
1.45	5/8/2007	Added new command byte #89 (59h), #90 (5Ah), #91 (5Bh), #92 (5Ch), #237 (EDh), #238 (EEh), #240 (F1h), and #243 (F3h).	Maximilian Maung
1.45	5/8/2007	Added new command word A501h, A505h, A506h, A700h, A721h, A722h, A723h, A724h, A725h, A801h, and A802h.	Maximilian Maung