

Anritsu

MS2711B
Hand-Held
Spectrum Analyzer

Programming Manual



**Hand-Held Spectrum Analyzer, for Measuring,
Monitoring and Analyzing Signal Environments**

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Programming Overview

NOTE: This programming manual is written exclusively for the Anritsu Model MS2711B with firmware version 2.00 or higher. For information on firmware upgrades, contact your local Anritsu Service Center. Commands listed in this manual for the Anritsu MS2711B are not all backward-compatible with the MS2711, MS2711A or Anritsu Site Master models.

General Description

The MS2711B has three modes of operation: single-sweep, continuous-sweep and remote mode. Single-sweep and continuous-sweep modes are selected by pressing the **SINGLE/CONT** front panel key. In single-sweep mode, the unit completes one sweep and then halts, waiting for the command to continue. During this hold time, the unit goes into a power saving mode to conserve battery life. In continuous-sweep mode, the unit sweeps without halting.

A serial command sent to the MS2711B serial port while the unit is in single- or continuous-sweep mode causes the MS2711B to enter remote mode. In remote mode, the MS2711B stops sweeping entirely and attends to the serial port. The MS2711B indicates remote mode by displaying the word REMOTE on the front panel display.

Once in remote mode, control bytes and associated data can be sent to the MS2711B to command the unit to perform various functions and activities. The MS2711B responds with data or feedback as necessary. Remote mode supports all features accessible from the keypad except the printer, which requires connection to the same 9-pin connector on the MS2711B connector panel.

Remote mode can be exited by pressing the **ESCAPE/CLEAR** front panel key or by sending the Exit Remote control byte #255 (0xFF) command. When the remote session is terminated, the MS2711B resumes normal operation in the same sweep mode it was in before entering remote mode.

Interface Cable Installation

The MS2711B is a DTE-type serial device. Communication between the MS2711B and a PC is accomplished over a null modem serial cable provided with the MS2711B (Anritsu part number 800-441). Connect the cable to the Serial Interface connector on the MS2711B Test Connector Panel and to the appropriate COM port connector on the PC.

Serial Communication Parameters

The MS2711B begins communication at 9600 bps when first powered on. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used. The Set Baud Rate Control Byte #197 (0xC5) serial command can be used to change the baud rate to 19,200, 38,400, 56,000 or 115,200. An invalid setting returns the rate to 9600.

Communications Error Checking

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. Use the expected number of response bytes (listed in the control byte description section of this manual) when waiting for feedback from the MS2711B. For data streams going to the MS2711B, 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 MS2711B validates input parameters for each control byte sequence. If the input parameters are out of range or invalid, the MS2711B notifies the computer by sending Parameter Error Byte #224 (0xE0). The MS2711B discards the received data and waits for the next control byte.

Entering Remote Mode

Send the Enter Remote Mode Byte #69 (0x45) to the MS2711B to enter remote mode at the end of the current sweep. Send the Enter Remote Mode Immediately byte #70 (0x46) to enter remote mode in the middle of a sweep.

The MS2711B's serial port buffer is one byte wide. No internal buffer exists, so waiting for the response from the unit is essential. If the MS2711B is not in remote mode, sending a second byte overwrites the original byte commanding it to enter remote mode. If control byte #69 is sent, the MS2711B will enter remote mode at the end of the current sweep. If control byte #70 is sent, the unit will enter remote mode as soon as it receives the byte. This means that data stored for the current sweep may be incomplete. Once a response string is received from the MS2711B, the unit is ready to accept additional control bytes.

Exiting Remote Mode

To exit remote mode, send the Exit Remote Control byte #255 (0xFF) to the MS2711B. The MS2711B sends a response byte of 255 (0xFF) then exits remote mode. Remote mode can also be exited by pressing the **ES-CAPE/CLEAR** front panel key.

Remote Mode Changes to MS2711B Operating Parameters

System parameters changed during remote mode remain changed for normal operation after the unit exits remote mode. However, the changes are not automatically written to the non-volatile EEPROM. Turning off the MS2711B power erases the changed settings.

To retain the changes, the setup must be saved to one of the setup memory locations. Use either the run-time setup location 0, (which holds the power-on defaults) or one of the nine other setup locations. Control byte #64 (0x40) sets the auto-save flag which commands the MS2711B to automatically save the changes to the run-time setup location upon exiting remote mode. See the MS2711B User's Guide or information in this manual on control byte #18 (0x12) for further details.

Write Cycle Limitation of EEPROM

The EEPROM, used to store calibrations, setups and traces has a guaranteed lifetime of at least 100,000 write cycles and an unlimited number of read cycles. The write cycle limitation is for a specific location. For example, setup #1 can be stored 100,000 times and setup #2 can be stored 100,000 times, etc. Because of this, the MS2711B does not automatically store the changed system parameters to the EEPROM. Be aware of the EEPROM write cycle limitation when programming the MS2711B and keep the number of write cycles to a minimum.

Documentation Conventions

Throughout this manual, the following conventions will be observed:

Numeric Representation

Hexadecimal numbers are represented with the prefix 0x. For example, the decimal number 255 is represented in hexadecimal as 0xFF.

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 Summary

Control Byte #	Name	Description	WD Timer?
1 (0x01)	Setup System	Sets system status flags and switches	Yes
3 (0x03)	Select Measurement Mode	Sets measurement mode	Yes
7 (0x07)	Read Time/Date	Reads time and date from the real time clock	—
8 (0x08)	Set Time/Date	Sets the real time clock time and date	Yes
9 (0x09)	Set Reference Number	Sets reference number for a sweep trace	Yes
10 (0x0A)	Serial Port Echo On/Off	Allows synchronization of the Spectrum Analyzer and request from computer for sweep trace	Yes
12 (0x0C)	Watch-dog Timer On/Off	Enable or disable the watch-dog timer	—
16 (0x10)	Store Sweep Trace	Save current trace data to EEPROM	Yes
17 (0x11)	Recall Sweep Trace	Queries the MS2711B for sweep trace data	Yes
18 (0x12)	Save System Setup	Save current system setup parameters to EEPROM	Yes
19 (0x13)	Recall System Setup	Recall system setup parameters from EEPROM	Yes
20 (0x14)	Query System Status	Queries the MS2711B for current system settings	—
21 (0x15)	Trigger Self-Test	Triggers a self-test	—
24 (0x18)	Query Trace Names	Returns list of all saved traces	—
25 (0x19)	Delete Sweep Trace	Delete single or all stored sweep traces	Yes
26 (0x1A)	Upload Sweep Trace	Uploads a sweep trace to the MS2711B	Yes
27 (0x1B)	Query Sweep Memory	Queries percentage of memory available for trace storage	—
30 (0x1E)	Select Printer Type	Select printer type	Yes
34 (0x22)	Set A/B Trace	Set up A and B trace definitions	Yes
37 (0x25)	Get Options	Queries the options installed and returns a list as an ASCII string.	—
39 (0x27)	Query Power Level	Return Power Level at Detector Port	—
40 (0x28)	Set Power Monitor Units	Set Power Monitor display units	Yes
41 (0x29)	Set Relative Mode	Enable or disable Power Monitor Relative Mode	Yes
42 (0x2A)	Set Offset Mode	Enable or disable Power Monitor Offset Mode	Yes
43 (0x2B)	Set Zero Mode	Enable or disable Power Monitor Zeroing Mode	Yes
48 (0x30)	Trigger Sweep	Starts the next sweep	—
50 (0x32)	Check Battery Status	Return smart battery status	—
64 (0x40)	Auto Save Runtime Setup	Automatically save the runtime setup when exiting remote mode	—
69 (0x45)	Enter Remote Mode	Enters remote mode at the end of the sweep and returns model number and firmware version	—

Control Byte #	Name	Description	WD Timer?
70 (0x46)	Enter Remote Mode Immediately	Enters remote mode immediately and returns the model number and firmware version	—
82 (0x52)	Write Antenna	Receives an Antenna via the serial port	Yes
83 (0x53)	Recall Antenna	Sends an Antenna via the serial port	Yes
84 (0x54)	Set Field Strength Measurement	Enables/disables and defines the field strength measurement	Yes
85 (0x55)	Set Channel Power	Enables/disables and defines the channel power measurement	Yes
86 (0x56)	Read Channel Power	Returns the result of the channel power measurement	Yes
87 (0x57)	Set Adjacent Channel Power Ratio	Enables/disables and defines the adjacent channel power measurement	Yes
88 (0x58)	Read Adjacent Channel Power Ratio	Returns the result of the adjacent channel power measurement	Yes
96 (0x60)	Measure OCC BW % of Power	Measure OCC BW with % of Power method	Yes
97 (0x61)	Measure OCC BW dB Down	Measure OCC BW with dB down method	Yes
99 (0x63)	Set Frequency	Sets the frequency range	Yes
100 (0x64)	Set Center Freq./Span	Sets the center frequency and frequency span	Yes
101 (0x65)	Set Scale	Sets the graph boundaries	Yes
102 (0x66)	Set Marker	Sets an individual marker	Yes
103 (0x67)	Set Single Limit	Set position and on/off status of the single limit line	Yes
105 (0x69)	Set Max Hold	Enable or disable Max Hold	Yes
106 (0x6A)	Set Resolution Bandwidth	Sets the resolution bandwidth	Yes
107 (0x6B)	Set Video Bandwidth	Sets the video bandwidth	Yes
108 (0x6C)	Set Sweep Mode	Sets the sweep mode	Yes
109 (0x6D)	Set Marker to Peak	Sets specified marker to peak measurement	Yes
110 (0x6E)	Set Marker to Center	Sets the specified marker to the center frequency	Yes
111 (0x6F)	Set Attenuation	Sets the attenuation for the Spectrum Analyzer	Yes
112 (0x70)	Set AM/FM Demodulation	Sets the AM/FM demodulation state, type, and volume	Yes
113 (0x71)	Set Multiple Limit	Sets the position and status of a limit segment	Yes
114 (0x72)	Set Return Sweep Time	Enables/disables returning the current sweep time	Yes
115 (0x73)	Set Reference Level Offset	Set the value of the reference level offset.	Yes
116 (0x74)	Set Impedance	Set the impedance and the loss value due to an adapter.	Yes
117 (0x75)	Read Marker Value	Return the frequency location and value of the specified marker.	Yes

Control Byte #	Name	Description	WD Timer?
118 (0x76)	Set Sweep Averaging	Sets the number of sweeps to average	Yes
128 (0x80)	Set Preamp	Sets preamplifier parameters	Yes
130 (0x82)	Normalize	Uses current sweep data as normalization data	—
131 (0x83)	Set Normalization On/Off	Enables/disables a current normalization	Yes
151 (0x97)	Set TG Frequency Offset	Set the TG frequency offset value.	Yes
152 (0x98)	Set TG Output Power Level	Set the TG output power level value in increments of 0.1 dB	Yes
197 (0xC5)	Set Baud Rate	Set baud rate for communications between the MS2711B and the PC	Yes
221 (0xDD)	Read Main Serial Number	Returns the MS2711B serial number	—
225 (0xE1)	Read ASCII Serial Number	Returns the MS2711B serial number in ASCII	—
253 (0xFD)	Reset Serial Port	Clears the serial input buffer and prepares the MS2711B to process a new command	—
255 (0xFF)	Exit remote mode	End serial communications	—

Control Byte Descriptions

Setup System - Control Byte #1 (0x01)

Description: Sets system status flags and switches. The current value of the flags can be obtained by executing command #20, Query System Setup, and parsing the values from the appropriate bytes. The MS2711B 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 #20 (0x14) response bytes 267 and 271 for current MS2711B configuration.

Bit #	Value	Current State	Description
0	RBW Coupling	Control byte #20, response byte 271, bit 2	Auto = adjust RBW as span is adjusted Manual = RBW is set independently of span (use command #106)
1	VBW Coupling	Control byte #20, response byte 271, bit 3	Auto = adjust VBW as RBW is adjusted Manual = VBW is set independently of RBW (use command #107)
2	LCD Backlight Status	Control byte #20, response byte 267, bit 7	Turn backlight ON or OFF.
3-4	Amplitude Units	Control byte #20, response byte 267, bits 3-4	Units in which power levels are displayed (dBm, dBV, dBmV, dB μ V)
5-6	Detection Algorithm	Control byte #20, response byte 267, bits 5-6	How the measured value for a given display point is calculated. Positive Peak: the value is the maximum of all measured values at the frequencies associated with the display point Average: the value is the arithmetic mean of all measured values at associated frequencies Negative Peak: the value is the minimum of all measured values at associated frequencies.
7	Attenuation Coupling	Control byte #20, response byte 271, bit 4	Auto = adjust attenuation as reference level is adjusted Manual = attenuation is set independently of reference level (use command #111)

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 = Amplitude units (00b = dBm 01b = dBV 10b = dBmV 11b = dB μ V)

bits 5-6 = Detection algorithm (00b = pos peak 01b = average 10b = neg peak)

bit 7 = Attenuation Coupling (to ref level) (1b = auto 0b = manual)

MS2711B Returns: 1 byte

255 (0xFF) Operation Complete Byte

238 (0xEE) Time-out Error

Select Measurement Mode - Control Byte #3 (0x03)

Description: Sets measurement mode of the MS2711B.

Note that Tracking Generator and Tracking Generator – Fast Tune Modes are available only with option 20.

See control byte #20 response byte 1 for current MS2711B mode.

Bytes to Follow: 1 byte

- 1) Measurement Mode
 - 0x30 : Spectrum Analyzer Mode
 - 0x40 : Power Monitor Mode
 - 0x60 : Tracking Generator Mode
 - 0x61 : Tracking Generator – Fast Tune Mode

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid Measurement Mode
- 238 (0xEE) Time-out Error

Read Time/Date - Control Byte #7 (0x07)

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

MS2711B Returns: 7 bytes

- 1) Hour
- 2) Minute
- 3) Month
- 4) Day
- 5) Year (Higher Byte)
- 6) Year (Lower Byte)
- 7) Daylight Saving ON/OFF (0x01 = ON 0x00 = OFF)

Set Time/Date - Control Byte #8 (0x08)

Description: Sets the real time clock time and date.

This Time/Date is stamped into all stored sweeps (for users' reference). Current time and date can be found by using control byte #7.

Bytes to Follow: 7 bytes

- 1) Hour
- 2) Minute
- 3) Month
- 4) Day
- 5) Year (Higher Byte)
- 6) Year (Lower Byte)
- 7) Daylight Saving ON/OFF (0x01 = ON 0x00 = OFF)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
238 (0xEE) Time-out Error

Set Reference Number- Control Byte #9 (0x09)

Description: The reference number is also known as the trace name. It is any combination of 16 letters, numbers, spaces 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

- 1-16) Reference number/trace name (ASCII text string)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
238 (0xEE) Time-out Error

Serial Port Echo On/Off - Control Byte #10 (0x0A)

Description: Sets the serial port echo ON/OFF. This activates once the MS2711B exits from the remote mode.

When Serial Port Echo is ON, the unit is in single-sweep mode. At the end of every sweep a Sweep Complete Byte (control byte #192) is sent. The unit performs another sweep when it receives a Sweep Trigger Byte (control byte #48).

Serial Port Echo status can't be saved to nor recalled from a setup. It must be re-set after the unit is power-cycled. The default value is OFF.

Serial Port Echo allows run-time handshaking between the MS2711B and the computer in the following sequence:

1. Enter remote mode. Set Serial Port Echo ON. Exit remote mode.
2. The MS2711B sweeps once and then sends the Sweep Complete Byte.
3. When the Sweep Complete Byte is received, enter remote mode.
4. Recall sweep 0 (last sweep trace in RAM).
5. Exit remote mode.
6. Send Sweep Triggering Byte #48 and wait for the next sweep cycle.
7. Repeat steps 2-6.

Bytes to Follow: 1 byte

- 1) Serial Port Echo Status
0x00: OFF
0x01: ON

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid serial port echo status
238 (0xEE) Time-out Error

Watch-dog Timer On/Off - Control Byte #12 (0x0C)

Description: Enables or disables the Watch-Dog timer.

The MS2711B incorporates a Watch-Dog Timer for higher reliability in serial communication. In selected control bytes (see Control Byte Summary), the MS2711B checks for the time interval between each byte received from the computer, if the Watch-Dog is enabled. If the time interval exceeds the set time limit (0.5 sec), the MS2711B notifies the computer by sending Time-out Byte #238 (0xEE). The MS2711B discards the data it just received and then waits for the next control byte sequence.

This setting cannot be saved to nor recalled from a setup. It must be re-set after the unit is power-cycled. The default value is OFF.

Bytes to Follow: 1 byte
1) Watch-Dog timer ON/OFF
 0x00 = OFF
 0x01 = ON

MS2711B Returns: 1 byte
1) 255 (0xFF) Operation Complete Byte
 224 (0xE0) Parameter Error: Invalid watch-dog timer status

Store Sweep Trace - Control Byte #16 (0x10)

Description: Saves current trace to the next available memory location.

Bytes to Follow: 0 bytes

MS2711B Returns: 5 bytes
1-4) Time/Date Stamp (in long integer format)
5) Operation result: 255 (0xFF) Operation Complete Byte
 224 (0xE0) Out of Memory (Memory Full)
 238 (0xEE) Time-out Error

Recall Sweep Trace - Control Byte #17 (0x11)

Description: Queries the MS2711B for sweep trace data.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

NOTE: This command is not backward compatible with the corresponding MS2711A command.

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

MS2711B Returns

(for valid sweeps): 1950 bytes

- 1-2) # of following bytes (1948 for a valid sweep)
- 3-4) Model ID (0x0B for the MS2711B)
- 5-11) Model Number (7 bytes in ASCII)
- 12-15) Software Version (4 bytes in ASCII)
- 16) Measurement Mode¹
- 17-20) Time/Date (long integer format⁶)
- 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 Level² (highest byte)
- 78) Ref Level
- 79) Ref Level
- 80) Ref Level (lowest byte)
- 81) Scale per div³ (highest byte)
- 82) Scale per div
- 83) Scale per div
- 84) Scale per div (lowest byte)
- 85) Frequency Marker 1⁴ (higher byte)
- 86) Frequency Marker 1 (lower byte)
- 87) Frequency Marker 2⁴ (higher byte)
- 88) Frequency Marker 2 (lower byte)
- 89) Frequency Marker 3⁴ (higher byte)
- 90) Frequency Marker 3 (lower byte)
- 91) Frequency Marker 4⁴ (higher byte)
- 92) Frequency Marker 4 (lower byte)
- 93) Frequency Marker 5⁴ (higher byte)
- 94) Frequency Marker 5 (lower byte)

- 95) Frequency Marker 6⁴ (higher byte)
- 96) Frequency Marker 6 (lower byte)
- 97) Single Limit² (highest byte)
- 98) Single Limit
- 99) Single Limit
- 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 Level²) (highest byte)
- 106) Multiple Upper Limit 1 Start Y (Power Level²)
- 107) Multiple Upper Limit 1 Start Y (Power Level²)
- 108) Multiple Upper Limit 1 Start Y (Power Level²) (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 Level²) (highest byte)
- 114) Multiple Upper Limit 1 End Y (Power Level²)
- 115) Multiple Upper Limit 1 End Y (Power Level²)
- 116) Multiple Upper Limit 1 End Y (Power Level²) (lowest byte)
- 117-260) Multiple Upper Limits 2-5, Multiple lowest 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 (0x00 = % of power, 0x01 = 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) Attenuation³ (highest byte)
- 279) Attenuation
- 280) Attenuation
- 281) Attenuation (lowest byte)
- 282-297) Antenna Name (16 bytes in ASCII)
- 298) Reference Level Offset² (highest byte)
- 299) Reference Level Offset
- 300) Reference Level Offset
- 301) Reference Level Offset (lowest byte)
- 302) Impedance⁷

- 303) Impedance Loss³ (highest byte)
- 304) Impedance Loss
- 305) Impedance Loss
- 306) Impedance Loss (lowest byte)
- 307) TG Frequency Offset⁵ (highest byte)
- 308) TG Frequency Offset
- 309) TG Frequency Offset
- 310) TG Frequency Offset (lowest byte)
- 311) TG Output Power Level² (highest byte)
- 312) TG Output Power Level
- 313) TG Output Power Level
- 314) TG Output Power Level (lowest byte)
- 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 01b = average 10b = neg. peak)
 bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = 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
bit 7 : Reserved
- 322) Status byte 8: (0b = OFF, 1b = ON)
(LSB) bit 0 : Preamplifier ON/OFF
bit 1 : Normalization ON/OFF
bits 2-7 : Not Used
- 323-350) Unused
- 351-1950) Sweep Data (400 points * 4 bytes/point = 1600 bytes)
4 bytes for each data point
 - 1. dBm² (highest byte)
 - 2. dBm
 - 3. dBm
 - 4. dBm (lowest byte)

MS2711B 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 ID (0x0B for MS2711B)
- 5-11) Extended Model # (7 bytes in ASCII)

MS2711B Returns (for invalid sweep location):

- 1 byte
- 1) 224 (0xE0): Parameter Error: Invalid sweep location
- 238 (0xEE): Time-out Error

Notes:

1. 0x30 = Spectrum Analyzer
0x40 = Power Monitor
0x60 = Tracking Generator
0x61 = Tracking Generator – Fast Tune
TG, and TG-Fast Tune Modes are available with Option 20.
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:
 $((\text{span} / (\# \text{ of data points} - 1)) * \text{point}) + \text{start frequency}$
where span is stored in bytes 69-72 and #data points is stored in bytes 55-56
5. “value” sent as (value in Hz + 5,000,000)
6. Time/Date long integer representation is in seconds since January 1, 1970
7. Impedance adapters:
0x00 = 50 Ohm
0x0A = 75 Ohm, adapter 12N50-75B
0x0C = 75 Ohm, other adapter offset
8. UPPER limits always trigger an error beep if data is ABOVE the limit segment
9. LOWER limits always trigger an error beep if data is BELOW the limit segment

Save System Setup - Control Byte #18 (0x12)

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

The MS2711B saves the parameters described in System Status Query (control byte #20) to the specified store location. The only exceptions are Serial Port Echo Status, Return Sweep Time, Watch-dog Timer State, the Auto-save Setup Flag and the normalization state.

Store location 0 is the run-time setup of the MS2711B. It holds the power-on defaults of the MS2711B.

Bytes to Follow: 1 byte

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

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid setup location
238 (0xEE) Time-out Error

Recall System Setup - Control Byte #19 (0x13)

Description: Recalls system setup parameters from a specific storage location.

The MS2711B recalls the parameters described in System Status Query (control byte #20) (except Serial Port Echo Status, Return Sweep Time, Watch-dog Timer State, the Auto-save Setup Flag and the normalization state) from the specified storage location. The recalled setup is not automatically saved as the runtime setup when exiting remote unless the Auto-save Setup Flag is set (see control byte #64).

To save the recalled setup as the run-time setup, save it to setup location 0 (which holds the power-on defaults/run-time setup). See control byte #18 for details.

Bytes to Follow: 1 byte

- 1) Location from which to recall system setup parameters:
0 = Run time setup
1-10 = Saved setups
255 = Default setup

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid storage location or no saved setup
238 (0xEE) Time-out Error

Query System Status - Control Byte #20 (0x14)

Description: Queries the MS2711B for current system settings.

The current state of the MS2711B 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 #20. The new start frequency will be returned in bytes 4-7 even though no sweep has yet been performed with that frequency.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

NOTE: This command is not backward compatible with the corresponding MS2711A command.

Bytes to Follow: 0 bytes

MS2711B Returns: 310 bytes

- 1) Measurement Mode¹
- 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) 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 Level² (highest byte)
- 25) Ref Level
- 26) Ref Level
- 27) Ref Level (lowest byte)
- 28) Scale per div³ (highest byte)
- 29) Scale per div
- 30) Scale per div
- 31) Scale per div (lowest byte)
- 32) Marker 1⁴ (higher byte)
- 33) Marker 1 (lower byte)
- 34) Marker 2⁴ (higher byte)
- 35) Marker 2 (lower byte)
- 36) Marker 3⁴ (higher byte)
- 37) Marker 3 (lower byte)
- 38) Marker 4⁴ (higher byte)
- 39) Marker 4 (lower byte)
- 40) Marker 5⁴ (higher byte)
- 41) Marker 5 (lower byte)
- 42) Marker 6⁴ (higher byte)
- 43) Marker 6 (lower byte)
- 44) Spectrum Analyzer Single Limit² (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 Level²) (highest byte)
- 53) Multiple Upper Limit 1 Start Y (Power Level²)
- 54) Multiple Upper Limit 1 Start Y (Power Level²)
- 55) Multiple Upper Limit 1 Start Y (Power Level²) (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)
- 59) Multiple Upper Limit 1 End X (Frequency in Hz) (lowest byte)
- 60) Multiple Upper Limit 1 End Y (Power Level²) (highest byte)
- 61) Multiple Upper Limit 1 End Y (Power Level²)
- 62) Multiple Upper Limit 1 End Y (Power Level²)
- 63) Multiple Upper Limit 1 End Y (Power Level²) (lowest byte)
- 64-207) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 48-63 for format)
- 208) RBW Setting⁵ (highest byte)
- 209) RBW Setting
- 210) RBW Setting
- 211) RBW Setting (lowest byte)
- 212) VBW Setting⁶ (highest byte)
- 213) VBW Setting
- 214) VBW Setting
- 215) VBW Setting (lowest byte)
- 216) OCC BW Method (0x00 = % of power, 0x01 = 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) Attenuation⁷ (highest byte)
- 226) Attenuation
- 227) Attenuation
- 228) Attenuation (lowest byte)
- 229) Antenna Index (0-9)
- 230-245) Antenna Name (16 bytes in ASCII)
- 246) AM/FM Demod Type (0x00 = FM-Wide Band, 0x01 = FM-Narrow Band, 0x02 = AM)
- 247) AM/FM Demod Volume (0x00 = min, 0xFF = max)
- 248) Reference Level Offset² (highest byte)
- 249) Reference Level Offset
- 250) Reference Level Offset
- 251) Reference Level Offset (lowest byte)
- 252) Impedance⁹
- 253) Impedance Loss² (highest byte)
- 254) Impedance Loss
- 255) Impedance Loss

- 256) Impedance Loss (lowest byte)
- 257) TG Frequency Offset⁸ (highest byte)
- 258) TG Frequency Offset
- 259) TG Frequency Offset
- 260) TG Frequency Offset (lowest byte)
- 261) TG Output Power Level² (highest byte)
- 262) TG Output Power Level
- 263) TG Output Power Level
- 264) TG Output Power Level (lowest byte)
- 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
 - bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dB μ V)
 - bits 5-6 : Detection alg (00b = pos peak 01b = average 10b = neg peak)
 - 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 / LOWER¹⁰
 - bit 6 : Multiple Limit Upper Segment 2 Status ON/OFF
 - bit 7 : Multiple Limit Upper Segment 2 Limit Level UPPER / LOWER¹⁰
- 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 / LOWER¹⁰
 - bit 2 : Multiple Limit Upper Segment 4 Status ON/OFF
 - bit 3 : Multiple Limit Upper Segment 4 Limit Level UPPER / LOWER¹⁰
 - bit 4 : Multiple Limit Upper Segment 5 Status ON/OFF
 - bit 5 : Multiple Limit Upper Segment 5 Limit Level UPPER / LOWER¹⁰
 - bit 6 : Multiple Limit Lower Segment 1 Status ON/OFF
 - bit 7 : Multiple Limit Lower Segment 1 Limit Type UPPER / LOWER¹¹
- 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 / LOWER¹¹
 - bit 2 : Multiple Limit Lower Segment 3 Status ON/OFF
 - bit 3 : Multiple Limit Lower Segment 3 Limit Level UPPER / LOWER¹¹
 - bit 4 : Multiple Limit Lower Segment 4 Status ON/OFF
 - bit 5 : Multiple Limit Lower Segment 4 Limit Level UPPER / LOWER¹¹
 - bit 6 : Multiple Limit Lower Segment 5 Status On/Off
 - bit 7 : Multiple Limit Lower Segment 5 Limit Level UPPER / LOWER¹¹
- 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
 - 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 : Preamp Saturation Echo ON/OFF
 - bit 3 : Dynamic Attenuation ON/OFF
 - bit 4 : Normalization ON/OFF
 - bits 5-7 : Not Used
- 277-284) Reserved
- 285) SSB/CW BFO Adjustment Value (0-255)
- 286) AM/FM Demod Center Frequency Step Size¹³ (highest byte)
- 287) AM/FM Demod Center Frequency Step Size
- 288) AM/FM Demod Center Frequency Step Size
- 289) AM/FM Demod Center Frequency Step Size (lowest byte)
- 290) RTC Battery Voltage¹⁴ (higher byte)
- 291) RTC Battery Voltage (lower byte)
- 292) Motherboard PCB ID¹⁵ (higher byte)
- 293) Motherboard PCB ID (lower byte)
- 294-310) Not Used

Notes:

1. 0x30 = Spectrum Analyzer
0x40 = Power Monitor
0x60 = Tracking Generator
0x61 = Tracking Generator – Fast Tune
TG and TG-Fast Tune modes are only available with Option 20.
2. “value” sent as (value in dBm * 1000) + 270,000
3. “value” sent as (value * 1000)
4. 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.
5. RBW:
0x00 = 10 kHz
0x01 = 30 kHz
0x02 = 100 kHz
0x03 = 1 MHz

6. VBW:
 - 0x00 = 100 Hz
 - 0x01 = 300 Hz
 - 0x02 = 1 kHz
 - 0x03 = 3 kHz
 - 0x04 = 10 kHz
 - 0x05 = 30 kHz
 - 0x06 = 100 kHz
 - 0x07 = 300 kHz
7. Attenuation:
 - 0x00 = 0 dB
 - 0x01 = 10 dB
 - 0x02 = 20 dB
 - 0x03 = 30 dB
 - 0x04 = 40 dB
 - 0x05 = 50 dB
8. "value" sent as (value in Hz + 5,000,000)
9. Impedance Adapter:
 - 0x00 = 50 Ohm
 - 0x0A = 75 Ohm, adapter 12N50-75B
 - 0x0C = 75 Ohm, other adapter offset
10. UPPER limits always trigger an error beep if data is ABOVE the limit segment
11. LOWER limits always trigger an error beep if data is BELOW the limit segment
12. Preamp is available with Option 8.
13. "value" sent as: (value in Hz) + 1,000,000,000
14. "value" sent as: (value in Volts) * 10
15. "value" sent as (value in Volts * 1000)

Trigger Self-test - Control Byte #21 (0x15)

Description: Triggers a self test on the MS2711B.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 0 bytes

MS2711B Returns: 8 bytes

- 1) Self-test report: (0b = FAIL, 1b = PASS)
(LSB) bit 0 : Battery
bit 1 : Temperature
bit 2 : EEPROM read/write
bits 3- 7 : Not used
- 2) Self-test report: (0b = FAIL, 1b = PASS)
(LSB) bit 0 : Spectrum Analyzer Lock
bit 1 : Tracking Generator Lock
bits 2-7 : Not used
- 3) Battery Voltage¹ (higher byte)
- 4) Battery Voltage (lower byte)
- 5) Temperature² (higher byte)
- 6) Temperature (lower byte)
- 7) Lock Fail Counter (higher byte)
- 8) Lock Fail Counter (lower byte)

Notes:

1. Voltage sent as (voltage * 10)
2. Temperature sent as (degrees Celsius * 10)

Query Trace Names - Control Byte #24 (0x18)

Description: Returns a list of all saved traces and the associated information that is displayed when the <RECALL DISPLAY> button is pressed.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 0 bytes

MS2711B Returns: 2 + 41 x number of saved traces

1-2) # of saved traces

For each trace:

1-2) Trace Index

3) Measurement Mode¹

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

22-25) Date/Time as Unsigned Long Integer²

26-41) Trace Name (16 bytes in ASCII)

Notes:

1. 0x30 = Spectrum Analyzer
0x40 = Power Monitor

0x60 = Tracking Generator
0x61 = Tracking Generator – Fast Tune
TG and TG-Fast Tune modes are only available with Option 20.

2. Time/Date long integer representation is in seconds since January 1, 1970

Delete Sweep Trace - Control Byte #25 (0x19)

Description: Delete single or all stored sweep traces in MS2711B.

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

MS2711B Returns: 1 byte
1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid storage location or no saved trace
238 (0xEE) Time-out Error

Upload Sweep Trace - Control Byte #26 (0x1A)

Description: Transfers a sweep trace from a PC to the MS2711B.
For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

NOTE: This command is not backward compatible with the corresponding MS2711A command.

Bytes to Follow: 1930 bytes

- 1-2) # of following bytes (1928)
- 3) Measurement Mode¹
- 4-7) Time/Date (long integer format⁸)
- 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)
- 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 Level² (highest byte)
- 61) Ref Level
- 62) Ref Level
- 63) Ref Level (lowest byte)
- 64) Scale per div³ (highest byte)
- 65) Scale per div
- 66) Scale per div
- 67) Scale per div (lowest byte)
- 68) Marker 1⁴ (higher byte)
- 69) Marker 1 (lower byte)
- 70) Marker 2⁴ (higher byte)
- 71) Marker 2 (lower byte)
- 72) Marker 3⁴ (higher byte)
- 73) Marker 3 (lower byte)
- 74) Marker 4⁴ (higher byte)
- 75) Marker 4 (lower byte)
- 76) Marker 5⁴ (higher byte)
- 77) Marker 5 (lower byte)
- 78) Marker 6⁴ (higher byte)
- 79) Marker 6 (lower byte)
- 80) Single Limit² (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 Level²) (highest byte)
- 89) Multiple Upper Limit 1 Start Y (Power Level²)
- 90) Multiple Upper Limit 1 Start Y (Power Level²)
- 91) Multiple Upper Limit 1 Start Y (Power Level²) (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 Level²) (highest byte)
- 97) Multiple Upper Limit 1 End Y (Power Level²)
- 98) Multiple Upper Limit 1 End Y (Power Level²)
- 99) Multiple Upper Limit 1 End Y (Power Level²) (lowest byte)
- 100-243) Multiple Upper Limits 2-5, Multiple lowest Limits 1-5 (see bytes 80-95 for format)
- 244) RBW Setting⁵ (highest byte)
- 245) RBW Setting
- 246) RBW Setting
- 247) RBW Setting (lowest byte)
- 248) VBW Setting⁶ (highest byte)
- 249) VBW Setting
- 250) VBW Setting
- 251) VBW Setting (lowest byte)
- 252) OCC BW Method (0x00 = % of power, 0x01 = 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) Attenuation³ (highest byte)
- 262) Attenuation
- 263) Attenuation
- 264) Attenuation (lowest byte)
- 265-280) Antenna Name (16 bytes in ASCII)
- 281) Reference Level Offset² (highest byte)
- 282) Reference Level Offset
- 283) Reference Level Offset
- 284) Reference Level Offset (lowest byte)
- 285) Impedance⁹
- 286) Impedance Loss³ (highest byte)
- 287) Impedance Loss
- 288) Impedance Loss
- 289) Impedance Loss (lowest byte)
- 290) TG Frequency Offset⁷ (highest byte)
- 291) TG Frequency Offset
- 292) TG Frequency Offset
- 293) TG Frequency Offset (lowest byte)
- 294) TG Output Power Level² (highest byte)
- 295) TG Output Power Level
- 296) TG Output Power Level

- 297) TG Output Power Level (lowest byte)
- 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
 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 01b = average 10b = neg. peak)
 bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dB μ V)
 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
 bits 2-7 : Not Used

306-330) Not Used

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

4 bytes for each data point

1. dBm² (highest byte)
2. dBm
3. dBm
4. dBm (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Not enough bytes transferred
- 225 (0xE1) Memory Error: Not enough memory to store data
- 238 (0xEE) Time-out Error

Notes:

1. 0x30 = Spectrum Analyzer
0x40 = Power Monitor
0x60 = Tracking Generator
0x61 = Tracking Generator – Fast Tune
TG and TG-Fast Tune modes are only available with Option 20.
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 56-59 and #data points is stored in bytes 42-43
5. Valid frequencies (in Hz) are 10,000, 30,000, 100,000, 1,000,000
6. Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000
7. “value” sent as (value in Hz + 5,000,000)
8. Time/Date long integer representation is in seconds since January 1, 1970
9. Impedance Adapter:
0x00 = 50 Ohm
0x0A = 75 Ohm, adapter 12N50-75B
0x0C = 75 Ohm, other adapter offset

Query Sweep Memory - Control Byte #27 (0x1B)

Description: Queries MS2711B for percentage of memory that is available for trace storage.

Bytes to Follow: 0 bytes

MS2711B Returns: 1 byte

- 1) % of memory currently used (0 to 100)

Select Printer Type - Control Byte #30 (0x1E)

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 340, 350
 - 11 – HP DJ 500 Series
 - 12 – HP DJ 600 Series
 - 13 – HP DJ 800 Series
 - 14 – HP DJ 1120
 - 15 – HP LJ 6L, 6P, 4000
 - 16 – Epson Esc/P Compatible
 - 17 – Epson Esc/P2 Compatible
 - 18 – Epson Esc/P Raster Compatible
 - 19 – HP PCL3 Compatible

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte

Set A/B Trace - Control Byte #34 (0x22)

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 (0x00 = A only, 0x01 = A-B, 0x02 = A+B)
- 2) “B” trace status (0x00 = OFF, 0x01 = 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

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Incorrect “A” or “B” status, “B” trace requested to be used in calculations or displayed, but no trace or invalid trace specified
- 238 (0xEE) Time-out Error

Get Options - Control Byte #37 (0x25)

Description: Queries the options installed on the MS2711B, returns a list as an ASCII string.

- Option 5: Power Monitor
- Option 8: Preampfier
- Option 20: Tracking Generator

Note that Options 5 and 8 are mutually exclusive. That is, an MS2711B can have EITHER power monitor OR preamplifier, but not both.

Bytes to Follow: 0 bytes

MS2711B Returns: Number of bytes depends on the options
Maximum String: "5, 20" or "8, 20"
Minimum String: "5" or "8"
If NO options are installed: "NONE"

Query Power Level - Control Byte #39 (0x27)

Description: Returns power monitor state and measured value.

Notes:

The power level can be queried without putting the unit in Power Monitor Mode.

Absolute Power of -100 indicates a hardware failure (power monitor mode unavailable or RF detector not connected).

Bytes to Follow: 0 bytes

MS2711B Returns: 21 bytes

- 1) Status Byte (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
- 2-5) Relative Mode Reference Power Level (dBm * 1,000)
- 6-9) Offset Mode Offset in dB (dB * 1,000)
- 10-13) Zero Mode Power Level in dBm (dBm * 1,000)
- 14-17) Absolute Power Level in dBm (dBm * 1,000)
- 18-21) Power in dBm / dBr (dBm * 1,000 or dBr *1,000)

Set Power Monitor Units - Control Byte #40 (0x28)

Description: Set Power Monitor units to watts or dBm.

Bytes to Follow: 1 byte

- 1) Units
 - 0x00 - Watt (% if in Relative Mode)
 - 0x01 - dBm (dBr if in Relative Mode)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid power monitor unit
- 238 (0xEE) Time-out Error

Relative Mode On/Off - Control Byte #41 (0x29)

Description: Enable or disable Power Monitor Relative Mode

Bytes to Follow: 1 byte

- 1) Relative Mode state
 - 0x00 - OFF
 - 0x01 - ON w/ trigger (use the current power level as a reference power level)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid parameter
- 238 (0xEE) Time-out Error

Offset Mode On/Off - Control Byte #42 (0x2A)

Description: Enable or disable Power Monitor Offset Mode. Define the power level to use as an offset. Send the offset power level as (power level in dB * 1,000).

NOTE: If you turn the Offset mode OFF, you must still send the other bytes or you will receive a Time-out Error. Bytes 2 - 5 will be ignored.

Bytes to Follow: 5 bytes

- 1) ON/OFF (0x01 = ON, 0x00 = OFF)
- 2) Offset Power Level (highest byte)
- 3) Offset Power Level
- 4) Offset Power Level
- 5) Offset Power Level (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid state or offset power level
- 238 (0xEE) Time-out Error

Zero Mode On/Off - Control Byte #43 (0x2B)

Description: Enable or disable Power Monitor Zeroing Mode.

Bytes to Follow: 1 byte

- 1) Zero Mode state
 - 0x00 - OFF
 - 0x01 - ON with trigger (current power level is referenced as -80 dBm)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid state
- 238 (0xEE) Time-out Error

Trigger sweep - Control Byte #48 (0x30)

Description: Causes the MS2711B to perform a sweep if it is in single-sweep mode or if Serial Port Echo is ON.

Notes:

If the MS2711B is not in single-sweep mode and Serial Port Echo is OFF, sending the byte does nothing.

This command is for local mode operation. If the MS2711B is in remote mode, sending the byte does nothing.

Bytes to Follow: 0 bytes

MS2711B Returns: 1 byte

- 1) Sweep Complete Byte #192 (0xC0)

Check Battery Status - Control Byte #50 (0x32)

Description: Return smart battery status.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 0 bytes

MS2711B Returns: 17 bytes

- 1-2) Battery Status Flags¹
- 3-4) State of Charge as a % of Design Capacity (0 to 100+(%) Full)
- 5-6) Battery Voltage (0 to 65535 in mV)
- 7-8) Battery Current²
- 9-10) Battery Average Current³
- 11-12) Average Time to Empty⁴
- 13-14) Battery Charge Cycle Count (0 to 65535 cycles)
- 15-16) Battery Capacity at Full Charge in mA Hours (0 to 65535 cycles)
- 17) Unit under battery power (0x01 = YES; 0x00 = NO)

Notes:

1. Battery Status Flags
 - 0x0000 = OK
 - 0x0001 = Busy
 - 0x0002 = Attempted to read/write to a reserved function code
 - 0x0003 = Attempted to execute an unsupported function code
 - 0x0004 = Attempted to write to a read-only function code
 - 0x0005 = Data overflow/underflow
 - 0x0006 = Bad data size on write attempt
 - 0x0007 = Unknown error
 - 0x0010 = Fully discharged
 - 0x0020 = Fully charged
 - 0x0040 = Discharging
 - 0x0080 = Initialized
 - 0x0100 = Remaining time alarm
 - 0x0200 = Remaining capacity alarm
 - 0x0400 = Reserved
 - 0x0800 = Terminate discharging alarm
 - 0x1000 = Over temperature alarm
 - 0x2000 = Reserved
 - 0x4000 = Terminate charge alarm
 - 0x8000 = Over-charged alarm

“Happy” battery = 0x0000 OR 0x00E0

2. Current supplied or accepted by battery terminals
3. Rolling 1 minute average of the current being supplied or accepted by battery terminals
4. Rolling 1 minute average of predicted remaining battery life

Automatically Save Runtime Setup - Control Byte #64 (0x40)

Description: Sets and clears the “auto-save setup flag”.

The settings changed when the MS2711B is in remote mode are not automatically saved to the runtime setup. This is done in order to preserve write cycles on the EEPROM used to store setups. If this flag is set, the current settings will be saved to the runtime setup (setup 0) when the unit exits remote mode.

This flag must be set once per power cycle of the MS2711B. 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) Auto-save flag state
 - 0x00 = OFF (default)
 - 0x01 = ON

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 238 (0xEE) Time-out Error

Enter Remote Mode - Control Byte #69 (0x45)

Description: Enter remote mode at the end of a sweep. Send the model number and firmware version to the computer in response.

To initiate communication, send the Enter Remote mode byte #69 (0x45) to the MS2711B and wait for response.

Since the MS2711B responds to this command at the end of a sweep, the computer must wait until the MS2711B sends the return bytes before sending a new control byte. Otherwise, the new control byte overwrites the old one (the Enter Remote mode command) and the MS2711B does not respond as expected.

Once in remote mode, the MS2711B stops sweeping. A Remote Mode Indicator appears on the LCD.

The MS2711B sends its model and software version numbers to the computer. The MS2711B is now able to take multiple control bytes. It waits for the next control byte.

Bytes to Follow: 0 bytes

MS2711B Returns: 13 bytes

- 1-2) Model ID (0x0B for MS2711B)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version (4 bytes ASCII)

Enter Remote Mode Immediately- Control Byte #70 (0x46)

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

To initiate communication, send the Enter Remote mode byte #70 (0x46) to the MS2711B and wait 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 MS2711B stops sweeping. A Remote Mode Indicator appears on the LCD.

The MS2711B sends its model and software version numbers to the computer. The MS2711B is now able to take multiple control bytes. It waits for the next control byte.

Bytes to Follow: 0 bytes

MS2711B Returns: 13 bytes

- 1-2) Model ID (0x0B for MS2711B)
- 3-9) Extended Model # (7 bytes in ASCII)
- 10-13) Software Version (4 bytes in ASCII)

Write Antenna - Control Byte #82 (0x52)

Description: Receives an antenna to the MS2711B 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 MS2711B. 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.

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

Bytes to Follow: 24 – 378, 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)

For each antenna factor:

- 1) Frequency (in Hz) (highest byte)
- 2) Frequency (in Hz)
- 3) Frequency (in Hz)
- 4) Frequency (in Hz) (lowest byte)
- 5) Antenna Factor (higher byte)
- 6) Antenna Factor (lower byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Not enough bytes transferred
- 238 (0xEE) Time-out Error

Recall Antenna - Control Byte #83 (0x53)

Description: Sends an antenna from the MS2711B 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 MS2711B. 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.

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

Bytes to Follow: 1 byte

- 1) Antenna List index (1-10)

MS2711B Returns: (26-380 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) Number of Following Bytes

For each antenna factor:

- 1) Frequency (in Hz) (highest byte)
- 2) Frequency (in Hz)
- 3) Frequency (in Hz)
- 4) Frequency (in Hz) (lowest byte)
- 5) Antenna Factor (higher byte)
- 6) Antenna Factor (lower byte)

Set Field Strength Measurement - Control Byte #84 (0x54)

Description: Sets the state of the measurement (ON or OFF) and the antenna index for the field strength measurement.

Note that if the field strength measurement is turned ON, all other measurements (channel power, adjacent channel power, occupied bandwidth, AM/FM demodulation) are turned OFF.

Bytes to Follow: 2 bytes

- 1) Field Strength Measurement State (ON/OFF)
- 2) Antenna List index (1-10)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid state or index
- 238 (0xEE) Time-out Error

Set Channel Power - Control Byte #85 (0x55)

Description: Sets the state of the measurement (ON or OFF), the center frequency and the span (in Hz).

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 #26, Upload Sweep Trace.

Note that if the channel power measurement is turned ON, all other measurements (field strength, adjacent channel power, occupied bandwidth, AM/FM demodulation) 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 (in Hz)
- 7-10) Integration Bandwidth (in Hz)
- 11-14) Span Frequency (in Hz)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid parameter value
- 238 (0xEE) Time-out Error

Read Channel Power - Control Byte #86 (0x56)

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 a 1-200 to read the channel power associated with a stored trace (use Query Trace Names, #24, to obtain a list of trace numbers).
For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 1 byte
1) Channel Power Location (0 = current measured value, 1 – 200 = value in stored trace)

MS2711B Returns: 21 bytes
1) Channel Power ON/OFF
2-5) Channel Center Frequency (in Hz)
6-9) Integration Bandwidth (in Hz)
10-13) Channel Span Frequency (in Hz)
14-17) Channel Power¹
18-21) Channel Power Density²

Notes:

1. Power values are sent as (power in dBm * 100) + 270000
2. Power density values are sent as (density in dBm/Hz * 100) + 270000

Set Adjacent Channel Power Ratio (ACPR) - Control Byte #87 (0x57)

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 (in Hz).
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 #26, Upload Sweep Trace.
Note that if the ACPR measurement is turned ON, all other measurements (field strength, channel power, occupied bandwidth, AM/FM demodulation) 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 (in Hz)
7-10) Main Channel Bandwidth (in Hz)
11-14) Adjacent Channel Bandwidth (in Hz)
15-18) Channel Spacing (in Hz)

MS2711B Returns:

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid parameter value
- 238 (0xEE) Time-out Error

Read Adjacent Channel Power Ratio (ACPR) - Control Byte #88 (0x58)

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 a 1-200 to read the adjacent channel power with a stored trace (use Query Trace Names, #24, to obtain a list of trace numbers). For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 1 byte

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

MS2711B Returns: 29 bytes

- 1) ACPR ON/OFF
- 2-5) Main Channel Center Frequency (in Hz)
- 6-9) Main Channel Bandwidth (in Hz)
- 10-13) Adjacent Channel Bandwidth (in Hz)
- 14-17) Channel Spacing (in Hz)
- 18-21) Main Channel Power¹
- 22-25) Lower Adjacent Channel Power¹
- 26-29) Upper Adjacent Channel Power¹

Notes:

- 1. Power values are sent as (power in dBm * 100) + 270000

Measure OCC BW % of Power - Control Byte #96 (0x60)

Description: Measure occupied bandwidth with the Percentage of Power method. This means that the unit will measure the bandwidth in which the specified percentage of power is contained. For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 4 bytes

- 1) % of Power³ (highest byte)
- 2) % of Power
- 3) % of Power
- 4) % of Power (lowest byte)

MS2711B Returns: 16 bytes

- 1) OCC BW¹ (highest byte)
- 2) OCC BW
- 3) OCC BW
- 4) OCC BW (lowest byte)
- 5) Measured dB down² (highest byte)
- 6) Measured dB down
- 7) Measured dB down
- 8) Measured dB down (lowest byte)
- 9) Low OCC BW Frequency¹ (highest byte)
- 10) Low OCC BW Frequency
- 11) Low OCC BW Frequency
- 12) Low OCC BW Frequency (lowest byte)
- 13) High OCC BW Frequency¹ (highest byte)
- 14) High OCC BW Frequency
- 15) High OCC BW Frequency
- 16) High OCC BW Frequency (lowest byte)

Notes:

1. Frequency (in Hz)
2. (dB * 10,000)
3. % of power * 100

Measure OCC BW dB Down - Control Byte #97 (0x61)

Description: Measure occupied bandwidth with the dB Down method. This means the unit will measure the bandwidth within the specified number of dB down from the center of power.
For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 4 bytes

- 1) dB down³ (highest byte)
- 2) dB down
- 3) dB down
- 4) dB down (lowest byte)

MS2711B Returns: 16 bytes

- 1) OCC BW¹ (highest byte)
- 2) OCC BW
- 3) OCC BW
- 4) OCC BW (lowest byte)
- 5) Measured % of power² (highest byte)
- 6) Measured % of power
- 7) Measured % of power
- 8) Measured % of power (lowest byte)
- 9) Low OCC BW Frequency¹ (highest byte)
- 10) Low OCC BW Frequency
- 11) Low OCC BW Frequency
- 12) Low OCC BW Frequency (lowest byte)

- 13) High OCC BW Frequency¹ (highest byte)
- 14) High OCC BW Frequency
- 15) High OCC BW Frequency
- 16) High OCC BW Frequency (lowest byte)

Notes:

1. Frequency (in Hz)
2. % of power * 100
3. (dB * 100)

Set Frequency - Control Byte #99 (0x63)

Description: Sets the MS2711B frequency range by defining the start and stop frequencies.
Frequencies are defined in Hz.

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)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid frequency range
- 238 (0xEE) Time-out Error

Set Center Freq./Span - Control Byte #100 (0x64)

Description: Sets the MS2711B frequency range by defining the center and span frequencies.
Frequencies are defined in Hz.

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)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid frequency range
- 238 (0xEE) Time-out Error

Set Scale - Control Byte #101 (0x65)

Description: Sets the reference level and the number of dB represented by each graph division. Ref Level is the “top” scale of the graph, and there are total of 10 divisions, so the “bottom” scale can be determined by: Ref level + (10 * dB/div).
For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 8 bytes

- 1) Ref Level¹ (highest byte)
- 2) Ref Level
- 3) Ref Level
- 4) Ref Level (lowest byte)
- 5) dB/div² (highest byte)
- 6) dB/div
- 7) dB/div
- 8) dB/div (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error
- 238 (0xEE) Time-out Error

Notes:

1. “value” sent as (value in dBm * 1,000) + 270,000
2. “value” sent as (value in dB * 1,000)

Set Marker - Control Byte #102 (0x66)

Description: Sets an individual marker.
The marker location (“Marker Value”) is specified as a point on the graph (0-399), not as a frequency. To calculate the point from a frequency, do the following:
$$\text{Point} = (399 * (\text{marker freq} - \text{start freq})) / \text{span}$$

Bytes to Follow: 5 bytes

- 1) Marker Number (0x01 = marker 1, 0x02 = marker 2, 0x03 = marker 3, 0x04 = marker 4, 0x05 = marker 5, 0x06 = marker 6)
- 2) Marker Line ON/OFF (0x01 = ON, 0x00 = OFF)
- 3) Marker Delta Status ON/OFF (markers 1-4 only) (0x01 = ON, 0x00 = OFF)
- 4) Marker Value (0-399) (higher byte)
- 5) Marker Value (0-399) (lower byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid marker, marker status, or marker position
- 238 (0xEE) Time-out Error

Set Single Limit - Control Byte #103 (0x67)

Description: Sets the position and status of the single limit line.

The single limit is a single, horizontal line that can be defined to act as an upper limit or as a lower limit. Multiple limits are defined by multiple limit segments, each with a different finite slope. See control byte #113 for information about multiple limits.

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

The limit line can be either an upper limit or a lower limit. In other words, the limit line can be set to trigger an error beep when data appears above the limit line, below the limit line or not at all. To beep when data appears above the limit line (i.e. to make it an UPPER limit), set byte 3 to UPPER (i.e. set it to 0x01). To beep when data is below the line (i.e. to make it a LOWER limit), set byte 3 to LOWER (i.e. set it to 0x00). To enable the beep, turn the Limit Beep byte (byte 2) ON (i.e. set it to 0x01). Send the Limit Value as (value in dBm * 1,000) + 270,000

Bytes to Follow: 7 bytes:

- 1) Limit Line ON/OFF (0x01 = ON, 0x00 = OFF)
- 2) Limit Beep ON/OFF (0x01 = ON, 0x00 = OFF)
- 3) UPPER/LOWER Limit (0x01 = UPPER, 0x00 = LOWER)
- 4) Limit Value (highest byte)
- 5) Limit Value
- 6) Limit Value
- 7) Limit Value (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid limit, limit status, or limit value
238 (0xEE) Time-out Error

Set Max Hold - Control Byte #105 (0x69)

Description: Sets the Max Hold state. When Max Hold is enabled, the unit compares the current measured value for a point to the maximum measured value for that point. It then keeps and displays the maximum of the two.

Bytes to Follow: 1 byte

- 1) Max Hold State
0x00 – OFF
0x01 – ON

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid state
238 (0xEE) Time-out Error

Set Resolution Bandwidth - Control Byte #106 (0x6A)

Description: Sets the resolution bandwidth (RBW).
Automatic control couples the RBW to the span. Note that setting the RBW using this command automatically sets the RBW coupling to “MANUAL”, allowing it to be defined independently of the span.

Bytes to Follow: 1 byte
1) RBW
 0x00 – 10 kHz resolution BW
 0x01 – 30 kHz resolution BW
 0x02 – 100 kHz resolution BW
 0x03 – 1 MHz resolution BW

MS2711B Returns: 1 byte
1) 255 (0xFF) Operation Complete Byte
 224 (0xE0) Parameter Error
 238 (0xEE) Time-out Error

Set Video Bandwidth - Control Byte #107 (0x6B)

Description: Sets the video bandwidth (VBW).
Automatic control couples the VBW to the resolution bandwidth. Note that setting the VBW using this command automatically sets the VBW coupling to “MANUAL”, thereby allowing it to be defined independently of the RBW.

Bytes to Follow: 1 byte
1) VBW
 0x00 – 100 Hz video BW
 0x01 – 300 Hz video BW
 0x02 – 1 kHz video BW
 0x03 – 3 kHz video BW
 0x04 – 10 kHz video BW
 0x05 – 30 kHz video BW
 0x06 – 100 kHz video BW
 0x07 – 300 kHz video BW

MS2711B Returns: 1 byte
1) 255 (0xFF) Operation Complete Byte
 224 (0xE0) Parameter Error
 238 (0xEE) Time-out Error

Set Sweep Mode - Control Byte #108 (0x6C)

Description: Sets the sweep mode to either single or continuous.

Single-sweep mode sweeps once and holds the data until it receives the “Trigger Sweep” command (#48) or until the user presses the **ENTER** key. When in continuous-sweep mode, the MS2711B starts a new sweep as soon as it completes one.

Bytes to Follow: 1 byte

- 1) Sweep Mode
 - 0x00 – Single Sweep
 - 0x01 – Continuous Sweep

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid Mode
- 238 (0xEE) Time-out Error

Set Marker to Peak - Control Byte #109 (0x6D)

Description: Sets the specified marker to the frequency of the peak measurement of the sweep.

Bytes to Follow: 1 byte

- 1) Marker to set to peak (1-6)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error
- 238 (0xEE) Time-out Error

Set Marker to Center - Control Byte #110 (0x6E)

Description: Sets the specified marker to the center frequency.

Bytes to Follow: 1 byte

- 1) Marker to make the center frequency (1-4)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error
- 238 (0xEE) Time-out Error

Set Attenuation - Control Byte #111 (0x6F)

Description: Sets the attenuation for the receiver.
AUTOMATIC attenuation control couples the attenuation to the reference level.
DYNAMIC attenuation control adjusts the reference level and attenuation as necessary to optimally display the peak signal.
MANUAL attenuation control allows it to be defined independently of the reference level.
Note that setting a specific attenuation with this command will automatically change the attenuation control to MANUAL. Sending the command followed by 0xFF will automatically change the attenuation control to DYNAMIC. To return the attenuation to AUTOMATIC control, use Control Byte #1, Setup System.

Bytes to Follow: 1 byte

- 1) Attenuation
 - 0x00 – 0 dB
 - 0x01 – 10 dB
 - 0x02 – 20 dB
 - 0x03 – 30 dB
 - 0x04 – 40 dB
 - 0x05 – 50 dB
 - 0xFF – DYNAMIC ATTENUATION

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error
- 238 (0xEE) Time-out Error

Set AM/FM Demodulation - Control Byte #112 (0x70)

Description: Sets the AM/FM demodulation state (ON/OFF), type and volume.
This command will only be successful if the measurement mode of the unit is SPECTRUM ANALYZER.

Bytes to Follow: 3 bytes

- 1) Demod state (0x00 = OFF, 0x01 = ON)
- 2) Demod type (0x00 = FM-Wide band, 0x01 = FM-Narrow band, 0x02 = AM)
- 3) Volume (0x00 = minimum, 0xFF = maximum)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error: Invalid state, demod type or volume
- 238 (0xEE) Time-out Error

Set 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 MS2711B. The first two bytes of the command specify which segment is being defined. There are 5 upper limits and 5 lower limits available. 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.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 20 bytes

- 1) Segment number (1-5)
- 2) Segment type (0x00 = LOWER limit, 0x01 = UPPER limit)
- 3) Limit Line ON/OFF (0x01 = ON, 0x00 = OFF)
- 4) Limit Beep ON/OFF (0x01 = ON, 0x00 = OFF)
- 5) Limit Value Start X¹ (highest byte)
- 6) Limit Value Start X
- 7) Limit Value Start X
- 8) Limit Value Start X (lowest byte)
- 9) Limit Value Start Y² (highest byte)
- 10) Limit Value Start Y
- 11) Limit Value Start Y
- 12) Limit Value Start Y (lowest byte)
- 13) Limit Value End X¹ (highest byte)
- 14) Limit Value End X
- 15) Limit Value End X
- 16) Limit Value End X (lowest byte)
- 17) Limit Value End Y² (highest byte)
- 18) Limit Value End Y
- 19) Limit Value End Y
- 20) Limit Value End Y (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error : Invalid limit, limit status, or limit value
- 238 (0xEE) Time-out Error

Notes:

1. Frequency in Hz
2. "value" sent as (value in dBm * 1,000) + 270,000

Set Return Sweep Time - Control Byte #114 (0x72)

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.

This is not saved to the runtime setup, so it must be reset every time the MS2711B power is recycled.

Bytes to Follow: 1 byte

- 1) Return SPA Sweep Time flag state
0x00 = Don't Return Sweep Time
0x01 = Return Sweep Time

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error: Invalid state
238 (0xEE) Time-out Error

Set Reference Level Offset - Control Byte #115 (0x73)

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 added to the reference level.

If the reference level offset is non-zero, that value will be subtracted from the measured marker value to get the resulting displayed marker value. This allows compensation for external devices, such as attenuators.

Note that the valid range is -100 to +100 dB.

Send the value as (value in dB * 1,000) + 270,000.

For example, to compensate for a 30 dB attenuator, the reference level offset should be -30 dBm. 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)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error
238 (0xEE) Time-out Error

Set Impedance - Control Byte #116 (0x74)

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

The MS2711B can automatically compensate for the effects of impedance adapters. The impedance of the MS2711B is 50Ω so there is no need for an adapter in this case. The loss for the Anritsu 12N50-75B 75Ω adapter is known by the MS2711B.

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 a known adapter is specified, bytes 2-5 are ignored. If an unknown adapter is specified, the unit uses bytes 2-5 to correct for the adapter.

For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

Bytes to Follow: 5 bytes

- 1) Impedance¹
- 2) Impedance Loss²
- 3) Impedance Loss
- 4) Impedance Loss
- 5) Impedance Loss (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error
238 (0xEE) Time-out Error

Notes:

1. Impedance Adapter:
0x00 = 50 Ohm
0x0A = 75 Ohm, adapter 12N50-75B
0x0C = 75 Ohm, other adapter offset
2. Send the loss value as (value in dB * 1000).

Read Marker Value - Control Byte #117 (0x75)

Description: Returns the frequency location of the specified marker, and the value at that location.
For data formats, refer to the footnotes listed beside the return bytes. The associated descriptions are located at the end of the control byte description.

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

MS2711B Returns

(valid response): 8 bytes

- 1) Frequency¹
- 2) Frequency
- 3) Frequency
- 4) Frequency (lowest byte)
- 5) Value at Marker²
- 6) Value at Marker
- 7) Value at Marker
- 8) Value at Marker (lowest byte)

MS2711B Returns

(invalid response): 1 byte

- 1) 224 (0xE0) Parameter Error: Invalid marker number
238 (0xEE) Time-out Error

Notes:

1. Frequency in Hz
2. Marker value sent as (value in dBm * 1,000) + 270,000

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)

MS2711B Returns: 1 byte
1) 255 (FFh) Operation Complete
224 (E0h) Parameter Error
238 (EEh) Time Out Error

Set Preamp - Control Byte #128 (0x80)

Description: Sets preamplifier parameters.
The preamplifier can be turned ON or OFF.
When on, the preamp's input can be saturated at a level dependent on the current attenuation setting. The unit can return a byte at the end of a sweep to warn that the preamplifier input is saturated. This byte is returned after the sweep complete byte (if Serial Port Echo is ON) and after the sweep time (if Return SPA Sweep Time is ON).

Note that this command works only if the preamplifier (option 8) is installed.

Bytes to Follow: 2 bytes
1) Preamp ON/OFF (0x01 = ON, 0x00 = OFF)
2) Preamp Saturation Echo ON/OFF (0x01 = ON, 0x00 = OFF)

MS2711B Returns: 1 byte
1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error
238 (0xEE) Time-out Error

Normalize - Control Byte #130 (0x82)

Description: Uses the most recent sweep data for the normalization data. This has the same effect as pressing the NORMALIZE soft key in the Trace menu of the MS2711B.

Note that the following conditions MUST be true for this command to be executed successfully:

- This command must be the first serial command executed after entering remote mode.
- There must be one complete, valid sweep of data.
- Trace math must be disabled (see control byte #34).
- The Field Strength measurement must be disabled (see control byte #84).
- Max Hold must be disabled (see control byte # 105).
- Sweep averaging must be disabled (see control byte #118).

Bytes to Follow: 0 bytes

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error

Set Normalization ON/OFF - Control Byte #131 (0x83)

Description: Enables or disables a current normalization.

Note that there must be current normalization data for this command to be successful. Normalization is current if it has been performed on the current setup since the last power-on.

Bytes to Follow: 1 byte

- 1) Normalization ON/OFF (0x01 = ON, 0x00 = OFF)

MS2711B Returns: 1 byte

- 1) 224 (0xE0) Parameter Error: Invalid state or invalid normalization data
- 238 (0xEE) Time-out Error

Set TG Frequency Offset- Control Byte #151 (0x97)

Description: Set the TG frequency offset value.

The TG frequency offset is an offset relative to the spectrum analyzer receiver frequency.

Valid values are -5.0 MHz to +5 MHz.

Send the offset as (frequency in Hz) + 5,000,000.

Bytes to Follow: 4 bytes

- 1) TG Frequency Offset (highest byte)
- 2) TG Frequency Offset
- 3) TG Frequency Offset
- 4) TG Frequency Offset (lowest byte)

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete Byte
- 224 (0xE0) Parameter Error
- 238 (0xEE) Time-out Error

Set TG Output Power Level- Control Byte #152 (0x98)

Description: Set the TG output power level value in increments of 0.1 dB.

Valid values are 0 dBm to -60 dBm.

Send the power level as (value in dBm * 1,000) + 270,000.

Bytes to Follow: 4 bytes

- 1) TG Output Power Level (highest byte)
- 2) TG Output Power Level
- 3) TG Output Power Level
- 4) TG Output Power Level (lowest byte)

- MS2711B Returns:** 1 byte
- 1) 255 (0xFF) Operation Complete Byte
224 (0xE0) Parameter Error
238 (0xEE) Time-out Error
-

Set Baud Rate - Control Byte #197 (0xC5)

Description: Set the baud rate for communications between the MS2711B and the PC.
Serial communications begin at 9600 bps when the MS2711B is powered on. An invalid setting returns the rate to 9600.
After sending this command, immediately change the baud rate of the PC. The MS2711B will wait 500 ms before sending a response byte to allow time for the PC to sync.

- Bytes to Follow:** 1 byte
- 1) Baud Rate
0x00 = 9,600
0x01 = 19,200
0x02 = 38,400
0x03 = 56,000
0x04 = 115,200

- MS2711B Returns:** 1 byte
- 1) 255 (0xFF) Operation Complete Byte
238 (0xEE) Time-out Error
-

Read Main Serial Number - Control Byte #221 (0xDD)

Description: Returns the MS2711B serial number.

Bytes to Follow: 0 bytes

- MS2711B Returns:** 4 bytes
- 1) Serial Number (highest byte)
 - 2) Serial Number
 - 3) Serial Number
 - 4) Serial Number (lowest byte)
-

Read ASCII Serial Number - Control Byte #225 (0xE1)

Description: Returns the MS2711B serial number in ASCII.
The secondary serial number is currently unused.

- Bytes to Follow:** 1 byte
- 1) Serial number storage location (0x01=main serial, 0x02=secondary)

- MS2711B Returns:** 8 bytes
- 1-8) Serial Number (in ASCII)

Reset Serial Port - Control Byte #253 (0xFD)

Description: Clears the MS2711B serial input buffer and resets it to accept a new command. This command may be sent at any time - in the middle of another command or as a “stand-alone” command.

Bytes to Follow: 5 bytes

- 1) 0xFD
- 2) 0xFD
- 3) 0xFD
- 4) 0xFD
- 5) 0xFD

MS2711B Returns: 1 byte

- 1) 253 (0xFD) Serial Port Reset

Note:

If this command is issued in the middle of another command, response bytes from that command may also be returned as the MS2711B continues to try to process the input bytes as valid data. The receipt of 0xFD signifies that the port is clear and serial communications have been reset.

Exit Remote Mode - Control Byte #255 (0xFF)

Description: MS2711B exits remote mode

Bytes to Follow: 0 bytes

MS2711B Returns: 1 byte

- 1) 255 (0xFF) Operation Complete

Notes:

The computer sends a serial stop byte #255 (0xFF) to the MS2711B. MS2711B returns a confirm flag (0xFF). The MS2711B resumes sweeping, either in continuous-sweep or single-sweep mode.

The “ESCAPE” key on the MS2711B key pad also causes the unit to exit remote mode (given that the serial communication is still in sync). In this case, the MS2711B 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 automatically written to the non-volatile EEPROM when exiting remote mode unless the “auto-save runtime setup” flag is enabled (see control byte #64).

If the flag is not set, the current setup can be saved manually to the run-time setup (saved setup location 0, which holds the power-on defaults) or one of the nine saved setups (saved setup location 1-9). See control byte #18 (0x12) for details.

Parameter Definitions

Parameter	# of bytes	Step	Example / Description
Frequency	4 bytes unsigned	1 Hz	1000.3 MHz = 1000300000
Frequency Offset	4 bytes unsigned	1 Hz	1.00 MHz = 1000000 + 5000000 -1.00 MHz = -1000000 + 5000000
Scale	4 bytes unsigned	1 / 1000 dB	20dB = 290000 0 dB = 270000 -120 dB = 150000
Markers	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 399 (400 data points in total)
Power: dBm/dBr	4 bytes unsigned	1 / 1000 dBm 1 / 1000 dBr	51.3 dBm = 51300 10.4 dBr = 10400
Lock Fail Counter	2 bytes unsigned	1 error count	234 fails = 234

Programming Examples

This section contains several sample functions, written in C, that can be used as references when programming the MS2711B. These include functions to enter and exit remote mode and set the reference level of the spectrum analyzer.

```
/******  
/* 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 */

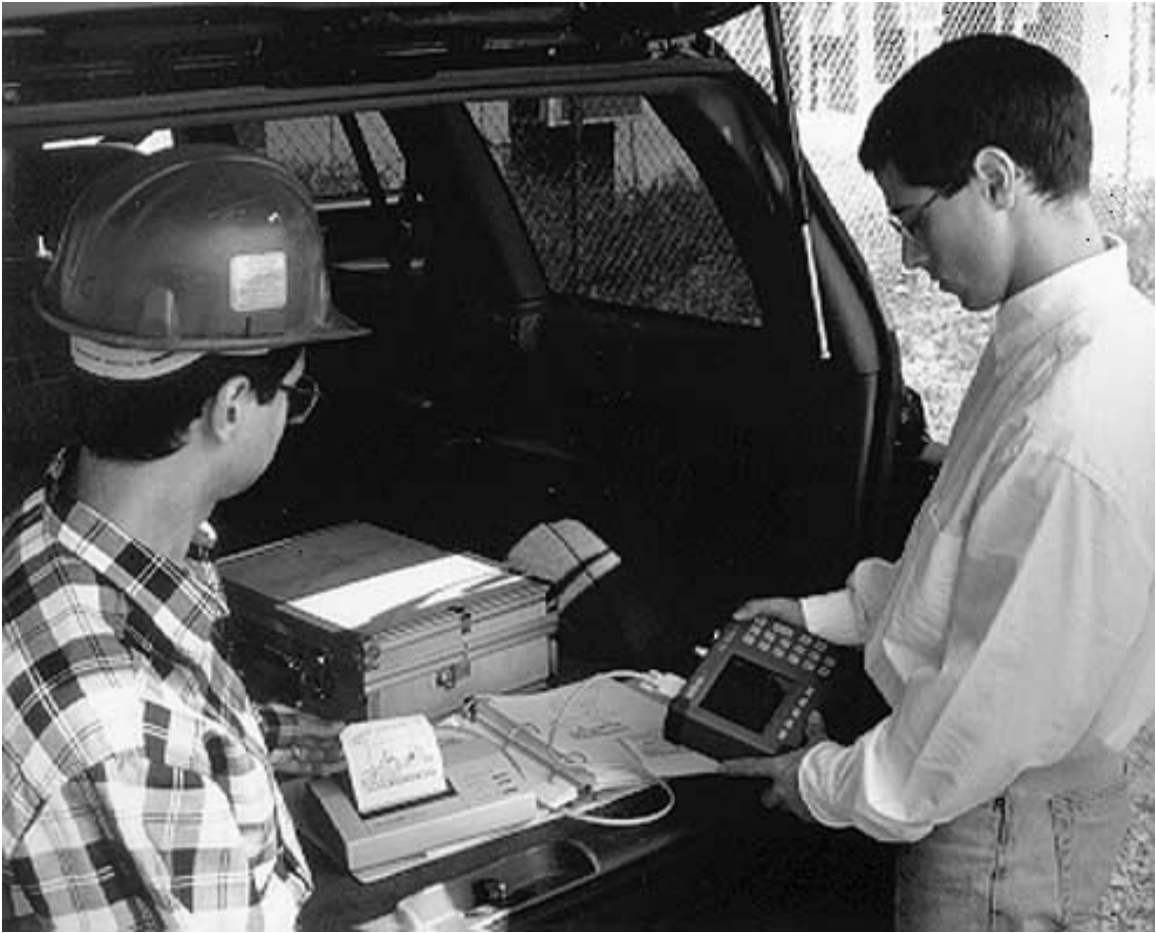
```

```

/*****
/* 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 */

```

Anritsu