Anritsu

Cell Master™

MT8212A

A Multi-function Base Station Test Tool for Greater Flexibility and Technician Productivity

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Programming Manual

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Programming Overview

NOTE: This programming manual is written exclusively for the Anritsu Cell Master Model MT8212A. For information on firmware upgrades, contact your local Anritsu Service Center. Commands listed in this manual are not all backward-compatible with earlier Anritsu models.

General Description

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

Once in remote mode, a series of control bytes and associated data are sent to the Cell Master to perform various functions and activities. The serial port supports virtually all features accessible from the keypad with the exception of the printer. The printer requires connection to the same 9-pin connector on the Cell Master rear panel used for remote communication.

To complete the communication session, send the control byte to exit remote mode and the Cell Master will resume normal operations. You may also exit the remote mode by pressing the **ESCAPE/CLEAR** key on the Cell Master front panel.

Interface Cable Installation

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

Serial Communication Parameters

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

Communications Error Checking

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. Use the expected number of response bytes (listed in the control byte description section of this manual) when waiting for feedback from the Cell Master. For data streams going to the Cell Master, the "watch dog timer" protects against interrupted transmissions by aborting a control byte sequence if the inter-byte time limit is exceeded.

Parameter Validation

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

Entering Remote Mode

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

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

Exiting Remote Mode

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

Remote Mode Changes to Cell Master Operating Parameters

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

To retain the changes, the setup must be saved to one of the setup memory locations. Use either the run-time setup location 0, (which holds the power-on defaults) or one of the nine other setup locations. Control byte #64 (40h) sets the auto-save flag which commands the Cell Master to automatically save the changes to the run-time setup location upon exiting remote mode. See the Cell Master User's Guide or information in this manual on control byte #18 (12h) for further details.

Write Cycle Limitation of EEPROM

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

Documentation Conventions

Throughout this manual, the following conventions will be observed:

Numeric Representation

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

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

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).

Mode References

The term "VNA" in reference to a command denotes Return Loss, SWR, Cable Loss and DTF modes. The term "SPA" in reference to a command denotes Spectrum Analyzer mode. All other modes are referenced individually.

Control Byte Summary

Control Byte #	Name	Description	Watchdog Timer
1 (01h)	Setup System	Sets system status flags and switches	Yes
2 (02h)	Set VNA Frequency	Sets Cell Master VNA frequency range	Yes
3 (03h)	Select Measurement Mode	Sets current Cell Master measurement mode	Yes
4 (04h)	Set VNA Scale	Sets Cell Master VNA scale values	Yes
5 (05h)	Set VNA Marker	Sets position and on/off status of Cell Master markers in VNA modes	Yes
6 (06h)	Set VNA Single Limit	Sets position and on/off status of the Cell Master single limit in VNA modes	Yes
7 (07h)	Set DTF Parameters	Sets Distance to Fault parameters	Yes
8 (08h)	Set Time/Date	Sets time and date of the Cell Master	Yes
9 (09h)	Set Reference Number	Sets reference number (trace name) for a sweep trace	Yes
10 (0Ah)	Serial Port Echo On/Off	Allows synchronization of the Cell Master and request from computer for sweep trace	Yes
11 (0Bh)	VNA Single Sweep On/Off	Enables or disables single sweep operation in VNA modes	Yes
12 (0Ch)	Watch-dog Timer On/Off	Enables or disables the watch-dog timer	—-
13 (0Dh)	Sequence Cell Master Calibration	Triggers a calibration step	Yes
14 (0Eh)	Set Cell Master Data Points	Sets number of measurement data points for Cell Master VNA modes	Yes
15 (0Fh)	Set Cell Master Calibration Mode	Sets the Cell Master calibration mode to OSL Cal (standard) or FlexCal	Yes
16 (10h)	Store Sweep Trace	Saves current trace data to EEPROM	—-
17 (11h)	Recall Sweep Trace	Cell Master sends the sweep data associated with a trace	Yes
18 (12h)	Save System Setup	Saves system setup parameters to EEPROM	Yes
19 (13h)	Recall System Setup	Recalls system setup parameters from EEPROM	Yes
20 (14h)	Query System Status	Gets the current system settings	—-
21 (15h)	Trigger Self-Test	Triggers a self test	—-
22 (16h)	Read Fail Counters	Returns the values of the lock-fail and integrator counters	—-
24 (18h)	Query Trace Names	Returns list of all saved traces	—-
25 (19h)	Delete Sweep Trace	Deletes single or all stored sweep traces	Yes
26 (1Ah)	Upload SPA Sweep Trace	Uploads a spectrum analyzer sweep trace to Cell Master.	Yes
27 (1Bh)	Query Sweep Memory	Queries Cell Master for percentage of memory that is available for trace storage	
28 (1Ch)	Upload VNA Sweep Trace	Uploads a Cell Master VNA mode sweep trace to the Cell Master	Yes
30 (1Eh)	Select Printer Type	Selects printer type	Yes
31 (1Fh)	Select DTF Windowing	Selects DTF Windowing Methods	Yes
32 (20h)	Set VNA Trace Math	Selects Trace Math operation for VNA modes	Yes
34 (22h)	Set VNA Trace Overlay	Sets trace overlay operation and trace for VNA modes.	Yes
35 (23h)	Set SPA A/B Trace	Defines traces “A” and “B” for SPA mode.	Yes
37 (25h)	Get Options	Returns an ASCII string listing installed options.	—-
39 (27h)	Query Power Level	Returns power level at RF In in Power Meter mode	—-
40 (28h)	Set Power Meter Units	Sets Power Meter displaying unit	Yes
41 (29h)	Set Power Meter Relative Mode	Enables or disables Power Meter Relative Mode	Yes

Control Byte #	Name	Description	Watchdog Timer
42 (2Ah)	Set Power Meter Offset Mode	Enables or disables Power Meter offset	Yes
43 (2Bh)	Set Power Meter Zero Mode	Enables or disables Power Meter zeroing mode	Yes
44 (2Ch)	Power Meter RMS Averaging On/Off	Sets Power Meter RMS Averaging.	Yes
45 (2Dh)	Power Meter Center Frequency and Span	Sets the center frequency and span frequency for the Power Meter mode	Yes
48 (30h)	Trigger Sweep	Starts the next sweep	—-
50 (32h)	Check Battery Status	Returns smart battery status	—-
53 (35h)	Set SPA Minimum Sweep Time	Sets the min sweep time for the SPA when the span is 0	Yes
54 (36h)	Set Trigger Position	Sets the trigger position for the SPA when the span is 0	Yes
55 (37h)	Set Video Trigger Level	Sets the trigger level for the SPA in video trigger mode	Yes
64 (40h)	Auto Save Runtime Setup	Automatically save the runtime setup when exiting remote mode	Yes
69 (45h)	Enter Remote Mode	Enters remote mode at the end of the sweep and returns model number and firmware version	—-
70 (46h)	Enter Remote Mode Immediately	Enters remote mode immediately and returns model number and firmware version	—-
80 (50h)	Write Custom Cable	Writes Custom Cable data to Cell Master	Yes
81 (51h)	Recall Custom Cable	Recalls Custom Cable data from Cell Master	Yes
82 (52h)	Write Antenna	Writes custom antenna data to the Cell Master via the serial port	Yes
83 (53h)	Recall Antenna	Recalls custom antenna data from the Cell Master via the serial port	Yes
84 (54h)	Set Field Strength Measurement	Sets the field strength measurement state and the antenna index	Yes
85 (55h)	Set Channel Power	Sets the Channel Power measurement state and the setup parameters	Yes
86 (56h)	Read Channel Power	Reads the current channel power or the channel power of a stored trace	Yes
87 (57h)	Set ACPR	Sets the ACPR measurement state and parameters	Yes
88 (58h)	Read ACPR	Reads the current adjacent channel power or the adjacent channel power of a stored trace	Yes
89 (59h)	Read Signal Standard Name	Returns the signal standard name in English	Yes
96 (60h)	Measure OCC BW % of Power	Measures OCC BW with % of Power method	Yes
97 (61h)	Measure OCC BW dB Down	Measures OCC BW with dB down method	Yes
99 (63h)	Set Spectrum Analyzer Start/Stop Frequency	Sets the Spectrum Analyzer Start and Stop frequencies	Yes
100 (64h)	Set Spectrum Analyzer Center Freq./Span	Sets the Spectrum Analyzer center frequency and frequency span	Yes
101 (65h)	Set Spectrum Analyzer Scale	Sets the Spectrum Analyzer reference level and scale value	Yes
102 (66h)	Set Spectrum Analyzer Marker	Sets position and on/off status of a Spectrum Analyzer marker	Yes
103 (67h)	Set Spectrum Analyzer Single Limit	Sets position and on/off status of Spectrum Analyzer single limit line	Yes

Control Byte #	Name	Description	Watchdog Timer
105 (69h)	Set Spectrum Analyzer Max Hold	Enables or disables the Spectrum Analyzer Max Hold feature	Yes
106 (6Ah)	Set Spectrum Analyzer Resolution Bandwidth Freq	Sets the Spectrum Analyzer resolution BW frequency	Yes
107 (6Bh)	Set Spectrum Analyzer Video Bandwidth Freq	Sets the Spectrum Analyzer video BW frequency	Yes
108 (6Ch)	Set Spectrum Analyzer Sweep Mode	Sets the Spectrum Analyzer sweep mode	Yes
109 (6Dh)	Set Spectrum Analyzer Marker to Peak	Sets specified marker to peak value of the sweep	Yes
110 (6Eh)	Set Spectrum Analyzer Marker to Center	Sets the center frequency equal to the frequency of the specified marker	Yes
111 (6Fh)	Set Spectrum Analyzer Attenuation	Sets the attenuation for the Cell Master Spectrum Analyzer mode	Yes
112 (70h)	Set VNA Segmented Limit Lines	Sets the position and On/Off status of the segmented limit lines for the VNA modes	Yes
113 (71h)	Set Spectrum Analyzer Multiple Limit	Sets the position and On/Off Status of a limit segment for the SPA mode	Yes
114 (72h)	Set Return Spectrum Analyzer Sweep Time	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	Yes
115 (73h)	Set Reference Level Offset	Sets the value of the reference level offset	Yes
117 (0x75)	Read Marker Value	Returns the frequency location of the specified marker, and the value at that location	Yes
118 (76h	Set Sweep Averaging	Sets the number of sweeps to average	Yes
120 (78h)	Field InstaCal	Initiates an InstaCal calibration	—-
124 (7Ch)	Read InstaCal Module ASCII Serial Number	Returns the InstaCal Module serial number in ASCII	Yes
129 (81h)	Set Cell Master Marker (Peak/Valley)	Sets an individual marker in current measurement mode to either peak (maximum) signal or valley (minimum) signal	Yes
133 (85h)	Set/Reset SPA External Reference	Sets the external reference frequency for the spectrum analyzer	Yes
134 (86h)	Check External SPA Reference	Returns the state of the SPA external reference	—-
136 (88h)	Set SPA Preamp State	Sets the state of the SPA preamp	Yes
197 (C5h)	Set Baud Rate	Sets the serial communication baud rate for this session	Yes
198 (C6h)	Set Language	Sets the Cell Master display language	Yes
208 (D0h)	Query Time	Queries the Cell Master for the current time in ASCII format	—-
221 (DDh)	Read Main Serial Number	Returns the Main (External) Serial Number as four bytes	Yes
255 (FFh)	Exit Remote Mode	Ends serial communications	—-
A001h	Set T1 Transmission Level	Sets the transmission level of T1 measurement mode	Yes
A002h	Set T1/E1 Clock Source	Sets the Clock Source of T1/E1 measurement mode	Yes
A003h	Set T1/E1 Pattern	Sets the data pattern of T1/E1 measurement mode	Yes
A004h	Set T1/E1 Error Insert Type/Value	Sets the Insertion Error type and the number of errors	Yes
A005h	Set T1/E1 Framing Mode	Sets the Framing Mode of T1/E1 measurement	Yes
A006h	Start and Stop T1/E1 Measurement	Toggles state of T1 and E1 measurements	—-

Control Byte #	Name	Description	Watchdog Timer
A007h	Insert Error for T1/E1 Measurement	Inserts the error defined into the data flow	—-
A008h	Get T1/E1 Pattern	Returns the current pattern for T1 and E1 modes	—-
A009h	Get T1/E1 Frame Sync Status	Returns the current frame sync status for T1 and E1 modes	—-
A00Ah	Get T1/E1 Pattern Sync Status	Returns the current pattern sync status for T1 and E1 modes	—-
A00Bh	Get T1/E1 Carrier Status	Returns the carrier status for T1 and E1 modes	—-
A00Ch	Get T1/E1 Error Type and Number	Returns the error type and numbers for T1 and E1 modes	—-
A00Dh	Set T1/E1 Line Coding Options	Sets line coding options for T1 and E1 modes	Yes
A00Eh	Set E1 Impedance Options	Sets the impedance for the E1 mode	Yes
A00Fh	Read T1 Volts Peak-to-Peak	Returns the Vpp measurement result	—-
A013h	Set T1/E1 Receive Input Configuration Options	Sets the Rx input configuration for T1 and E1 modes	Yes
A014h	Set T1/E1 Measurement Duration	Sets T1 and E1 measurement duration	Yes
A015h	Set T1/E1 Data Logging	Enables/disables data logging in T1/E1 modes	Yes
A103h	Select SPA/Power Meter Signal Standard	Selects a Signal Standard	Yes
A104h	Select SPA/Power Meter Channel	Selects a channel within the range of the currently selected signal standard	Yes
AA30h	Trigger Sweep	Causes the Cell Master to perform a sweep if it is in single sweep mode	—-

Control Byte Descriptions

Setup System – Control Byte #1 (01h)

Description: Sets system status flags and switches. The current value of the flags can be obtained by executing command #20, Query System Setup, and parsing the values from the appropriate bytes. The Cell Master acts on the entire byte. So, the state of each of the bits must be defined every time the command is issued. See control byte #20 (14h) response bytes 395, 396, and 397 for current Cell Master configuration.

Bytes to Follow: 2 bytes

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

2) Status Byte 2
   - bit 0: RBW Coupling (to span) (1b = Auto 0b = Manual)
   - bit 1: VBW Coupling (to RBW) (1b = Auto 0b = Manual)
   - bit 2: Not Used
   - bits 3-4: Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
   - bits 5-6: Detection Algorithm (00b = Positive Peak 01b = RMS Average 10b = Negative Peak 11b = Sampling Mode)
   - bit 7: Attenuation Coupling (to ref level) (1b = Auto 0b = Manual)

Cell Master Returns: 1 byte

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

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

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

Valid range is 25 MHz – 4000 MHz.

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

Bytes to Follow: 8 bytes

1) Start Frequency (highest byte)
2) Start Frequency
3) Start Frequency
4) Start Frequency (lowest byte)
5) Stop Frequency (highest byte)
6) Stop Frequency
7) Stop Frequency
8) Stop Frequency (lowest byte)

Cell Master Returns: 1 byte

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

1 Set the Metric/English flag to the proper value before sending distance information.

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

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

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

Bytes to Follow: 1 byte

1) Measurement Mode
   - 00h: RL Frequency
   - 01h: SWR Frequency
   - 02h: Cable Loss Frequency
   - 10h: RL Distance
   - 11h: SWR Distance
   - 30h: Spectrum Analyzer Mode
   - 40h: Power Monitor Mode
   - 60h: T1 Tester Mode
   - 70h: E1 Tester Mode

Cell Master Returns: 1 byte

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

Set Cell Master VNA Scale – Control Byte #4 (04h)

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

Return Loss & Cable Loss:

Unit is dB/1000.
Maximum value sent is 60000 which represents 60.00 dB,
Minimum value sent is 0 which represent 0.00 dB,
Start value < Stop value

SWR:

Unit is 1/1000 (of ratio)
Maximum value sent is 65535 which represents 65.53
Minimum value sent is 1000 which represents 1.00
Start value < Stop value

See control byte #20 (14h) response bytes 12 to 19 for current Cell Master scaling.

Bytes to Follow: 8 bytes

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

Cell Master Returns: 1 byte

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

Set Cell Master VNA Marker – Control Byte #5 (05h)

Description: Sets an individual marker position and status in the current VNA measurement mode. See Control Byte #102 to set markers in Spectrum Analyzer mode.

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

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

point = (resolution – 1) * (marker freq – start freq) / (stop freq – start freq)

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

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

See control byte #20 (14h) response byte 382 for current marker on/off status.

Bytes to Follow: 5 bytes

1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
2) Marker Line On/Off (01h = On, 00h = Off)
3) Marker Delta On/Off (01h = On, 00h = Off) [2]
4) Marker Value (highest byte)
5) Marker Value (lowest byte)

Cell Master Returns: 1 byte

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

Set Cell Master VNA Single Limit – Control Byte #6 (06h)

Description: Sets the position and On/Off status of the Single Limit Line for the VNA modes. See control byte #103 to set the single limit for spectrum analyzer mode.

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

The single limit and multiple limit types are mutually exclusive. That is, setting the single limit ON automatically turns multiple limit lines OFF. See control byte #112 (70h) for information about multiple limits. See control byte #20 (14h) response bytes 32-35, and byte 386 bits 0-1 for current Cell Master configuration.

Bytes to Follow: 6 bytes

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

Cell Master Returns: 1 byte

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

2 This byte is not applicable for markers 5 and 6. It will be ignored by the Cell Master.

Notes:

Return Loss & Cable Loss:

Limit should be sent as (dB * 1000)
Maximum value sent is 60000 which represents 60.00 dB
Minimum value sent is 0 which represents 0.0 dB

SWR:

Limit is in thousandths (of ratio), so it should be sent as (ratio * 1000)
Maximum value sent is 65530 which represents 65.53
Minimum value sent is 1000 which represents 1.00

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

Description: Sets Distance to Fault parameters.

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

Enter Start and Stop distances in hundred-thousandths of a meter or foot (12.34m would be sent as 1234000).

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

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

See control byte #20 (14h) response bytes 106-113 (Distance), 126-133 (Propagation Velocity & Cable Loss) for current Cell Master configuration.

Bytes to Follow: 16 bytes

1) Start Distance (highest byte)
2) Start Distance
3) Start Distance
4) Start Distance (lowest byte)
5) Stop Distance (highest byte)
6) Stop Distance
7) Stop Distance
8) Stop Distance (lowest byte)
9) Relative Propagation Velocity (highest byte)
10) Relative Propagation Velocity
11) Relative Propagation Velocity
12) Relative Propagation Velocity (lowest byte)
13) Cable Loss (highest byte)
14) Cable Loss
15) Cable Loss
16) Cable Loss (lowest byte)

Cell Master Returns: 1 byte

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

Set Time/Date – Control Byte #8 (08h)

Description: Sets the current time and date.

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

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

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

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

Bytes to Follow: 7 bytes

1) Hour
2) Minute
3) Month
4) Day
5) Year (Highest byte)
6) Year (Lowest byte)
7) Daylight Saving (ON/~OFF)

Cell Master Returns: 1 byte

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

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

Description: Stores a Reference Number with the sweep trace.

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

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

Bytes to Follow: 16 bytes (ASCII text string)

Cell Master Returns: 1 byte

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

Serial Port Echo On/Off – Control Byte #10 (0Ah)

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

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Enables or disables the Single Sweep Mode during Cell Master VNA modes of operation. For Single Sweep Mode during Spectrum Analyzer mode of operation, see control byte #108 (6Ch). Single Sweep Mode activates once the Cell Master exits from the remote mode.

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Initiates a calibration step. The Cell Master must be calibrated to give accurate measurements.

The command sequence must be sent in correct order. i.e. Open -> Short -> Load. You can also abort the calibration by command – "Abort" before the command - "Load" is sent. Once command - "Load" is sent, calibration is completed, and the old calibration data is lost.

The unit under test returns #255(FFh) upon receiving the command, and return #240 (F0h) when the calibration of the connected component is completed, then waits for further commands to complete the whole calibration process.

This command is designed to be executed step by step: open, short, load. Issuing any other command during this command sequence will cause undesired results.

Bytes to Follow: 1 byte

1) Calibration Step to trigger
   01h = open
   02h = short
   03h = load
   04h = abort

Cell Master Returns: 2 bytes

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Error : Invalid Cal operation or Cal Incomplete
   238 (EEh) Time-out Error
2) 240 (F0h) Calibration step is completed

Set Cell Master Data Points – Control Byte #14 (0Eh)

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

Bytes to Follow: 1 byte

1) Number of Data Points
   00h = 130 Points
   01h = 259 Points
   02h = 517 Points

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error : Invalid number of data points
   238 (EEh) Time-out Error

Set Cell Master Calibration Mode – Control Byte #15 (0Fh)

Description: Set the Cell Master calibration mode to OSL Cal (standard) or FlexCal.

Bytes to Follow: 1 byte

1) Calibration Mode
   00h = OSL Calibration (standard)
   01h = FlexCal Calibration

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 5 bytes

1-4) Time/Date Stamp (In long integer format)
5) Operation result:
255 (FFh) Operation Complete Byte
224 (E0h) Out of memory (Memory full)
238 (EEh) Time-out Error

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

Description: Queries the Cell Master for sweep trace data.

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

Bytes to Follow: 1 byte

0 = Last sweep trace before entering remote mode (sweep trace in RAM)
1- 200 = Specific saved sweep number (stored sweeps in Flash memory)

Cell Master Returns:

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

For all "Cell Master VNA Modes" :

57) Start Frequency[6] (highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (lowest byte)
61) Stop Frequency (highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (lowest byte)
65) Minimum Frequency Step Size (highest byte)
66) Minimum Frequency Step Size

3 MM/DD/YYYY = 00h, DD/MM/YYYY = 01h, YYYY/MM/DD = 02h.

4 Refer to Control Byte #3 "Select Measurement Mode" for detailed value.

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

6 Frequency units is Hz

67) Minimum Frequency Step Size
68) Minimum Frequency Step Size (lowest byte)
69) Scale Top[7] (highest byte)
70) Scale Top
71) Scale Top
72) Scale Top (lowest byte)
73) Scale Bottom (highest byte)
74) Scale Bottom
75) Scale Bottom
76) Scale Bottom (lowest byte)
77) Frequency Marker 1[8] (highest byte)
78) Frequency Marker 1 (lowest byte)
79) Frequency Marker 2 (highest byte)
80) Frequency Marker 2 (lowest byte)
81) Frequency Marker 3 (highest byte)
82) Frequency Marker 3 (lowest byte)
83) Frequency Marker 4 (highest byte)
84) Frequency Marker 4 (lowest byte)
85) Frequency Marker 5 (highest byte)
86) Frequency Marker 5 (lowest byte)
87) Frequency Marker 6 (highest byte)
88) Frequency Marker 6 (lowest byte)
89) Single Limit[9] (highest byte)
90) Single Limit
91) Single Limit
92) Single Limit (lowest byte)
93) Multiple Limit Segment # (1)
94) Multiple Limit Segment Status
95) Multiple Limit Start X[10] (highest byte)
96) Multiple Limit Start X
97) Multiple Limit Start X
98) Multiple Limit Start X (lowest byte)
99) Multiple Limit Start Y (highest byte)
100) Multiple Limit Start Y (lowest byte)
101) Multiple Limit End X (highest byte)
102) Multiple Limit End X
103) Multiple Limit End X
104) Multiple Limit End X (lowest byte)
105) Multiple Limit End Y (highest byte)
106) Multiple Limit End Y (lowest byte)
107–162) Repeat bytes 93-106 for segments 2-5
163) Start Distance[11] (highest byte)
164) Start Distance
165) Start Distance
166) Start Distance (lowest byte)
167) Stop Distance (highest byte)

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7 See Control Byte #4 “Set Cell Master VNA Scale” for data format

8 marker point = (# of data points - 1) * (marker freq - start freq) / (stop freq - start freq) where # of data points can be found in bytes 55-56, start freq is in bytes 57-60, and stop freq is in bytes 61-64.

9 See Control Byte #6 “Set Cell Master VNA Single Limit” for data format.

10 See Control Byte #112 “Set Cell Master VNA Segmented Limit Lines” for data format.

11 Distance data uses units 1/100,000m (or feet)

168) Stop Distance
169) Stop Distance
170) Stop Distance (lowest byte)
171) Distance Marker 1[12] (highest byte)
172) Distance Marker 1 (lowest byte)
173) Distance Marker 2 (highest byte)
174) Distance Marker 2 (lowest byte)
175) Distance Marker 3 (highest byte)
176) Distance Marker 3 (lowest byte)
177) Distance Marker 4 (highest byte)
178) Distance Marker 4 (lowest byte)
179) Distance Marker 5 (highest byte)
180) Distance Marker 5 (lowest byte)
181) Distance Marker 6 (highest byte)
182) Distance Marker 6 (lowest byte)
183) Relative Propagation Velocity[13] (highest byte)
184) Relative Propagation Velocity
185) Relative Propagation Velocity
186) Relative Propagation Velocity (lowest byte)
187) Cable Loss[14] (highest byte)
188) Cable Loss
189) Cable Loss
190) Cable Loss (lowest byte)
191) Average Cable Loss[15] (highest byte)
192) Average Cable Loss
193) Average Cable Loss
194) Average Cable Loss (lowest byte)
195) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
196) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 2 Delta On/Off
bit 1 : Marker 3 Delta On/Off
bit 2 : Marker 4 Delta On/Off
bits 3-7 : Not Used
197) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bit 2: Trace Math On/Off
bits 3-5 : Not Used
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of Measurement (1b = Metric, 0b = English)

12 Marker Point = (# data points - 1) * (marker dist - start dist) / (stop dist - start dist) Where # of data points can be found in bytes 55-56, start dist is in bytes 163-166, and stop dist is in bytes 167-170.

13 Relative Propagation Velocity uses units 1/100,000

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

15 Average Cable Loss is dB * 1000.

198) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

199) Status Byte 5 (Cal Status):
00h : Calibration Off
01h : Standard Calibration On
02h : InstaCal Calibration On
03h : Standard FlexCal On
04h : InstaCal FlexCal On

200-228) Not Used

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

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

229-4364) Sweep Data (517 points * 8 bytes/point = 4136 bytes)
8 bytes for each data point
1. gamma[16] (highest byte)
2. gamma
3. gamma
4. gamma (lowest byte)
5. phase[17] (highest byte)
6. phase
7. phase
8. phase (lowest byte)

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

For Spectrum Analyzer Mode:

57) Start Frequency[18] (highest byte)
58) Start Frequency
59) Start Frequency
60) Start Frequency (lowest byte)
61) Stop Frequency (highest byte)
62) Stop Frequency
63) Stop Frequency
64) Stop Frequency (lowest byte)
65) Center Frequency (highest byte)
66) Center Frequency
67) Center Frequency
68) Center Frequency (lowest byte)
69) Frequency Span (highest byte)
70) Frequency Span
71) Frequency Span

16 Gamma data uses 1/10,000 units.

17 Phase data uses 1/10 degree unit.

18 Frequency in Hz

72) Frequency Span (lowest byte)
73) Minimum Frequency Step Size (highest byte)
74) Minimum Frequency Step Size
75) Minimum Frequency Step Size
76) Minimum Frequency Step Size (lowest byte)
77) Ref Level[19] (highest byte)
78) Ref Level
79) Ref Level
80) Ref Level (lowest byte)
81) Scale per div[20] (highest byte)
82) Scale per div
83) Scale per div
84) Scale per div (lowest byte)
85) Frequency Marker 1[21] (highest byte)
86) Frequency Marker 1 (lowest byte)
87) Frequency Marker 2 (highest byte)
88) Frequency Marker 2 (lowest byte)
89) Frequency Marker 3 (highest byte)
90) Frequency Marker 3 (lowest byte)
91) Frequency Marker 4 (highest byte)
92) Frequency Marker 4 (lowest byte)
93) Frequency Marker 5 (highest byte)
94) Frequency Marker 5 (lowest byte)
95) Frequency Marker 6 (highest byte)
96) Frequency Marker 6 (lowest byte)
97) Single Limit[22] (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 Level[23]) (highest byte)
106) Multiple Upper Limit 1 Start Y (Power Level)
107) Multiple Upper Limit 1 Start Y (Power Level)
108) Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
109) Multiple Upper Limit 1 End X (Frequency in Hz) (highest byte)
110) Multiple Upper Limit 1 End X (Frequency in Hz)
111) Multiple Upper Limit 1 End X (Frequency in Hz)
112) Multiple Upper Limit 1 End X (Frequency in Hz) (lowest byte)
113) Multiple Upper Limit 1 End Y (Power Level) (highest byte)
114) Multiple Upper Limit 1 End Y (Power Level)
115) Multiple Upper Limit 1 End Y (Power Level)
116) Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
117-260) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 101-116 for format)

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19 Value sent as (Value in dBm * 1000) + 270,000

20 Value sent as (Value * 1000)

21 Value sent as data point on display. Freq = (Point * Span / (Total Data Points - 1)) + Start Freq

22 Value sent as (Value in dBm * 1000) + 270,000

23 Value sent as (value in dBm * 1000) + 270,000

261) RBW Setting (Frequency in Hz) (highest byte)
262) RBW Setting (Frequency in Hz)
263) RBW Setting (Frequency in Hz)
264) RBW Setting (Frequency in Hz) (lowest byte)
265) VBW Setting (Frequency in Hz) (highest byte)
266) VBW Setting (Frequency in Hz)
267) VBW Setting (Frequency in Hz)
268) VBW Setting (Frequency in Hz) (lowest byte)
269) OCC BW Method (0b = % of power, 1b = dB down)
270) OCC BW % Value[24] (highest byte)
271) OCC BW % Value
272) OCC BW % Value
273) OCC BW % Value (lowest byte)
274) OCC BW dBc [25](highest byte)
275) OCC BW dBc
276) OCC BW dBc
277) OCC BW dBc (lowest byte)
278) Attenuation[26] (highest byte)
279) Attenuation
280) Attenuation
281) Attenuation (lowest byte)
282-297)Antenna Name(16 bytes in ASCII)
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 : Not Used
bit 1 : Marker 2 Delta On/Off
bit 2 : Marker 3 Delta On/Off
bit 3 : Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (Manual = 0b, Auto = 1b)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 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 = RMS average 10b = neg. peak 11b=sampling mode)
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 : Not Used
301) Status Byte 4[27]
(0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)

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24 % value is 0-99

25 dBc value 0 - 120 dBc

26 Value sent as (value in dB * 1000)

27 For bits 2, 1 and 0 ("X" is don't care): 0X0=no limit, 1X0=single limit, 0X1=multiple limit, 1X1=multiple limit.

bit 1 : Not Used
bit 2 : Single Limit On/Off
bit 3 : Single Limit Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 1 Status On/Off
bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[28]
bit 6 : Multiple Limit Upper Segment 2 Status On/Off
bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

302) Status Byte 5
(0b = Off/Beep if data is below line, 1b = On/Beep if data is above line)
(LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Upper Segment 4 Status On/Off
bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Upper Segment 5 Status On/Off
bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 1 Status On/Off
bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW[29]

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

304) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies no averaging)
bit 7: Not Used

305) Reference Level Offset [30](highest byte)
306) Reference Level Offset
307) Reference Level Offset
308) Reference Level Offset (lowest byte)
309) External Reference Frequency [31]
310) Signal Standard (highest byte) [32]
311) Signal Standard (lowest byte)
312) Channel Selection (highest byte) [33]
313) Channel Selection (lowest byte)
314) Interference Analysis Cellular Standard[34]
315) Interference Analysis Estimated Bandwidth (highest byte)
316) Interference Analysis Estimated Bandwidth
317) Interference Analysis Estimated Bandwidth
318) Interference Analysis Estimated Bandwidth (lowest byte)
319) Interference Analysis Frequency (in Hz) (highest byte)
320) Interference Analysis Frequency (in Hz)
321) Interference Analysis Frequency (in Hz)

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28 Upper limits always trigger an error beep if data is ABOVE the limit segment, for example, this bit is always 1b.

29 LOWER limits always trigger an error beep if data is BELOW the limit segment, for example, this bit is always 0b.

30 Value sent as (value in dBm * 1000) + 270,000

31 1 byte in MHz (i.e. 20 = 20MHz)

32 Index into Standard list (use control byte #89 to retrieve the ASCII string name). “No Standard” is sent as FFFEh.

33 “No Channel” is sent as FFFEh.

34 4 Standards -00h=1250 kHZ CDMA, 01h=GSM, 02h=TDMA, 03h=AMPS, 04h=Unknown, FFh=Interference Analysis measurement off

322) Interference Analysis Frequency (in Hz) (lowest byte)
323-326) Reserved
327) Trigger Type [35]
328) Trigger Position (0-100%)
329) Min Sweep Time (in μs) (higest byte)
330) Min Sweep Time (in μs)
331) Min Sweep Time (in μs)
332) Min Sweep Time (in μs) (lowest byte)
333) Video Trigger Level (highest byte) [36]
334) Video Trigger Level
335) Video Trigger Level
336) Video Trigger Level (lowest byte)
337) Status Byte 8
(LSB) bits 0-1: Trace Math operation (00b=A only 01b=A-B 10b=A+B)
bits 2-7: Not Used
338-400) Not Used
401-2004) Sweep Data (401 points * 4 bytes/point= 1604 bytes)
4 bytes for each data point
1. dBm[37] (highest byte)
2. dBm
3. dBm
4. dBm (lowest byte)

For T1 Tester / E1 Tester Mode:

57) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
58) Framing Mode
(T1 Mode: 01h: ESF, 02h: D4SF)
(E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
59) Line Coding (01h: B8ZS, 02h: AMI, 03h: HDB3)
60) Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
61) Clock Source (00h: External, 01h: Internal)
62) Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
63) Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
64) Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)
65) CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
66) Display Type (00h: Histogram, 01h: Raw Data)
67) Impedance (Valid for E1 Only) (01h: 75 Ù, 02h: 120 Ù)
68) Pattern (higher byte)
69) Pattern (lower byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
70) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
71) Insert Bit Error Value (1-1000) (highest byte)
72) Insert Bit Error Value
73) Insert Bit Error Value
74) Insert Bit Error Value (lowest byte)
75) Insert BPV Error Value (1-1000) (highest byte)
76) Insert BPV Error Value
77) Insert BPV Error Value

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35 Trigger Type 00h=single, 01h=free run, 02h=video, 03h=external

36 Value sent as (value in dBm ∗ 1000) + 270,000.

37 Value sent as (value in dBm * 1000) + 270,000

78) Insert BPV Error Value (lowest byte)
79) Insert Frame Error Value (1-1000) (highest byte)
80) Insert Frame Error Value
81) Insert Frame Error Value
82) Insert Frame Error Value (lowest byte)
83) Measurement Duration (highest byte)
84) Measurement Duration
85) Measurement Duration
86) Measurement Duration (lowest byte) (00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days)
87) Histogram Resolution (highest byte)
88) Histogram Resolution
89) Histogram Resolution
90) Histogram Resolution (lowest byte) (00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min)
91) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
92) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
93) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
94) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
95 – 98) BPV Error Count
99 – 102) CRC Error Count
103 – 106) Frame Error Count
107 – 110) LOF Error Count
111 – 114) E Bit Error Count (E1 Only)
115 – 118) Errored Seconds
119 – 122) Bit Count
123 – 126) Bit Errors
127) User Defined Pattern (convert to binary for pattern) (highest byte)
128) User Defined Pattern
129) User Defined Pattern
130) User Defined Pattern (lowest byte)
131 – 138) Measurement Start Time String (ASCII string: “HH:MM:SS”)
139 – 150) Reserved
151 – 158) Measurement Stop Time String (ASCII string: “HH:MM:SS”)
159 – 170) Reserved
171 – 181) Elapsed Time String (ASCII string: “DD,HH:MM:SS”)
182 – 189) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
190 – 689) 100 data points with 5 bytes for each data point.
1st byte has information about Carrier Loss, Frame Loss, BPV and CRC
Following 4 bytes correspond to the Bit Error Count
Break down of the 1st byte :

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Not Used	Not Used	Not Used	Carrier Loss	Frame Loss	BPV Error	CRC/E-bit Error	Any error

690 – 800) Not Used

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

1-2) Number of following bytes (9 bytes for invalid sweep recall)
3-4) Model # (unsigned integer, 13h for Cell Master Model MT8212A)
5-11) Extended Model # (7 bytes in ASCII)

Cell Master Returns (Invalid sweep location): 1byte

1) 224 (E0) Parameter Error: Invalid sweep location

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

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

The Cell Master saves all parameters described in Query System Status - Control Byte #20 (14h), (except Serial Port Echo Status) to the specified store location. Store location 0 is the run-time setup of the Cell Master. It holds the power-on defaults of the Cell Master.

Bytes to Follow: 1 byte

1) Location to save system setup parameters:
   0 – 10 for SWR Mode, Return Loss Mode, Cable Loss Mode and DTF Mode
   0 – 5 for Spectrum Analyzer Mode
   0 – 5 for T1/E1 Modes

Cell Master Returns: 1 byte

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

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

Description: Recalls system setup parameters from a specific store location. Storage locations depend on the measurement mode of the current setup. When the current mode is Spectrum Analyzer, Spectrum Analyzer setups (1-5) can be recalled. When the current mode is one of the Cell Master VNA modes (SWR, RL, CL, DTF), one of the 10 VNA mode setups can be recalled. When the current mode is T1/E1, one of the T1/E1 setups can be recalled (1-5).

The Cell Master recalls all parameters described in Query System Status - Control Byte #20 (14h), (except Serial Port Echo Status) from the specified store location. The recalled setup does not automatically become the power-on runtime setup when exiting remote.

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

Bytes to Follow: 1 byte

1) Location from which to recall system setup parameters:
   0 = Run time setup for all measurement modes
   1 – 10 = Saved setups for Cell Master VNA modes SWR, RL, CL, DTF
   1 – 5 = Saved setups for Spectrum Analyzer mode
   1 – 5 = Saved setups for T1/E1 modes
   255 = Default setup

Cell Master Returns: 1 byte

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

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

Description: Queries the Cell Master for current system settings.

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

Bytes to Follow: 0 bytes

Cell Master Returns: 800 bytes

1) Measurement Mode[38]
2) Cell Master VNA Mode Data Points (highest byte)
3) Cell Master VNA Mode Data Points (lowest byte)
4) VNA Start Frequency (Frequency in Hz) (highest byte)
5) VNA Start Frequency
6) VNA Start Frequency
7) VNA Start Frequency (lowest byte)
8) VNA Stop Frequency (Frequency in Hz) (highest byte)
9) VNA Stop Frequency
10) VNA Stop Frequency
11) VNA Stop Frequency (lowest byte)
12) VNA Scale Start (highest byte)[39]
13) VNA Scale Start
14) VNA Scale Start
15) VNA Scale Start (lowest byte)
16) VNA Scale Stop (highest byte)
17) VNA Scale Stop
18) VNA Scale Stop
19) VNA Scale Stop (lowest byte)
20) VNA Frequency Marker 1 (highest byte)[40]
21) VNA Frequency Marker 1(lowest byte)
22) VNA Frequency Marker 2 (highest byte)
23) VNA Frequency Marker 2 (lowest byte)
24) VNA Frequency Marker 3 (highest byte)
25) VNA Frequency Marker 3 (lowest byte)
26) VNA Frequency Marker 4 (highest byte)
27) VNA Frequency Marker 4 (lowest byte)
28) VNA Frequency Marker 5 (highest byte)
29) VNA Frequency Marker 5 (lowest byte)
30) VNA Frequency Marker 6 (highest byte)
31) VNA Frequency Marker 6 (lowest byte)
32) Cell Master VNA Single Limit (highest byte)[41]
33) Cell Master VNA Single Limit
34) Cell Master VNA Single Limit
35) Cell Master VNA Single Limit (lowest byte)
36) VNA Multiple Limit Segment # (1)
37) VNA Multiple Limit Segment Status (0h = Off, 01h = On)
38) VNA Multiple Limit Segment Start X (highest byte)[42]
39) VNA Multiple Limit Segment Start X
40) VNA Multiple Limit Segment Start X
41) VNA Multiple Limit Segment Start X (lowest byte)
42) VNA Multiple Limit Segment Start Y (highest byte)
43) VNA Multiple Limit Segment Start Y (lowest byte)
44) VNA Multiple Limit Segment End X (highest byte)
45) VNA Multiple Limit Segment End X
46) VNA Multiple Limit Segment End X

38 Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

39 See “Set Cell Master VNA Scale” Control Byte #4 for data format.

40 Marker Point = (# data points - 1) * (marker freq - start freq) / (stop freq - start freq) Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.

41 See Control Byte #6, “Set Cell Master VNA Single Limit” for data format.

42 See Control Byte #112, “Set Cell Master VNA Segmented Limit Lines” for data format.

47) VNA Multiple Limit Segment End X (lowest byte)
48) VNA Multiple Limit Segment End Y (highest byte)
49) VNA Multiple Limit Segment End Y (lowest byte)
50-105) Repeat bytes 36 – 49 for segments 2 - 5
106) Start Distance (highest byte)[43]
107) Start Distance
108) Start Distance
109) Start Distance (lowest byte)
110) Stop Distance (highest byte)
111) Stop Distance
112) Stop Distance
113) Stop Distance (lowest byte)
114) Distance Marker 1 (highest byte)[44]
115) Distance Marker 1 (lowest byte)
116) Distance Marker 2 (highest byte)
117) Distance Marker 2 (lowest byte)
118) Distance Marker 3 (highest byte)
119) Distance Marker 3 (lowest byte)
120) Distance Marker 4 (highest byte)
121) Distance Marker 4 (lowest byte)
122) Distance Marker 5 (highest byte)
123) Distance Marker 5 (lowest byte)
124) Distance Marker 6 (highest byte)
125) Distance Marker 6 (lowest byte)
126) Relative Propagation Velocity (highest byte)[45]
127) Relative Propagation Velocity
128) Relative Propagation Velocity
129) Relative Propagation Velocity (lowest byte)
130) Cable Loss (highest byte)[46]
131) Cable Loss
132) Cable Loss
133) Cable Loss (lowest byte)
134) Average Cable Loss[47] (highest byte)
135) Average Cable Loss
136) Average Cable Loss
137) Average Cable Loss (lowest byte)
138) Spectrum Analyzer Mode Data Points (highest byte)
139) Spectrum Analyzer Mode Data Points (lowest byte)
140) Spectrum Analyzer Start Frequency[48] (highest byte)
141) Spectrum Analyzer Start Frequency
142) Spectrum Analyzer Start Frequency
143) Spectrum Analyzer Start Frequency (lowest byte)
144) Spectrum Analyzer Stop Frequency (highest byte)
145) Spectrum Analyzer Stop Frequency

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43 Distance data uses units 1/100,000m or 1/100,000 ft

44 Marker Point = (# data points - 1) * (marker dist - start dist) / (stop dist - start dist) Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.

45 Relative Propagation Velocity uses units 1/100,000.

46 Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.

47 Average Cable Loss is dB * 1000.

48 Frequency unit is Hz.

146) Spectrum Analyzer Stop Frequency
147) Spectrum Analyzer Stop Frequency (lowest byte)
148) Spectrum Analyzer Center Frequency (highest byte)
149) Spectrum Analyzer Center Frequency
150) Spectrum Analyzer Center Frequency
151) Spectrum Analyzer Center Frequency (lowest byte)
152) Spectrum Analyzer Frequency Span (highest byte)
153) Spectrum Analyzer Frequency Span
154) Spectrum Analyzer Frequency Span
155) Spectrum Analyzer Frequency Span (lowest byte)
156) Spectrum Analyzer Minimum Frequency Step Size (highest byte)
157) Spectrum Analyzer Minimum Frequency Step Size
158) Spectrum Analyzer Minimum Frequency Step Size
159) Spectrum Analyzer Minimum Frequency Step Size (lowest byte)
160) Ref Level (highest byte)[49]
161) Ref Level
162) Ref Level
163) Ref Level (lowest byte)
164) Scale per div (highest byte)[50]
165) Scale per div
166) Scale per div
167) Scale per div (lowest byte)
168) Spectrum Analyzer Frequency Marker 1 (highest byte)[51]
169) Spectrum Analyzer Frequency Marker 1 (lowest byte)
170) Spectrum Analyzer Frequency Marker 2 (highest byte)
171) Spectrum Analyzer Frequency Marker 2 (lowest byte)
172) Spectrum Analyzer Frequency Marker 3 (highest byte)
173) Spectrum Analyzer Frequency Marker 3 (lowest byte)
174) Spectrum Analyzer Frequency Marker 4 (highest byte)
175) Spectrum Analyzer Frequency Marker 4 (lowest byte)
176) Spectrum Analyzer Frequency Marker 5 (highest byte)
177) Spectrum Analyzer Frequency Marker 5 (lowest byte)
178) Spectrum Analyzer Frequency Marker 6 (highest byte)
179) Spectrum Analyzer Frequency Marker 6 (lowest byte)
180) Spectrum Analyzer Single Limit (highest byte)[52]
181) Spectrum Analyzer Single Limit
182) Spectrum Analyzer Single Limit
183) Spectrum Analyzer Single Limit (lowest byte)
184) SPA Multiple Upper Limit 1 Start X (Frequency in Hz) (highest byte)
185) SPA Multiple Upper Limit 1 Start X (Frequency in Hz)
186) SPA Multiple Upper Limit 1 Start X (Frequency in Hz)
187) SPA Multiple Upper Limit 1 Start X (Frequency in Hz) (lowest byte)
188) SPA Multiple Upper Limit 1 Start Y (Power Level) (highest byte) [53]
189) SPA Multiple Upper Limit 1 Start Y (Power Level)
190) SPA Multiple Upper Limit 1 Start Y (Power Level)
191) SPA Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)

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49 Value sent as (value in dBm * 1000) + 270,000)

50 Value sent as (value * 1000)

51 Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

52 Value sent as (value in dBm * 1000) + 270,000

53 Value sent as (value in dBm * 1000) + 270,000

192) SPA Multiple Upper Limit 1 End X (Frequency in Hz) (highest byte)
193) SPA Multiple Upper Limit 1 End X (Frequency in Hz)
194) SPA Multiple Upper Limit 1 End X (Frequency in Hz)
195) SPA Multiple Upper Limit 1 End X (Frequency in Hz) (lowest byte)
196) SPA Multiple Upper Limit 1 End Y (Power Level) (highest byte) [54]
197) SPA Multiple Upper Limit 1 End Y (Power Level)
198) SPA Multiple Upper Limit 1 End Y (Power Level)
199) SPA Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
200-343) SPA Multiple Upper Limits 2-5, multiple Lower Limits 1-5 (see bytes 184-199 for format)
344) RBW Setting (highest byte)[55]
345) RBW Setting
346) RBW Setting
347) RBW Setting (lowest byte)
348) VBW Setting (highest byte)[56]
349) VBW Setting
350) VBW Setting
351) VBW Setting (lowest byte)
352) OCC BW Method[57]
353) OCC BW % Value (highest byte)[58]
354) OCC BW % Value
355) OCC BW % Value
356) OCC BW % Value (lowest byte)
357) OCC BW dBc (highest byte)[59]
358) OCC BW dBc
359) OCC BW dBc
360) OCC BW dBc (lowest byte)
361) Attenuation (highest byte)
362) Attenuation
363) Attenuation
364) Attenuation (lowest byte)
365) Antenna Index(0-14)
366-381) Antenna Name (16 bytes in ASCII)
382) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Cell Master VNA Marker 1 On/Off
bit 1 : Cell Master VNA Marker 2 On/Off
bit 2 : Cell Master VNA Marker 3 On/Off
bit 3 : Cell Master VNA Marker 4 On/Off
bit 4 : Cell Master VNA Marker 5 On/Off
bit 5 : Cell Master VNA Marker 6 On/Off
bits 6- 7 : Not Used
383) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Not Used
bit 1 : Cell Master VNA Marker 2 Delta On/Off
bit 2 : Cell Master VNA Marker 3 Delta On/Off

54 Value sent as (value in dBm * 1000) + 270,000

55 0002h = 100Hz, 0003h = 300Hz, 0004h = 1kHz, 0005h = 3kHz, 0006h = 10 kHz, 0007h = 30 kHz, 0008h = 100 kHz, 0009h = 300 kHz, 000Ah = 1 MHz

56 0000h = 100 Hz, 0001h = 300 Hz, 0002h = 1 kHz, 0003h = 3 kHz, 0004h = 10 kHz, 0005h = 30 kHz, 0006h = 100 kHz, 0007h = 300 kHz

57 00h = % of power, 01h = dB down

58 0 - 99%

59 0 - 120 dBc

bit 3 : Cell Master VNA Marker 4 Delta On/Off
bits 4-7: Not Used

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

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

386) Status Byte 5: (0b = Off , 1b = On)
(LSB) bit 0 : Cell Master Limit Type (0b = Single, 1b = Multiple)
bit 1 : Cell Master Limit Beep On/Off
bit 2 : FREQ-SWR Multiple Limit Segment 1 Status On/Off
bit 3 : FREQ-SWR Multiple Limit Segment 2 Status On/Off
bit 4 : FREQ-SWR Multiple Limit Segment 3 Status On/Off
bit 5 : FREQ-SWR Multiple Limit Segment 4 Status On/Off
bit 6: FREQ-SWR Multiple Limit Segment 5 Status On/Off
bit 7 : Cell Master Single Limit Status On/Off

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

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

389) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used
bit 2 : DIST-SWR Multiple Limit Segment 1 Status On/Off
bit 3 : DIST-SWR Multiple Limit Segment 2 Status On/Off
bit 4 : DIST-SWR Multiple Limit Segment 3 Status On/Off
bit 5 : DIST-SWR Multiple Limit Segment 4 Status On/Off
bit 6: DIST-SWR Multiple Limit Segment 5 Status On/Off
bit 7 : Not Used

390) Status Byte 9: (0b = Off, 1b = On)
(LSB) bits 0-1: Not Used

bit 2: DIST-RL Multiple Limit Segment 1 Status On/Off
bit 3: DIST-RL Multiple Limit Segment 2 Status On/Off
bit 4: DIST-RL Multiple Limit Segment 3 Status On/Off
bit 5: DIST-RL Multiple Limit Segment 4 Status On/Off
bit 6: DIST-RL Multiple Limit Segment 5 Status On/Off
bit 7: Not Used

391) Status Byte 10: (0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW[60]
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW

392) Status Byte 11 : (0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW [61]

393) Status Byte 12 : (0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW

394) Status Byte 13:
(LSB) bits 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used

395) Status Byte 14: (0b = Off, 1b = On)
(LSB) bit 0 : Fixed CW Mode On/Off
bit 1 : Cell Master VNA Cal On/Off
bit 2 : LCD Back Light On/Off
bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
bit 4 : InstaCal On/Off
bits 5-6: Instrument Date Format[62]
bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)

396) Status Byte 15: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off

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60 Beep level is always 1b for upper segmented limit line

61 Beep level is always 0b for lower segmented limit line

62 MM/DD/YYYY = 00h, DD/MM/YYYY = 01h, YYYY/MM/DD = 02h.

bit 1 : Not Used
bit 2 : SPA Cal Status On/Off
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bits 5-6 : Detection Alg (00b=pos. peak 01b=RMS average 10b=neg. peak 11b=sampling mode)
bit 7 : Not Used

397) Status Byte 16: (0b = Off, 1b = On)
(LSB) bit 0: Serial Port Echo Status On/Off
bit 1: Return Sweep Time On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Not Used

398) Printer Type[63]
399) Current Language (0 = English, 1 = French, 2 = German, 3 = Spanish, 4 = Chinese, 5 = Japanese)
400) LCD Contrast Value (0-255)
401) RTC battery [64](higher byte)
402) RTC battery (lower byte)
403) PC board revision [65](higher byte)
404) PC board revision (lower byte)
405) Reference Level Offset[66] (highest byte)
406) Reference Level Offset
407) Reference Level Offset
408) Reference Level Offset (lowest byte)
409) External Reference Frequency [67]
410) Signal Standard (highest byte) [68]
411) Signal Standard (lowest byte)
412) Channel Selection (highest byte) [69]
413) Channel Selection (lowest byte)
414) Trigger Type [70]
415) Interference Analysis Frequency (in Hz) (highest byte)
416) Interference Analysis
417) Interference Analysis
418) Interference Analysis (lowest byte)
419) Power Meter Start Freq (highest byte)
420) Power Meter Start Freq
421) Power Meter Start Freq
422) Power Meter Start Freq (lowest byte)
423) Power Meter Stop Freq (highest byte)
424) Power Meter Stop Freq
425) Power Meter Stop Freq
426) Power Meter Stop Freq (lowest byte)

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63 See Control Byte #30 for supported printers.

64 Value sent as Volts * 10. For example, 2.7 V = 27.

65 This value is for internal use only.

66 Value is sent as (value in dB ∗ 1000) + 270,000

67 1 byte in MHz (i.e., 20 = 20MHz)

68 Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” is sent as FFFEh.

69 “No Channel” is sent as FFFEh.

70 Trigger Type - 00h=single, 01h=free run, 02h=video, 03h=external.

427) Power Meter Center Freq (highest byte)
428) Power Meter Center Freq
429) Power Meter Center Freq
430) Power Meter Center Freq (lowest byte)
431) Power Meter Span Freq (highest byte)
432) Power Meter Span Freq
433) Power Meter Span Freq
434) Power Meter Span Freq (lowest byte)
435) Power Meter Offset (highest byte)
436) Power Meter Offset
437) Power Meter Offset
438) Power Meter Offset (lowest byte)
439) Power Meter Relative (highest byte)[71]
440) Power Meter Relative
441) Power Meter Relative
442) Power Meter Relative (lowest byte)
443) Power Meter Status (00h = Off, 01h = On)
444) Power Meter Unit (00h = Watts, 01h = dBm)
445) Power Meter Relative Status (00h = Off, 01h = On)
446) Power Meter Offset Status (00h = Off, 01h = On)
447) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
448) T1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
449) T1 Framing Mode (01h: ESF, 02h: D4SF)
450) T1 Line Coding (01h: B8ZS, 02h: AMI)
451) T1 Clock Source (00h: External, 01h: Internal)
452) T1 Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
453) T1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
454) T1 Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
455) T1 CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
456) T1 Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)
457) T1 Pattern (highest byte)
458) T1 Pattern (lowest byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
459) T1 Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
460) T1 Display Type (00h: Histogram, 01h: Raw Data)
461) T1 Impedance
462 - 477) First User Defined Loop Code Down (16 bytes)
478- 493) Second User Defined Loop Code Down (16 bytes)
494- 509) First User Defined Loop Code Up (16 bytes)
510- 525) Second User Defined Loop Code Up (16 bytes)
526- 557) User Defined Pattern (32 bytes)
558) T1 1st User Defined Loop Up (highest byte)
559) T1 1st User Defined Loop Up (lowest byte)
560) T1 2nd User Defined Loop Up (highest byte)
561) T1 2nd User Defined Loop Up (lowest byte)
562) T1 1st User Defined Loop Down (highest byte)
563) T1 1st User Defined Loop Down (lowest byte)
564) T1 2nd User Defined Loop Down (highest byte)
565) T1 2nd User Defined Loop Down (lowest byte)
566) T1 User Defined Pattern (highest byte)
567) T1 User Defined Pattern

71 Value as (value in dBm + 100) * 1000

568) T1 User Defined Pattern
569) T1 User Defined Pattern (lowest Byte)
570) T1 Bit Error Insert Value (1-1000) (highest byte)
571) T1 Bit Error Insert Value
572) T1 Bit Error Insert Value
573) T1 Bit Error Insert Value (lowest byte)
574) T1 Frame Error Insert Value (1-1000) (highest byte)
575) T1 Frame Error Insert Value
576) T1 Frame Error Insert Value
577) T1 Frame Error Insert Value (lowest byte)
578) T1 BPV Error Insert Value (1-1000) (highest byte)
579) T1 BPV Error Insert Value
580) T1 BPV Error Insert Value
581) T1 BPV Error Insert Value (lowest byte)
582) T1 Graph Resolution in Sec (highest byte)
583) T1 Graph Resolution in Sec
584) T1 Graph Resolution in Sec
585) T1 Graph Resolution in Sec (lowest byte)
586) E1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
587) E1 Framing Mode (03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
588) E1 Line Coding (02h: AMI, 03h: HDB3)
589) E1 Clock Source (00h: External, 01h: Internal)
590) E1 Tx Level
591) E1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
592) E1 Loop Code
593) E1 CRC Method
594) E1 Loop Type
595) E1 Pattern (highest byte)
596) E1 Pattern (lowest byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
597) E1 Pattern Invert (00h: Non-Inverted, 01h: Inverted)
598) E1 Display Type (00h: Histogram, 01h: Raw Data)
599) E1 Impedance (01h: 75 Ω, 02h: 120 Ω)
600 - 615) First User Defined Loop Code Down (16 bytes)
616 - 631) Second User Defined Loop Code Down (16 Bytes)
632 - 647) First User Defined Loop Code Up (16 Bytes)
648 - 663) Second User Defined Loop Code Up (16 Bytes)
664 - 695) User Defined Pattern (32 Bytes)
696) E1 1st User Defined Loop Up (highest byte)
697) E1 1st User Defined Loop Up (lowest byte)
698) E1 2nd User Defined Loop Up (highest byte)
699) E1 2nd User Defined Loop Up (lowest byte)
700) E1 1st User Defined Loop Down (highest byte)
701) E1 1st User Defined Loop Down (lowest byte)
702) E1 2nd User Defined Loop Down (highest byte)
703) E1 2nd User Defined Loop Down (lowest byte)
704) E1 User Defined Pattern (highest byte)
705) E1 User Defined Pattern
706) E1 User Defined Pattern
707) E1 User Defined Pattern (lowest byte)
708) E1 Bit Error Insert Value (1-1000) (highest byte)
709) E1 Bit Error Insert Value
710) E1 Bit Error Insert Value

711) E1 Bit Error Insert Value (lowest byte)
712) E1 Frame Error Insert Value (1-1000) (highest byte)
713) E1 Frame Error Insert Value
714) E1 Frame Error Insert Value
715) E1 Frame Error Insert Value (lowest byte)
716) E1 BPV Error Insert Value (1-1000) (highest byte)
717) E1 BPV Error Insert Value
718) E1 BPV Error Insert Value
719) E1 BPV Error Insert Value (lowest byte)
720) E1 Graph Resolution in Sec (highest byte)
721) E1 Graph Resolution in Sec
722) E1 Graph Resolution in Sec
723) E1 Graph Resolution in Sec (lowest byte)
724) Trigger Position (0-100%)
725) Min Sweep Time (in μs) (highest byte)
726) Min Sweep Time (in μs)
727) Min Sweep Time (in μs)
728) Min Sweep Time (in μs) (lowest byte)
729) Video Trigger Level (highest byte) [72]
730) Video Trigger Level
731) Video Trigger Level
732) Video Trigger Level (lowest byte)
733) T1 Measurement Duration [73]
734-800) Not Used

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

Description: Triggers a self test on the Cell Master.

Bytes to Follow: 0 bytes

Cell Master Returns: 12 bytes

1) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Phase Lock Loop
   bit 1 : Integrator
   bit 2 : Battery
   bit 3 : Temperature
   bit 4 : EEPROM read/write
   bit 5 : RTC Battery
   bits 6- 7 : Not Used
2) Self-test report: (0b = Fail, 1b = Pass)
   (LSB) bit 0 : Spectrum Analyzer Lock
   bits 1–7 : Not Used

3) Battery Voltage (highest byte)
4) Battery Voltage (lowest byte)
5) Temperature (highest byte)
6) Temperature (lowest byte)
7) Lock Fail Counter (highest byte)
8) Lock Fail Counter (lowest byte)

72 Value sent as (value in dBm ∗ 1000) + 270,000.

73 Measurement Duration: 00h=manual, 01h=3 min, 02h=15 min, 03h=30 min, 04h=1 hr, 05h=3 hr, 06h=6 hr, 07h=12 hr, 08h=1 day, 09h=2 days.

9) Integrator Fail Counter (highest byte)
10) Integrator Fail Counter (lowest byte)
11) Spectrum Analyzer Lock Fail Counter (highest byte)
12) Spectrum Analyzer Lock Fail Counter (lowest byte)

Notes:

Battery Voltage in 1/10th of a Volt (e.g. 124 = 12.4 Volts)

Temperature in 1/10th of degree Celsius (e.g., 362 = 36.2°C) or degree Fahrenheit (e.g., 934 = 93.4°F), depending on the current measurement unit (Metric or English) selected

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 8 bytes

1) Value of SM Lock Fail Counter (highest byte)
2) Value of SM Lock Fail Counter (lowest byte)
3) Value of Integration Fail Counter (highest byte)
4) Value of Integration Fail Counter (lowest byte)
5) Value of SA Lock Fail Counter (highest byte)
6) Value of SA Lock Fail Counter (lowest byte)
7) Value of SA Fatal Error Counter (highest byte)
8) Value of SA Fatal Error Counter (lowest byte)

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

Description: Returns a list of all saved traces.

Bytes to Follow: 0 bytes

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

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

255 (FFh) Operation Complete Byte

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte

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

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

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

Bytes to Follow: 2004 bytes

1-2) # of following bytes (2002)
3) Measurement Mode[74]
4-7) Time/Date (long integer format[75])
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) # data points (401)
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 Level[76] (highest byte)
61) Ref Level
62) Ref Level
63) Ref Level (lowest byte)
64) Scale per div[77] (highest byte)
65) Scale per div
66) Scale per div
67) Scale per div (lowest byte)
68) Marker 1[78] (highest byte)
69) Marker 1 (lowest byte)
70) Marker 2 (highest byte)
71) Marker 2 (lowest byte)
72) Marker 3 (highest byte)
73) Marker 3 (lowest byte)
74) Marker 4 (highest byte)
75) Marker 4 (lowest byte)

74 See Control Byte #3 “Select Measurement Mode” for measurement modes.

75 Time/Date long integer representation is in seconds since January 1, 1997.

76 Value sent as (value in dBm * 1000) + 270,000

77 Value sent as (value * 1000)

78 Marker values are sent as # of data point on display. See Control Byte #102, “Set Spectrum Analyzer Marker” for calculation of data point.

76) Marker 5 (highest byte)
77) Marker 5 (lowest byte)
78) Marker 6 (highest byte)
79) Marker 6 (lowest byte)
80) Single Limit[79] (highest byte)
81) Single Limit
82) Single Limit
83) Single Limit (lowest byte)
84) Multiple Upper Limit 1 Start X (Frequency in Hz) (highest byte)
85) Multiple Upper Limit 1 Start X (Frequency in Hz)
86) Multiple Upper Limit 1 Start X (Frequency in Hz)
87) Multiple Upper Limit 1 Start X (Frequency in Hz) (lowest byte)
88) Multiple Upper Limit 1 Start Y (Power Level) (highest byte)
89) Multiple Upper Limit 1 Start Y (Power Level)
90) Multiple Upper Limit 1 Start Y (Power Level)
91) Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
92) Multiple Upper Limit 1 End X (Frequency in Hz) (highest byte)
93) Multiple Upper Limit 1 End X (Frequency in Hz)
94) Multiple Upper Limit 1 End X (Frequency in Hz)
95) Multiple Upper Limit 1 End X (Frequency in Hz) (lowest byte)
96) Multiple Upper Limit 1 End Y (Power Level) (highest byte)
97) Multiple Upper Limit 1 End Y (Power Level)
98) Multiple Upper Limit 1 End Y (Power Level)
99) Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
100-243) Multiple Upper Limits 2-5, Multiple Lower Limits 1-5 (see bytes 84-99 for format)
244) RBW Setting[80] (highest byte)
245) RBW Setting
246) RBW Setting
247) RBW Setting (lowest byte)
248) VBW Setting[81] (highest byte)
249) VBW Setting
250) VBW Setting
251) VBW Setting (lowest byte)
252) OCC BW Method (00h = % of power, 01h = dB down)
253) OCC BW % Value (0-99) (highest byte)
254) OCC BW % Value (0-99)
255) OCC BW % Value (0-99)
256) OCC BW % Value (0-99) (lowest byte)
257) OCC BW dBc (0-120) (highest byte)
258) OCC BW dBc (0-120)
259) OCC BW dBc (0-120)
260) OCC BW dBc (0-120) (lowest byte)
261) Attenuation[82] (highest byte)
262) Attenuation
263) Attenuation
264) Attenuation (lowest byte)
265-280) Antenna Name (16 bytes in ASCII)

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79 All amplitude values are sent as (value in dBm * 1000) + 270,000

80 Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000, 1,000,000

81 Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000

82 Value sent as (value * 1000)

281) 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

282) 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
bit 3 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 4 : Pre Amp Status On/Off
bit 5 : Dynamic Attenuation On/Off
bits 6-7: Not Used

283) Status Byte 3: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factor Correction On/Off
bits 1-2 : Detection alg (00b = pos. peak 01b = RMS average 10b = neg. peak 11b = sampling mode)
bits 3-4 : Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power Ratio On/Off
bit 7: Not Used

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

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

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

287) Status Byte 7
(LSB) bits 0-6: Number of Sweeps to Average (1-25, 1 implies averaging off)
bit 7 : Not Used

288) Reference Level Offset[83] (highest byte)
289) Reference Level Offset
290) Reference Level Offset
291) Reference Level Offset (lowest byte)

83 Value sent as (Value in dBm * 1000) + 270,000

292) External Reference Frequency[84]
293) Signal Standard (highest byte) [85]
294) Signal Standard (lowest byte)
295) Channel Selection (highest byte) [86]
296) Channel Selection (lowest byte)
297) Interference Analysis Cellular Standard[87]
298) Interference Analysis Estimated Bandwidth (highest byte)
299) Interference Analysis Estimated Bandwidth
300) Interference Analysis Estimated Bandwidth
301) Interference Analysis Estimated Bandwidth (lowest byte)
302) Interference Analysis Frequency (in Hz) (highest byte)
303) Interference Analysis Frequency (in Hz)
304) Interference Analysis Frequency (in Hz)
305) Interference Analysis Frequency (in Hz) (lowest byte)
306-309) Reserved
310) Trigger Type [88]
311) Trigger Position (0 - 100%)
312) Minimum Sweep Time (in µs) (highest byte)
313) Minimum Sweep Time (in µs)
314) Minimum Sweep Time (in µs)
315) Minimum Sweep Time (in µs) (lowest byte)
316) Video Trigger Level (highest byte) [89]
317) Video Trigger Level
318) Video Trigger Level
319) Video Trigger Level (lowest byte)
320) Status Byte 8
(LSB) bits 0-1: Trace Math Operation (00b=A only, 01b=A-B, 10b=A+B)
bits 2-7: Not Used
321-400) Not Used
401-2004) Sweep Data
(401 points ∗ 4 bytes/point = 1604 bytes)
4 bytes for each data point
1. dBm[90] (highest byte)
2. dBm
3. dBm
4. dBm (lowest byte)

Cell Master Returns: 1 byte

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

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84 byte in MHz (i.e. 20 = 20MHz)

85 Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” is sent as FFFEh.

86 “No Channel” is sent as FFFEh.

87 4 Standards - 00h = 1250 kHz CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement off.

88 Trigger Type - 00h = single, 01h = free run, 02h = video, 03h = external.

89 Value sent as (value in dBm ∗ 1000) + 270,000.

90 Value sent as (value in dBm * 1000) + 270,000

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

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

Upload Cell Master VNA Sweep Trace – Control Byte #28 (1Ch)

Description: Uploads a Cell Master VNA Mode (SWR, return loss, cable loss, DTF) sweep trace to the Cell Master.

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

1-2) # of following bytes
3) Measurement Mode[91]
4-7) Time/Date (in Long Integer)
8-17) Date in String Format (mm/dd/yyyy)
18-25) Time in String Format (hh:mm:ss)
26-41) Reference number stamp (16 ASCII bytes)
42-43) # of data points
44) Start Frequency (highest byte)[92]
45) Start Frequency
46) Start Frequency
47) Start Frequency (lowest byte)
48) Stop Frequency (highest byte)
49) Stop Frequency
50) Stop Frequency
51) Stop Frequency (lowest byte)
52) Minimum Frequency Step Size (highest byte)
53) Minimum Frequency Step Size
54) Minimum Frequency Step Size
55) Minimum Frequency Step Size (lowest byte)
56) Scale Top (highest byte)[93]
57) Scale Top
58) Scale Top
59) Scale Top (lowest byte)
60) Scale Bottom (highest byte)
61) Scale Bottom
62) Scale Bottom
63) Scale Bottom (lowest byte)
64) Frequency Marker 1 (highest byte)[94]
65) Frequency Marker 1 (lowest byte)
66) Frequency Marker 2 (highest byte)
67) Frequency Marker 2 (lowest byte)
68) Frequency Marker 3 (highest byte)
69) Frequency Marker 3 (lowest byte)

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

92 Frequency in Hz

93 See Control Byte #4, “Set Cell Master VNA Scale” for data format.

94 Marker point = (Number of data points - 1) * (marker freq - start freq) / (stop freq - start freq)

70) Frequency Marker 4 (highest byte)
71) Frequency Marker 4 (lowest byte)
72) Frequency Marker 5 (highest byte)
73) Frequency Marker 5 (lowest byte)
74) Frequency Marker 6 (highest byte)
75) Frequency Marker 6 (lowest byte)
76) Single Limit Line Value (highest byte)[95]
77) Single Limit Line Value
78) Single Limit Line Value
79) Single Limit Line Value (lowest byte)
80) Multiple Limit Segment # (1)
81) Multiple Limit Segment Status (00h = Off, 01h = On)
82) Multiple Limit Start X (highest byte)[96]
83) Multiple Limit Start X
84) Multiple Limit Start X
85) Multiple Limit Start X (lowest byte)
86) Multiple Limit Start Y (highest byte)
87) Multiple Limit Start Y (lowest byte)
88) Multiple Limit End X (highest byte)
89) Multiple Limit End X
90) Multiple Limit End X
91) Multiple Limit End X (lowest byte)
92) Multiple Limit End Y (highest byte)
93) Multiple Limit End Y (lowest byte)
94-149) Repeat bytes 80-93 for segments 2-5
150) Start Distance (highest byte)[97]
151) Start Distance
152) Start Distance
153) Start Distance (lowest byte)
154) Stop Distance (highest byte)
155) Stop Distance
156) Stop Distance
157) Stop Distance (lowest byte)
158) Distance Marker 1 (highest byte)[98]
159) Distance Marker 1 (lowest byte)
160) Distance Marker 2 (highest byte)
161) Distance Marker 2 (lowest byte)
162) Distance Marker 3 (highest byte)
163) Distance Marker 3 (lowest byte)
164) Distance Marker 4 (highest byte)
165) Distance Marker 4 (lowest byte)
166) Distance Marker 5 (highest byte)
167) Distance Marker 5 (lowest byte)
168) Distance Marker 6 (highest byte)
169) Distance Marker 6 (lowest byte)
170) Relative Propagation Velocity (highest byte)[99]

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95 See Control Byte #6, “Set Cell Master VNA Single Limit” for data format

96 See Control Byte #112, Set “Cell Master VNA Segmented Limit Lines” for data format.

97 Distance data uses units 1/100,000m or 1/100,000 ft

98 Marker point = (# of data points - 1) * (marker dist - start dist) / (stop dist - start dist)

99 Relative Propagation Velocity uses units 1/100,000

171) Relative Propagation Velocity
172) Relative Propagation Velocity
173) Relative Propagation Velocity (lowest byte)
174) Cable Loss (highest byte)[100]
175) Cable Loss
176) Cable Loss
177) Cable Loss (lowest byte)
178) Average Cable Loss[101] (highest byte)
179) Average Cable Loss
180) Average Cable Loss
181) Average Cable Loss (lowest byte)
182) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Marker 1 On/Off
bit 1 : Marker 2 On/Off
bit 2 : Marker 3 On/Off
bit 3 : Marker 4 On/Off
bit 4 : Marker 5 On/Off
bit 5 : Marker 6 On/Off
bits 6-7 : Not Used
183) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Marker 2 Delta On/Off
bit 1 : Marker 3 Delta On/Off
bit 2 : Marker 4 Delta On/Off
bits 3-7: Not Used
184) Status Byte 3: (0b = Off , 1b = On)
(LSB) bit 0 : Single Limit On/Off
bit 1: CW On/Off
bit 2: Trace Math On/Off
bits 3-5: Not Used
bit 6 : Limit Type (0b = Single; 1b = Multiple)
bit 7 : Unit of measurement (1b = Metric, 0b = English)
185) Status Byte 4:
(LSB) bit 0 - 1 : DTF Windowing Mode
bit: 1 0
| |
0 0 - Rectangular (No Windowing)
0 1 - Nominal Side Lobe
1 0 - Low Side Lobe
1 1 - Minimum Side Lobe
bits 2 – 7 : Not Used
186) Status Byte 5 (Cal Status) :
00h : Calibration Off
01h : Standard Calibration On
02h : InstaCal Calibration On
03h : Standard FlexCal On
04h : InstaCal FlexCal On
187-215) Not Used
216-1255) Sweep Data (130 points * 8 bytes/point= 1040 bytes)
216-2287) (259 points * 8 bytes/point= 2072 bytes)
216-4351) (517 points * 8 bytes/point= 4136 bytes)

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

101 Average Cable Loss is dB * 1000.

8 bytes for each data point
1. Gamma[102] (highest byte)
2. Gamma
3. Gamma
4. Gamma (lowest byte)
5. Phase[103] (highest byte)
6. Phase
7. Phase
8. Phase (lowest byte)

Cell Master Returns: 1 byte

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

Notes:

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

Select Printer Type – Control Byte #30 (1Eh)

Description: Select Printer Type.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte

102 Gamma uses units scaled to 1/10,000

103 Phase is transmitted in 1/10ths of a degree

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

Description: Select DTF Windowing Methods.

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

Set Cell Master VNA Trace Math – Control Byte #32 (20h)

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

Bytes to Follow: 2 bytes

1) Trace Math Operation
   - 00h = Off
   - 01h = Addition
   - 02h = Subtraction

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

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 2 bytes

1) Trace Overlay Operation
   - 00h = Off
   - 01h = On

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

Cell Master Returns: 1 byte

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

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

Description: Defines traces “A” and “B” for SPA mode.

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

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

Bytes to Follow: 3 bytes

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

Cell Master Returns: 1 byte

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

Get Options – Control Byte #37 (25h)

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1-4 bytes, depending on the option(s)

If NO options are installed:
“None”

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 30 bytes

1) Status Byte # 1(0b = Off, 1b = On)
   (LSB) bit 0 : Unit (0b - Watt/%, 1b - dBm/dB)
   bit 2 : Relative Mode On/Off
   bit 3: Offset Mode On/Off
   bit 4: Zero Mode On/Off
   bits 5-7: Not Used
2) RMS Averaging Status[104]
3 - 6) Relative Mode Reference Power Level in dBm
7 - 10) Offset Mode Power Level
11 - 14) Zero Mode Power Level
15 - 18) Absolute Power Level
19 - 22) Power
23 - 26) Center Frequency (in Hz)
27 - 30) Span Frequency (in Hz)

Notes:

Power is returned as (dBm * 1000)
Relative power is returned as (dB * 1000)
Offset is returned as (dB * 1000)
Frequencies are returned in Hz

104 RMS Averaging, 00h = Off, 01h = Low, 02h = Medium, 03h = High

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

Description: Set Power Meter units to watts or dBm.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Enable or disable Power Meter Relative Mode.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Enable or disable Power Meter Offset Mode.

Bytes to Follow: 5 bytes

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

Cell Master Returns: 1 byte

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

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

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

Description: Enable or disable Power Meter Zeroing Mode.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Set Power Meter RMS Averaging. Enabling to one of three different levels, or off.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 8 bytes

1) Center Frequency (in Hz) (highest byte)
2) Center Frequency (in Hz)
3) Center Frequency (in Hz)
4) Center Frequency (in Hz) (lowest byte)
5) Span Frequency (in Hz) (highest byte)
6) Span Frequency (in Hz)
7) Span Frequency (in Hz)
8) Span Frequency (in Hz) (lowest byte)

Cell Master Returns: 1 byte

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

Trigger Sweep – Control Byte #48 (30h)

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 2 bytes

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

Trigger Sweep – Control Word (AA30h)

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 2 bytes

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

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

Description: Return Smart Battery status.

Bytes to Follow: 0 bytes

Cell Master Returns: 17 bytes

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

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

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

Valid range is 50 to 200,000,000.

Bytes to Follow: 4 bytes

1) Minimum Sweep Time (in μs) (highest byte)
2) Minimum Sweep Time (in μs)
3) Minimum Sweep Time (in μs)
4) Minimum Sweep Time (in μs) (lowest byte)

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

1) Trigger Position (0 - 100%)

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 4 bytes

1) Trigger Level (highest byte)
2) Trigger Level
3) Trigger Level
4) Trigger Level (lowest byte)

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

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

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

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

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 13 bytes

1-2) Model # (unsigned integer, 13h for Cell Master MT8212A)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version - 4 bytes (ASCII)

Enter Remote Mode Immediately – Control Byte #70 (46h)

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

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

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 13 bytes

1-2) Model # (unsigned integer, 13h for Cell Master MT8212A)
3-9) Extended Model # (7 bytes in ASCII)
10-13) Software Version (4 bytes in ASCII)

Write Custom Cable – Control Byte #80 (50h)

Description: Write a cable parameter in the custom cable list.

Bytes to Follow: 25 bytes

1) Not Used
2) Cable List index (0 - 49)
3 – 17) Cable Description (string)
18) Propagation Velocity (highest byte)[105]
19) Propagation Velocity
20) Propagation Velocity
21) Propagation Velocity (lowest byte)

105 Propagation Velocity in units 1/100,000

22) Insertion Loss (highest byte)[106]
23) Insertion Loss
24) Insertion Loss
25) Insertion Loss (lowest byte)

Cell Master Returns: 1 byte

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

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

Description: Query a cable in the custom cable list.

Bytes to Follow: 2 bytes

1) Not Used
2) Cable list index (0-49)

Cell Master Returns: 24 bytes

1) Upper bound of Custom Cable Index
2 – 16) Cable Description (string)
17) Propagation Velocity (highest byte)[107]
18) Propagation Velocity
19) Propagation Velocity
20) Propagation Velocity (lowest byte)
21) Insertion Loss (highest byte)[108]
22) Insertion Loss
23) Insertion Loss
24) Insertion Loss (lowest byte)

Write Antenna – Control Byte #82 (52h)

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

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

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 (highest byte)

106 Insertion Loss in units 1/100,000 dB/m or 1/100,000 dB/ft

107 Propagation Velocity in units 1/100,000

108 Insertion Loss in units 1/100,000 dB/m or 1/100,000 dB/ft

6) Antenna Factor (lowest byte)

Cell Master Returns: 1 byte

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

Recall Antenna – Control Byte #83 (53h)

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

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

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

Bytes to Follow: 1 byte

1) Antenna List index (1-10)

Cell Master 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 (highest byte)
6) Antenna Factor (lowest byte)

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

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

11. MAXRAD MPA1750 - 1710-1880 MHz
12. MAXRAD MPA1850 - 1850-1990 MHz
13. MAXRAD MPA2450 - 2400-2483.5 MHz
14. Centurion EXC SM806 - 806-899 MHz
15. Centurion EXE-902-SM - 896-941 MHz

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

Bytes to Follow: 2 bytes

1) Field Strength Measurement State (On/Off)
2) Antenna List index (1-15)

Cell Master Returns: 1 byte

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

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

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

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

Send a 1 (one) to set the channel power associated with the trace that was most recently uploaded by command #26, Upload SPA Sweep Trace.

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

Bytes to Follow: 14 bytes

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

Cell Master Returns: 1 byte

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

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master 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 Power (= (power in dBm * 1000) + 270000)
18-21) Channel Power Density (= (density in dBm/Hz * 1000) + 270000)

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

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

Cell Master Returns: 1 byte

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

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master 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 Power (= (power in dBm * 1000) + 270000)
22-25) Lower Adjacent Channel Power (= (power in dBm * 1000) + 270000)
26-29) Upper Adjacent Channel Power (= (power in dBm * 1000) + 270000)

Read Signal Standard Name – Control Byte #89 (59h)

Description: Returns the name corresponding to the desired signal standard index as an ASCII string in English.

Bytes to Follow: 2 bytes

1) Signal Standard Index (higher byte)
2) Signal Standard Index (lower byte)

Cell Master Returns: 2 bytes + number of bytes in string (or 1 byte on error)

1) String length (in number of bytes - referred to as “X” on the next line)
2-(X+1) Standard Name in ASCII
X+2) 255 (FFh) Operation Complete Byte

or

1) 224 (E0h) Parameter Error
   238 (EEh) Time Out Error

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

Description: Measure OCC BW with % of Power method.

Bytes to Follow: 4 bytes

1) % of Power (highest byte)
2) % of Power
3) % of Power
4) % of Power (lowest byte) (in 100th of %, 9123 = 91.23%)

Cell Master Returns: 16 bytes

1-4) OCC BW (frequency in Hz)
5-8) Measure dB down (dB * 100,000)
9-12) Low Frequency OCC BW (frequency in Hz)
13-16) High Frequency OCC BW (frequency in Hz)

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

Description: Measure OCC BW with dB down method.

Bytes to Follow: 4 bytes

1-4) dB down (in 100th of dB, 1234 = 12.34dB)

Cell Master Returns: 16 bytes

1-4) OCC BW (frequency in Hz)
5-8) Measure % of Power (% of power * 100)
9-12) Low Frequency OCC BW (frequency in Hz)
13-16) High Frequency OCC BW (frequency in Hz)

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

Description: Sets the spectrum analyzer start and stop frequencies. Frequencies are sent 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)

Cell Master Returns: 1 byte

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

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

Description: Sets the spectrum analyzer center frequency and span. Frequencies are sent 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)

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 8 bytes

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

Cell Master Returns: 1 byte

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

Notes:

Ref Level is sent as the (Ref Level * 1000) + 270,000 (0 dBm = 270,000, 20 dBm = 290000, -120 dBm = 150,000)

Scale should be sent as (dBm * 1000) (e.g., -12.34 dBm = -12340)

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

Description: Sets an individual Spectrum Analyzer marker.

Bytes to Follow: 5 bytes

1) Marker Number (01h = marker 1, 02h = marker 2, 03h = marker 3, 04h = marker 4, 05h = marker 5, 06h = marker 6)
2) Marker Line On/Off (01h = On, 00h = Off)
3) Marker Delta Status On/Off (01h = On, 00h = Off)
4) Marker Value (highest byte)
5) Marker Value (lowest byte)

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 6 bytes

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

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 1 byte

1) Max Hold State
   00h – Max Hold Off
   01h – Max Hold On

Cell Master Returns: 1 byte

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

Set Spectrum Analyzer Resolution Bandwidth – Control Byte #106 (6Ah)

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

Bytes to Follow: 1 byte

1) Resolution Bandwidth Index
   02h – 100 Hz BW
   03h – 300 Hz BW
   04h – 1 kHz BW
   05h – 3 kHz BW
   06h – 10 kHz BW
   07h – 30 kHz BW
   08h – 100 kHz BW
   09h – 300 kHz BW
   0Ah – 1 MHz BW

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

1) Video Bandwidth Index
   - 00h – 3 Hz BW
   - 01h – 10 Hz BW
   - 02h – 30 Hz BW
   - 03h – 100 Hz BW
   - 04h – 300 Hz BW
   - 05h – 1 kHz BW
   - 06h – 3 kHz BW
   - 07h – 10 kHz BW
   - 08h – 30 kHz BW
   - 09h – 100 kHz BW
   - 0Ah – 300 kHz BW
   - 0Bh – 1 MHz BW

Cell Master Returns: 1 byte

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

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

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

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

1) Marker Number (1-6)

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

1) Marker Number (1-4)

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 1 byte

1) Attenuation Value (0-51)

Cell Master Returns: 1 byte

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

Set Cell Master VNA Segmented Limit Lines – Control Byte #112 (70h)

Description: Sets the position and On/Off status of the segmented limit lines for the VNA modes.

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

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

See control byte #20 (14h) response byte 36 to 105 for the current Cell Master configuration.

Bytes to Follow: 14 bytes

1) Limit Number
2) Limit Line On/Off (01h = On, 00h = Off)
3) Starting X (highest byte)[109]
4) Starting X
5) Starting X
6) Starting X (lowest byte)
7) Starting Y (highest byte)
8) Starting Y (lowest byte)
9) Ending X (highest byte)[110]
10) Ending X
11) Ending X
12) Ending X (lowest byte)

109 Frequency in Hz or distance in 1/100,000 ft (or meters)

110 Frequency in Hz or distance in 1/100,000 ft (or meters)

13) Ending Y (highest byte)
14) Ending Y (lowest byte)

Cell Master Returns: 1 byte

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

Notes: Limit Value depends on the current display mode selected.

Return Loss &:	Limit should be sent as (dB * 1000)
Cable Loss	Maximum value sent is 60000 which represents 60.00 dB
	Minimum value sent is 0 which represents 0.0 dB
SWR:	Limit is in thousandths (of ratio), so it should be sent as (ratio * 1000)
	Maximum value sent is 65530 which represents 65.53
	Minimum value sent is 1000 which represents 1.00

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

Description: Sets the position and ON/OFF Status of a limit segment.

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

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

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

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

Bytes to Follow: 20 bytes

1) Segment number (1-5)
2) Segment type (00h = LOWER limit, 01h = UPPER limit)
3) Limit Line ON/OFF (01h = On, 00h = Off)
4) Limit Beep ON/OFF (01h = On, 00h = Off)
5) Limit Value Start X [111](highest byte)
6) Limit Value Start X
7) Limit Value Start X
8) Limit Value Start X (lowest byte)
9) Limit Value Start Y [112](highest byte)
10) Limit Value Start Y
11) Limit Value Start Y
12) Limit Value Start Y (lowest byte)
13) Limit Value End X [113](highest byte)
14) Limit Value End X
15) Limit Value End X

111 Frequency in Hz

112 (Value in dBm * 1000) + 270,000

113 Frequency in Hz

16) Limit Value End X (lowest byte)
17) Limit Value End Y [114](highest byte)
18) Limit Value End Y
19) Limit Value End Y
20) Limit Value End Y (lowest byte)

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Set the value of the reference level offset.

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

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

Send the value as (value in dB * 1000) + 270,000.

For example, to compensate for a 30 dB attenuator, the reference level offset should be -30 dB. That value would be sent over the serial port as (-30 * 1000) + 270,000 = 240,000.

Bytes to Follow: 4 bytes

1) Reference Level Offset (highest byte)
2) Reference Level Offset
3) Reference Level Offset
4) Reference Level Offset (lowest byte)

Cell Master Returns: 1 byte

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

114 (Value in dBm * 1000) + 270,000

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

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

Bytes to Follow: 1 byte

1) Marker number (1-6)

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

1) Frequency (in Hz) (highest byte)
2) Frequency (in Hz)
3) Frequency (in Hz)
4) Frequency (in Hz) (lowest byte)
5) Value at Marker (highest byte)
6) Value at Marker
7) Value at Marker
8) Value at Marker (lowest byte)

or

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

Note: 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)

Cell Master Returns: 1 byte

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

Field InstaCal – Control Byte #120 (78h)

Description: This command is used by the customer in the field to start an InstaCal sequence.

Prior to sending this command to the Cell Master, the InstaCal module should be connected to the R/F Out port. To execute this command, exit remote mode after sending this command.

Byte to Follow: 0 bytes

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Communication Error : Cell Master was unable to communicate with InstaCal module
   238 (EEh) Time Out Error : Field InstaCal sequence was unable to complete

Read InstaCal Module ASCII Serial Number – Control Byte #124 (7Ch)

Description: Returns the InstaCal Module serial number in ASCII.

Bytes to Follow: 1 byte

1) Serial number storage location (01h=main serial, 02h=secondary)

Cell Master Returns: 8 bytes

1-8) Serial Number, in ASCII

Set Cell Master Marker (Peak/Valley) – Control Byte #129 (81h)

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

Bytes to Follow: 2 bytes

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

Cell Master Returns: 3 bytes (1 byte if an error occurs)

1) Marker Position (higher byte)[115]
2) Marker Position (lower byte)
3) 255 (FFh) Operation Complete Byte

or

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

Set / Reset Spectrum Analyzer External Reference – Control Byte #133 (85h)

Description: Sets the external reference frequency for the spectrum analyzer in increments of 1 MHz from 2 – 20 MHz. The frequencies are sent in Hz.

Bytes to Follow: 1 byte if turning the reference OFF, 5 bytes if turning the reference ON

Turn OFF the external reference:

1) 00h - Turn OFF the frequency reference

or

Turn ON the external reference (the reference frequency is also sent):

1) 01h - Turn ON the frequency reference
2) External Reference Frequency (in Hz) (highest byte)
3) External Reference Frequency (in Hz)
4) External Reference Frequency (in Hz)
5) External Reference Frequency (in Hz) (lowest byte)

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

On Success:

115 The marker position is sent as a data point on the display. Equivalent Frequency = (position * span / (# data points - 1)) + start frequency

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

or

On Error:

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

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

Description: Sets the state of Spectrum Analyzer preamplifier.

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

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

Set Baud Rate – Control Byte #197 (C5h)

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

Set Language – Control Byte #198 (C6h)

Description: Set the Cell Master display language.

Bytes to Follow: 1 byte

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

05h = Japanese

Cell Master Returns: 1 byte

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

Query Time – Control Byte #208 (D0h)

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

Bytes to Follow: 0 bytes

Cell Master Returns: 8 bytes (HH:MM:SS)

1) Hour (higher byte)
2) Hour (lower byte)
3) :
4) Minute (higher byte)
5) Minute (lower byte)
6) :
7) Second (higher byte)
8) Second (lower byte)

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

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

Bytes to Follow: 1 byte

1) Serial number storage location
   01h = Main (External) Serial Number,
   02h = Secondary (Motherboard) Serial Number
   03h = T1/E1 Serial Number

Cell Master Returns: 8 bytes

1-8) Serial Number (in ASCII)

Exit Remote Mode – Control Byte #255 (FFh)

Description: Cell Master exits remote mode

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

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

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

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete

Set T1 Transmission Level – Control Word (A001h)

Description: Sets the transmission level of T1 measurement mode.

Bytes to Follow: 1 byte

1) Transmission Level
   - 00h: 0 dB
   - 01h: -7.5 dB
   - 02h: -15 dB
   - 03h: -22 dB

Cell Master Returns: 1 byte

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

Set T1/E1 Clock Source – Control Word (A002h)

Description: Sets the Clock Source of T1/E1 measurement mode.

Bytes to Follow: 1 byte

1) Clock Source
   - 00h: Internal
   - 01h: External

Cell Master Returns: 1 byte

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

Set T1/E1 Pattern – Control Word (A003h)

Description: Sets the data pattern of T1/E1 measurement mode.

Bytes to Follow: 2 bytes

1) Data Pattern
   - 00h: AUTO_DETECT
   - 01h: PRBS_9
   - 02h: PRBS_11
   - 03h: PRBS_15
   - 04h: PRBS_20 (O.151)
   - 05h: PRBS_20 (O.153)
   - 06h: PRBS_23
   - 07h: QRSS
   - 08h: ONE_IN_8
   - 09h: TWO_IN_8
   - 0Ah THREE_IN_24
   - 0Bh: ALL_ONES
   - 0Ch: ALL_ZEROS
   - 0Dh: T1_DALY
   - 0Eh: BLUE_ALARM
   - 0Fh: YELLOW_ALARM
   - 10h: USER_DEFINED
2) Inverted Pattern Option (01h: Inverted; 00h: Non-inverted)

Cell Master Returns: 1 byte

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

Set T1/E1 Error Insert Type/Value – Control Word (A004h)

Description: Sets the Insertion Error type and the number of errors.

Bytes to Follow: 5 bytes

1) Error Type
   - 00h: Bit
   - 01h: Bert
   - 02h: BPV
   - 03h: Framing
2) Number of Errors (highest byte)
3) Number of Errors
4) Number of Errors
5) Number of Errors (lowest byte)

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid error type or value
   238 (EEh) Time Out Error

Set T1/E1 Framing Mode – Control Word (A005h)

Description: Sets the Framing Mode of T1/E1 measurement.

Bytes to Follow: 1 byte

1) Framing Mode
   - 00h: Auto (T1 Tester Only)
   - 01h: D4 SF
   - 02h: ESF (E1 Tester Only)
   - 03h: PCM30
   - 04h: PCM30 CRC
   - 05h: PCM31
   - 06h: PCM31 CRC

Cell Master Returns: 1 byte

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

Start and Stop T1/E1 Measurement – Control Word (A006h)

Description: This command toggles the Run/Stop state of the T1/E1 measurement. That is, if the command is sent while the measurement is running, the command stops the measurement. If the command is sent when the measurement is stopped, the command starts the measurement.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

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

Insert Error for T1/E1 Measurement – Control Word (A007h)

Description: This command inserts the error defined into the data flow.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

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

Get T1/E1 Pattern – Control Word (A008h)

Description: Get the current T1/E1 pattern.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) T1 Pattern

or

1) 238 (EEh) Time Out Error

Get T1/E1 Frame Sync Status – Control Word (A009h)

Description: Get the frame sync status of T1 /E1.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) Frame Sync Status (00h: Framed; 01h: Unframed)

or

1) 238 (EEh) Time Out Error

Get T1/E1 Pattern Sync Status – Control Word (A00Ah)

Description: Get the pattern sync status of T1/ E1.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) Pattern Sync Status (00h: In-sync; 01h: Out-of-sync)

or

1) 238 (EEh) Time Out Error

Get T1/E1 Carrier Status – Control Word (A00Bh)

Description: Get the carrier status of T1/E1.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

1) Carrier Status (00h: Carrier present; 01h: No carrier)

or

1) 238 (EEh) Time Out Error

Get T1/E1 Error Type and Number – Control Word (A00Ch)

Description: Get the error type and number of T1/E1.

Bytes to Follow: 0 bytes

Cell Master Returns: 16 bytes in T1 mode, 18 bytes in E1 mode, 1 byte on error

1) Frame Loss (higher byte)
2) Frame Loss (lower byte)
3) Bit Errors (highest byte)
4) Bit Errors
5) Bit Errors
6) Bit Errors (lowest byte)
7) BER (higher byte)
8) BER (lower byte)
9) BPV (higher byte)
10) BPV (lower byte)
11) CRC (higher byte)
12) CRC (lower byte)

T1:

13) Errored Seconds (highest byte)
14) Errored Seconds
15) Errored Seconds
16) Errored Seconds (lowest byte)

E1:

13) E Bits (higher byte)
14) E Bits (lower byte)
15) Errored Seconds (highest byte)
16) Errored Seconds
17) Errored Seconds
18) Errored Seconds (lowest byte)

or

1) 238 (EEh) Time Out Error

Set T1/E1 Line Coding Options – Control Word (A00Dh)

Description: Sets the line coding options of T1/E1 measurement mode.

Bytes to Follow: 1 byte

1) Line Coding
   00h: B8ZS (for T1 only)
   01h: AMI
   02h: HDB3 (for E1 only)

Cell Master Returns: 1 byte

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

Set E1 Impedance Options – Control Word (A00Eh)

Description: Sets the impedance for the E1 mode. Note that impedance is set separately for BERT and Vpp measurements.

Bytes to Follow: 2 bytes

1) E1 Measurement (00h: BERT, 01h: Vpp)
2) Impedance
   00h: 75Ω
   01h: 120Ω

Cell Master Returns: 1 byte

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

Read T1/E1 Volts Peak-to-Peak – Control Word (A00Fh)

Description: Initiates the Vpp measurement on the T1 board and returns the result.

Vpp value is sent as (Vpp ∗ 10).

Bytes to Follow: 0 bytes

Cell Master Returns: 3 bytes

1) Volts peak-to-peak (higher byte)
2) Volts peak-to-peak (lower byte)
3) 255 (FFh) Operation Complete Byte
   238 (EEh) Time-out Error

Set T1/E1 Receive Input Configuration Options - Control Word (A013h)

Description: Sets the Rx Input Configuration for the T1/E1 modes.

Bytes to Follow: 2 bytes

1) T1/E1 Measurement (00h: BERT, 01h: Vpp)
2) Rx Input Config
   00h: Terminate
   01h: Bridged
   02h: Monitor +20 dB (BERT only)

Cell Master Returns: 1 byte

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

Set T1/E1 Measurement Duration - Control Word (A014h)

Description: Sets the measurement duration for the current mode (T1 or E1).

Bytes to Follow: 1 byte

1) Measurement Duration Index
   00h: Manual
   01h: 3 minutes

02h: 15 minutes
03h: 30 minutes
04h: 1 hour
05h: 3 hours
06h: 6 hours
07h: 12 hours
08h: 1 day
09h: 2 days

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid duration or not in T1 or E1 mode
   238 (EEh) Time Out Error

Set T1/E1 Data Logging - Control Word (A015h)

Description: Enables and disables data logging for T1/E1 modes. The ability to log data depends on the amount of available memory.

Bytes to Follow: 1 byte

1) Data Logging Status
   00h: Off
   01h: On

Cell Master Returns: 1 byte

1) 255 (FFh) Operation Complete Byte
   224 (E0h) Parameter Error: Invalid status or not enough memory
   238 (EEh) Time Out Error

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

Description: Selects a Signal Standard. Use this command for both Spectrum Analyzer and Power Meter modes. See the "Signal Standards" section for a list of standards and their indices.

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

Select SPA/Power Meter Channel - Control Word (A104h)

Description: Selects a channel within the range of the currently selected signal standard. Use this command for both Spectrum Analyzer and Power Meter modes. See the "Signal Standards" section for a list of valid channels for the selected channel.

Bytes to Follow: 2 bytes

1) Channel (higher byte)
2) Channel (lower byte)

Cell Master Returns: 1 byte

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

Parameter Definitions

Parameter	# of bytes	Step	Example / Description
Frequency	4 bytes unsigned	1 Hz	1000.3 MHz = 1000300000
Scale (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
Limit (RL, CL)	2 bytes unsigned	1 / 1000 dB	51.3 dB = 51300
(SWR)	2 bytes unsigned	1 / 1000 (ratio)	65.53 = 65530
Markers (frequency and distance marker)	2 bytes unsigned	1 sweep point	Marker values are given in relative position of the graph. The lowest value is 0, the highest is (# of data points –1).
Distance	4 bytes unsigned	1/100,000 m/ft	12.34 m = 1234000
Relative Propagation Velocity	4 bytes unsigned	1 / 100,000	0.837 = 83700
Cable Loss	4 bytes unsigned	1 / 100,000 dB	-0.345 dB/m = 34500
Gamma	4 bytes signed	1 / 10,000 (ratio)	Gamma value is the ratio of magnitude of the reflected signal over the magnitude of the incident signal.
Phase	4 bytes signed	1 / 10 degree	Phase value is the difference in phase between the incident and reflected signals.
Power: dBm/dB	4 bytes signed	1 / 1000 dBm 1 / 1000 dB	51.3 dBm = 51300 10.4 dB = 10400
Lock Fail Counter	2 bytes unsigned	1 error count	234 fails = 234
Integrator Fail Counter	2 bytes unsigned	1 error count	123 fails = 123

Signal Standards

Index	Standard	Center	Span	Valid Channels
00h	AMPS / EIA 553 - Uplink	859000000	70000000	1-799, 990-1023
01h	AMPS / EIA 553 - Downlink	859000000	70000000	1-799, 990-1023
02h	C-450 (P) - Uplink	463500000	21000000	1-800
03h	C-450 (P) - Downlink	463500000	21000000	1-800
04h	C-450 (SA) - Uplink	462500000	15000000	1-247
05h	C-450 (SA) - Downlink	462500000	15000000	1-247
06h	CDMA US Cellular - Uplink	859000000	70000000	1-799, 990-1023
07h	CDMA US Cellular - Downlink	859000000	70000000	1-799, 990-1023
08h	CDMA US PCS - Uplink	1920000000	140000000	1-1199
09h	CDMA US PCS - Downlink	1920000000	140000000	1-1199
0Ah	CDMA Korea PCS - Uplink	1810000000	120000000	1-599
0Bh	CDMA Korea PCS - Downlink	1810000000	120000000	1-599
0Ch	CDMA Japan / ARIB - Uplink	878500000	93000000	1-799, 801-1039, 1041-1199
0Dh	CDMA Japan / ARIB - Downlink	878500000	93000000	1-799, 801-1039, 1041-1199
0Eh	CDMA China - 1 - Uplink	916000000	88000000	0-1000, 1329-2047
0Fh	CDMA China - 1 - Downlink	916000000	88000000	0-1000, 1329-2047
10h	CDMA China - 2 - Uplink	910000000	76000000	0-1000
11h	CDMA China - 2 - Downlink	910000000	76000000	0-1000
12h	CDMA2000 Class 0, Korea Cellular - Uplink	859000000	70000000	1-799, 990-1023
13h	CDMA2000 Class 0, Korea Cellular - Downlink	859000000	70000000	1-799, 990-1023
14h	CDMA2000 Class 0, N.A. Cellular - Uplink	859000000	70000000	1-799, 990-1023
15h	CDMA2000 Class 0, N.A. Cellular - Downlink	859000000	70000000	1-799, 990-1023
16h	CDMA2000 Class 1, N.A. PCS - Uplink	1920000000	140000000	0-1199
17h	CDMA2000 Class 1, N.A. PCS - Downlink	1920000000	140000000	0-1199
18h	CDMA2000 Class 2, (TACS Band) - Uplink	916000000	88000000	0-1100, 1329-2047
19h	CDMA2000 Class 2, (TACS Band) - Downlink	916000000	88000000	0-1100, 1329-2047
1Ah	CDMA2000 Class 3, (JTACS Band) - Uplink	878500000	93000000	1-799, 801-1039, 1041-1199
1Bh	CDMA2000 Class 3, (JTACS Band) - Downlink	878500000	93000000	1-799, 801-1039, 1041-1199
1Ch	CDMA2000 Class 4, Korea PCS - Uplink	1810000000	120000000	0-599
1Dh	CDMA2000 Class 4, Korea PCS - Downlink	1810000000	120000000	0-599
1Eh	CDMA2000 Class 5, (NMT-450-20 kHz) - Uplink	472500000	43000000	1039-1473, 1792-2016
1Fh	CDMA2000 Class 5, (NMT-450-20 kHz) - Downlink	472500000	43000000	1039-1473, 1792-2016
20h	CDMA2000 Class 5, (NMT-450-25 kHz) - Uplink	439500000	57000000	1-300, 539-871
21h	CDMA2000 Class 5, (NMT-450-25 kHz) - Downlink	439500000	57000000	1-300, 539-871
22h	CDMA2000 Class 6, IMT-2000 - Uplink	2045000000	250000000	0-1199
23h	CDMA2000 Class 6, IMT-2000 - Downlink	2045000000	250000000	0-1199
24h	CDMA2000 Class 7, N.A. 700 MHz Cellular - Uplink	770000000	48000000	0-359
25h	CDMA2000 Class 7, N.A. 700 MHz Cellular - Downlink	770000000	48000000	0-359
26h	ETACS - Uplink	916000000	88000000	0-1000, 1329-2047

Index	Standard	Center	Span	Valid Channels
27h	ETACS - Downlink	916000000	88000000	0-1000, 1329-2047
28h	GSM 900 - Uplink	897400000	40000000	1-124, 975-1023
29h	GSM 900 - Downlink	942400000	40000000	1-124, 975-1023
2Ah	GSM 1800 - Uplink	1747400000	80000000	512-885
2Bh	GSM 1800 - Downlink	1842400000	80000000	512-885
2Ch	GSM 1900 - Uplink	1879800000	80000000	512-810
2Dh	GSM 1900 - Downlink	1959800000	80000000	512-810
2Eh	JTACS - Uplink	878500000	93000000	0-1198 (even numbers only)
2Fh	JTACS - Downlink	878500000	93000000	0-1198 (even numbers only)
30h	MATS-E - Uplink	925000000	70000000	1-1000
31h	MATS-E - Downlink	925000000	70000000	1-1000
32h	N-AMPS / IS-88L - Uplink	859000000	70000000	1-799, 990-1023
33h	N-AMPS / IS-88L - Downlink	859000000	70000000	1-799, 990-1023
34h	N-AMPS / IS-88M - Uplink	859000000	70000000	1-799, 990-1023
35h	N-AMPS / IS-88M - Downlink	859000000	70000000	1-799, 990-1023
36h	N-AMPS / IS-88U - Uplink	897500000	147000000	1-799, 990-1023
37h	N-AMPS / IS-88U - Downlink	897500000	147000000	1-799, 990-1023
38h	NADC IS136 Cellular - Uplink	859000000	70000000	1-799, 990-1023
39h	NADC IS136 Cellular - Downlink	859000000	70000000	1-799, 990-1023
3Ah	NADC IS136 PCS - Uplink	1920000000	140000000	1-1199
3Bh	NADC IS136 PCS - Downlink	1920000000	140000000	1-1199
3Ch	NMT-411-25 kHz - Uplink	420500000	19000000	539-871
3Dh	NMT-411-25 kHz - Downlink	420500000	19000000	539-871
3Eh	NMT-450-20 kHz - Uplink	460500000	19000000	1039-1473
3Fh	NMT-450-20 kHz - Downlink	460500000	19000000	1039-1473
40h	NMT-450-25 kHz - Uplink	459000000	18000000	1-300
41h	NMT-450-25 kHz - Downlink	459000000	18000000	1-300
42h	NMT-470-20 kHz - Uplink	486500000	15000000	1972-2016
43h	NMT-470-20 kHz - Downlink	486500000	15000000	1972-2016
44h	NMT-900 - Uplink	925000000	70000000	1-1000
45h	NMT-900 - Downlink	925000000	70000000	1-1000
46h	NMT-900 (Offset) - Uplink	925000000	70000000	1025-2023
47h	NMT-900 (Offset) - Downlink	925000000	70000000	1025-2023
48h	NTACS - Uplink	878500000	93000000	1-1199
49h	NTACS - Downlink	878500000	93000000	1-1199
4Ah	PDC 800 Analog - Uplink	891500000	97000000	0-1680
4Bh	PDC 800 Analog - Downlink	891500000	97000000	0-1680
4Ch	PDC 1500 (JDC) - Uplink	1513000000	72000000	0-960
4Dh	PDC 1500 (JDC) - Downlink	1513000000	72000000	0-960
4Eh	PHS - Uplink	1906500000	23000000	1-77
4Fh	PHS - Downlink	1906500000	23000000	1-77

Index	Standard	Center	Span	Valid Channels
50h	SMR 800 - 12.5 kHz - Uplink	836000000	60000000	1-1199
51h	SMR 800 - 12.5 kHz - Downlink	836000000	60000000	1-1199
52h	SMR 800 - 25 kHz - Uplink	836000000	60000000	1-600
53h	SMR 800 - 25 kHz - Downlink	836000000	60000000	1-600
54h	SMR 1500 - Uplink	1483000000	60000000	1-479
55h	SMR 1500 - Downlink	1483000000	60000000	1-479
56h	TACS - Uplink	925000000	70000000	1-1000
57h	TACS - Downlink	925000000	70000000	1-1000
58h	802.11b - Uplink	2442000000	84000000	1-14
59h	802.11b - Downlink	2442000000	84000000	1-14
5Ah	802.11 DS - Uplink	2448000000	72000000	1-14
5Bh	802.11 DS - Downlink	2448000000	72000000	1-14
5Ch	802.11 FH - Uplink	2448500000	93000000	2-95
5Dh	802.11 FH - Downlink	2448500000	93000000	2-95
5Eh	802.11g - Uplink	2442000000	84000000	1-14
5Fh	802.11g - Downlink	2442000000	84000000	1-14

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