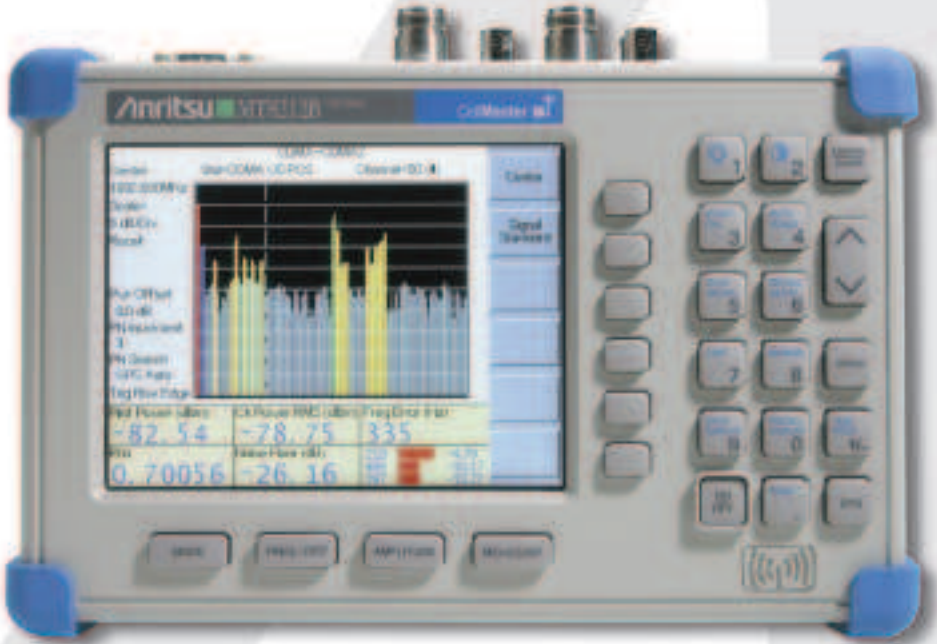


Cell Master™

MT8212B

An Integrated, Handheld Multi-function Base Station Test Tool for Greater Flexibility and Technician Productivity.



Programming Manual



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Programming Overview

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

This programming menu is written exclusively for Anritsu Cell Master model MT8212B. For information on firmware upgrades, please contact your local Anritsu service center.

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

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

Cabling

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

Serial Communication Parameters

The Cell Master communicates at a baud rate of 9600. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used. The Set Baud Rate serial command Control Byte #197 (C5h) can be used to change the baud rate to other common baud rates.

Communications Error Checking

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. The expected number of response bytes for each control byte (listed in the control byte description section of this manual) works well for responses coming from the 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 a sweep. Send the Enter Remote Mode Immediately byte #70 (46h) to enter remote mode in the middle of a sweep.

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

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

Exiting Remote Mode

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

Lifetime of Changes to Cell Master Operating Parameters

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

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

Write Cycle Limitation of EEPROM

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

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

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

Documentation Conventions

Through this manual the following conventions will be observed:

Numeric Representation:

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

Binary numbers are represented with the suffix b. For example, the decimal number 2 is represented in binary as 10b.

Decimal numbers are represented with the prefix # when referring to a control byte (command byte) and without a prefix or suffix in all other cases.

Bit Positions:

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

Control Byte Descriptions

Setup System – Control Byte #1 (01h)

Description: Sets system status flags and switches. The current value of the flags can be obtained by executing command #29, Query System Setup, and parsing the values from the appropriate bytes. The 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 #29 (1Dh) response bytes 170 (VNA modes) and 275 and 276 (Spectrum Analyzer mode) 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: Logarithmic Amplitude Units (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV)

bits 5-6: Detection Algorithm (00b = Positive Peak 01b = RMS Average
10b = Negative Peak 11b = Sampling 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

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

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 #29 (1Dh) response bytes 28 to 35 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
-

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 #29 (1Dh) response byte 3 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
 - 31h: Transmission Mode
 - 39h: Channel Scanner Mode
 - 3Bh: Interference Analyzer Mode
 - 3Ch: CW Signal Generator Mode
 - 40h: Power Meter Mode (narrow band)
 - 41h: Power Monitor Mode (Option 5)
 - 60h: T1 Tester Mode
 - 70h: E1 Tester Mode
 - 90h: CDMA Measurement Mode
 - 91h: GSM Measurement Mode
 - 92h: EVDO 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 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 #29 (1Dh) response bytes 36 to 43 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 measurement 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) do the following:

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

See control byte #29 (1Dh) response bytes 44 to 55 for current frequency markers.

See control byte #29 (1Dh) response bytes 138 to 149 for current distance markers.

See control byte #29 (1Dh) response byte 162 for current marker on/off status.

Bytes to Follow: 5 bytes

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

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

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 the 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 #29 (1Dh) response bytes 56-59, and byte 164 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

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.

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

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

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

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

See control byte #29 (1Dh) response bytes 130-137 (Distance), 150-157 (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 #33 to recall trace 0 and examining response bytes 31-38.

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

Bytes to Follow: 7 bytes

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

Cell Master Returns: 1 byte

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

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

Description: Stores a Reference Number with the sweep trace.

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

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

Bytes to Follow: 16 bytes (ASCII text string)

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 the 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.

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 = Not Used
05h = Abort

Cell Master Returns: 1 byte

- 1) 255 (FFh) Operation Complete Byte
224 (E0h) Error : Invalid Cal operation or Cal Incomplete
238 (Eeh) Time-out Error
-

Set Cell Master VNA 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 Trace Name (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
-

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 #29 (1Dh), (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 Power Meter 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 #29 (1Dh), (except Serial Port Echo Status) from the specified store location. The recalled setup does **not** automatically become the power-on runtime setup when exiting remote. Therefore, a call to #29 will not display the parameters in that setup.

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

Bytes to Follow: 1 byte

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

Cell Master Returns: 1 byte

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

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

Description: Triggers a self test on the Cell Master.

Bytes to Follow: 0 bytes

Cell Master Returns: 12 bytes

- 1) Self-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-report: (0b = Fail, 1b = Pass)
(LSB) bit 0 : Spectrum Analyzer Lock
bits 1–7 : Not Used
- 3) Battery Voltage (higher byte)
- 4) Battery Voltage (lower byte)
- 5) Temperature (higher byte)
- 6) Temperature (lower byte)
- 7) Lock Fail Counter (higher byte)
- 8) Lock Fail Counter (lower byte)
- 9) Integrator Fail Counter (higher byte)
- 10) Integrator Fail Counter (lower byte)
- 11) Spectrum Analyzer Lock Fail Counter (higher byte)
- 12) Spectrum Analyzer Lock Fail Counter (lower 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 (higher byte)
 - 2) Value of SM Lock Fail Counter (lower byte)
 - 3) Value of Integration Fail Counter (higher byte)
 - 4) Value of Integration Fail Counter (lower byte)
 - 5) Value of SA Lock Fail Counter (higher byte)
 - 6) Value of SA Lock Fail Counter (lower byte)
 - 7) Value of SA Fatal Error Counter (higher byte)
 - 8) Value of SA Fatal Error Counter (lower byte)
-

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

- 1) 255 (FFh) Operation Complete Byte
-

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

Description: Returns a list of all saved traces.

Bytes to Follow: 0 bytes

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
-

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)
-

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

This command is new to the MT8212A. Use it, instead of Control Byte #20, to access the new features.

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

The current state of the 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 #29. The new start frequency will be returned in the defined bytes, even though no sweep has been performed with that frequency.

Bytes to Follow: 0 bytes

Cell Master Returns:

For All Modes:

- 1) Number of Following Bytes (higher byte)
- 2) Number of Following Bytes (lower byte)
- 3) Measurement Mode³
- 4) Printer Type⁴
- 5) Current Language
(00h = English, 01h = French, 02h = German, 03h = Spanish, 04h = Chinese, 05h = Japanese)
- 6) LCD Contrast Value (0-255)
- 7) Date Format
(00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD)
- 8) RTC battery ⁵ (higher byte)
- 9) RTC battery (lower byte)
- 10) PC Board Revision ⁶ (higher byte)
- 11) PC Board Revision (lower byte)
- 12-13) Digital Mother Board ID. Beginning with motherboard 64968, the hardware includes a 9-bit digital ID port. The digital ID will be used together with the PC Board Revision (mother board ID voltage) to identify the board and “dash” number. For boards prior to 64968, bytes 12 and 13 will be 0
- 14-25) Not Used

For Cell Master VNA Modes:

- 26) Cell Master VNA Mode Data Points (higher byte)
- 27) Cell Master VNA Mode Data Points (lower byte)
- 28) VNA Start Frequency (Frequency in Hz) (highest byte)
- 29) VNA Start Frequency
- 30) VNA Start Frequency
- 31) VNA Start Frequency (lowest byte)
- 32) VNA Stop Frequency (Frequency in Hz) (highest byte)
- 33) VNA Stop Frequency
- 34) VNA Stop Frequency
- 35) VNA Stop Frequency (lowest byte)
- 36) VNA Scale Start (highest byte)⁷
- 37) VNA Scale Start
- 38) VNA Scale Start
- 39) VNA Scale Start (lowest byte)
- 40) VNA Scale Stop (highest byte)

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

⁴ See Control Byte #30 for supported printers.

⁵ Value sent as Volts * 10. For example, 2.7 V = 27.

⁶ This value is for internal use only.

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

- 41) VNA Scale Stop
- 42) VNA Scale Stop
- 43) VNA Scale Stop (lowest byte)
- 44) VNA Frequency Marker 1 (higher byte)⁸
- 45) VNA Frequency Marker 1 (lower byte)
- 46) VNA Frequency Marker 2 (higher byte)
- 47) VNA Frequency Marker 2 (lower byte)
- 48) VNA Frequency Marker 3 (higher byte)
- 49) VNA Frequency Marker 3 (lower byte)
- 50) VNA Frequency Marker 4 (higher byte)
- 51) VNA Frequency Marker 4 (lower byte)
- 52) VNA Frequency Marker 5 (higher byte)
- 53) VNA Frequency Marker 5 (lower byte)
- 54) VNA Frequency Marker 6 (higher byte)
- 55) VNA Frequency Marker 6 (lower byte)
- 56) Cell Master VNA Single Limit (highest byte)⁹
- 57) Cell Master VNA Single Limit
- 58) Cell Master VNA Single Limit
- 59) Cell Master VNA Single Limit (lowest byte)
- 60) VNA Multiple Limit Segment # (1)
- 61) VNA Multiple Limit Segment Status (0h = Off, 01h = On)
- 62) VNA Multiple Limit Segment Start X (highest byte)¹⁰
- 63) VNA Multiple Limit Segment Start X
- 64) VNA Multiple Limit Segment Start X
- 65) VNA Multiple Limit Segment Start X (lowest byte)
- 66) VNA Multiple Limit Segment Start Y (higher byte)
- 67) VNA Multiple Limit Segment Start Y (lower byte)
- 68) VNA Multiple Limit Segment End X (highest byte)
- 69) VNA Multiple Limit Segment End X
- 70) VNA Multiple Limit Segment End X
- 71) VNA Multiple Limit Segment End X (lowest byte)
- 72) VNA Multiple Limit Segment End Y (higher byte)
- 73) VNA Multiple Limit Segment End Y (lower byte)
- 74-129) Repeat bytes 60 – 73 for segments 2 - 5
- 130) Start Distance (highest byte)¹¹
- 131) Start Distance
- 132) Start Distance
- 133) Start Distance (lowest byte)
- 134) Stop Distance (highest byte)
- 135) Stop Distance
- 136) Stop Distance
- 137) Stop Distance (lowest byte)
- 138) Distance Marker 1 (higher byte)¹²
- 139) Distance Marker 1 (lower byte)
- 140) Distance Marker 2 (higher byte)
- 141) Distance Marker 2 (lower byte)
- 142) Distance Marker 3 (higher byte)
- 143) Distance Marker 3 (lower byte)

⁸ Marker Point = (# data points – 1) * (marker freq – start freq) / (stop freq – start freq)

Where # of data points can be found in bytes 2-3, start freq is in bytes 4-7, and stop freq is in bytes 8-11.

⁹ See Control Byte #6, “Set 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 1/100,000 ft

¹² Marker Point = (# data points – 1) * (marker dist – start dist) / (stop dist – start dist)

Where # of data points can be found in bytes 2-3, start dist is in bytes 106-109, and stop dist is in bytes 110-113.

- 144) Distance Marker 4 (higher byte)
- 145) Distance Marker 4 (lower byte)
- 146) Distance Marker 5 (higher byte)
- 147) Distance Marker 5 (lower byte)
- 148) Distance Marker 6 (higher byte)
- 149) Distance Marker 6 (lower byte)
- 150) Relative Propagation Velocity (highest byte)¹³
- 151) Relative Propagation Velocity
- 152) Relative Propagation Velocity
- 153) Relative Propagation Velocity (lowest byte)
- 154) Cable Loss (highest byte)¹⁴
- 155) Cable Loss
- 156) Cable Loss
- 157) Cable Loss (lowest byte)
- 158) Average Cable Loss¹⁵ (highest byte)
- 159) Average Cable Loss
- 160) Average Cable Loss
- 161) Average Cable Loss (lowest byte)
- 162) Status Byte 1: (0b = Off , 1b = On)
 - (LSB) bit 0 : Cell Master Marker 1 On/Off
 - bit 1 : Cell Master Marker 2 On/Off
 - bit 2 : Cell Master Marker 3 On/Off
 - bit 3 : Cell Master Marker 4 On/Off
 - bit 4 : Cell Master Marker 5 On/Off
 - bit 5 : Cell Master Marker 6 On/Off
 - bits 6- 7 : Not Used
- 163) Status Byte 2: (0b = Off, 1b = On)
 - (LSB) bit 0 : Not Used
 - bit 1 : Cell Master Marker 2 Delta On/Off
 - bit 2 : Cell Master Marker 3 Delta On/Off
 - bit 3 : Cell Master Marker 4 Delta On/Off
 - bits 4-7: Not Used
- 164) Status Byte 3: (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
- 165) Status Byte 4: (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
- 166) Status Byte 5: (0b = Off, 1b = On)
 - (LSB) bits 0-1: Not Used
 - bit 2: FREQ-CL Multiple Limit Segment 1 Status On/Off

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.

- bit 3: FREQ-CL Multiple Limit Segment 2 Status On/Off
 - bit 4: FREQ-CL Multiple Limit Segment 3 Status On/Off
 - bit 5: FREQ-CL Multiple Limit Segment 4 Status On/Off
 - bit 6: FREQ-CL Multiple Limit Segment 5 Status On/Off
 - bit 7: Not Used
- 167) Status Byte 6: (0b = Off, 1b = On)
 (LSB) bits 0-1: Not Used
 bit 2 : DIST-SWR Multiple Limit Segment 1 Status On/Off
 bit 3 : DIST-SWR Multiple Limit Segment 2 Status On/Off
 bit 4 : DIST-SWR Multiple Limit Segment 3 Status On/Off
 bit 5 : DIST-SWR Multiple Limit Segment 4 Status On/Off
 bit 6: DIST-SWR Multiple Limit Segment 5 Status On/Off
 bit 7 : Not Used
- 168) Status Byte 7: (0b = Off, 1b = On)
 (LSB) bits 0-1: Not Used
 bit 2: DIST-RL Multiple Limit Segment 1 Status On/Off
 bit 3: DIST-RL Multiple Limit Segment 2 Status On/Off
 bit 4: DIST-RL Multiple Limit Segment 3 Status On/Off
 bit 5: DIST-RL Multiple Limit Segment 4 Status On/Off
 bit 6: DIST-RL Multiple Limit Segment 5 Status On/Off
 bit 7: Not Used
- 169) Status Byte 8:
 (LSB) bits 0 - 1 : DTF Windowing Mode
 bit: 1 0
 | |
 0 0 - Rectangular (No Windowing)
 0 1 - Nominal Side Lobe
 1 0 - Low Side Lobe
 1 1 - Minimum Side Lobe
 bit 2: Serial Port Echo Status On/Off
 bits 3 – 7 : Not Used
- 170) Status Byte 9: (0b = Off, 1b = On)
 (LSB) bit 0 : Fixed CW Mode On/Off
 bit 1 : 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: Not Used
 bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)
- 171) VNA Signal Standard¹⁶ (higher byte)
 172) VNA Signal Standard (lower byte)
 173-196) VNA Signal Standard Name, 24 bytes of ASCII
 197-217) VNA Cable Name, 21 bytes of ASCII
 218-300) Not Used

For Spectrum Analyzer Mode:

- 26) Spectrum Analyzer Mode Data Points (higher byte)
- 27) Spectrum Analyzer Mode Data Points (lower byte)
- 28) Spectrum Analyzer Start Frequency¹⁷ (highest byte)
- 29) Spectrum Analyzer Start Frequency
- 30) Spectrum Analyzer Start Frequency
- 31) Spectrum Analyzer Start Frequency (lowest byte)
- 32) Spectrum Analyzer Stop Frequency (highest byte)

¹⁶ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

¹⁷ Frequency unit is Hz.

- 33) Spectrum Analyzer Stop Frequency
- 34) Spectrum Analyzer Stop Frequency
- 35) Spectrum Analyzer Stop Frequency (lowest byte)
- 36) Spectrum Analyzer Center Frequency (highest byte)
- 37) Spectrum Analyzer Center Frequency
- 38) Spectrum Analyzer Center Frequency
- 39) Spectrum Analyzer Center Frequency (lowest byte)
- 40) Spectrum Analyzer Frequency Span (highest byte)
- 41) Spectrum Analyzer Frequency Span
- 42) Spectrum Analyzer Frequency Span
- 43) Spectrum Analyzer Frequency Span (lowest byte)
- 44) Spectrum Analyzer Minimum Frequency Step Size (highest byte)
- 45) Spectrum Analyzer Minimum Frequency Step Size
- 46) Spectrum Analyzer Minimum Frequency Step Size
- 47) Spectrum Analyzer Minimum Frequency Step Size (lowest byte)
- 48) Ref Level (highest byte)¹⁸
- 49) Ref Level
- 50) Ref Level
- 51) Ref Level (lowest byte)
- 52) Scale per div (highest byte)¹⁹
- 53) Scale per div
- 54) Scale per div
- 55) Scale per div (lowest byte)
- 56) Spectrum Analyzer Frequency Marker 1 (higher byte)²⁰
- 57) Spectrum Analyzer Frequency Marker 1 (lower byte)
- 58) Spectrum Analyzer Frequency Marker 2 (higher byte)
- 59) Spectrum Analyzer Frequency Marker 2 (lower byte)
- 60) Spectrum Analyzer Frequency Marker 3 (higher byte)
- 61) Spectrum Analyzer Frequency Marker 3 (lower byte)
- 62) Spectrum Analyzer Frequency Marker 4 (higher byte)
- 63) Spectrum Analyzer Frequency Marker 4 (lower byte)
- 64) Spectrum Analyzer Frequency Marker 5 (higher byte)
- 65) Spectrum Analyzer Frequency Marker 5 (lower byte)
- 66) Spectrum Analyzer Frequency Marker 6 (higher byte)
- 67) Spectrum Analyzer Frequency Marker 6 (lower byte)
- 68) Spectrum Analyzer Single Limit (highest byte)²¹
- 69) Spectrum Analyzer Single Limit
- 70) Spectrum Analyzer Single Limit
- 71) Spectrum Analyzer Single Limit (lowest byte)
- 72) SPA Multiple Upper Limit 1 Start X (Frequency in Hz) (highest byte)
- 73) SPA Multiple Upper Limit 1 Start X (Frequency in Hz)
- 74) SPA Multiple Upper Limit 1 Start X (Frequency in Hz)
- 75) SPA Multiple Upper Limit 1 Start X (Frequency in Hz) (lowest byte)
- 76) SPA Multiple Upper Limit 1 Start Y (Power Level) (highest byte)²²
- 77) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 78) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 79) SPA Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
- 80) SPA Multiple Upper Limit 1 End X (Frequency in Hz) (highest byte)
- 81) SPA Multiple Upper Limit 1 End X (Frequency in Hz)

¹⁸ Value sent as (value in dBm * 1000) + 270,000)

¹⁹ Value sent as (value * 1000)

²⁰ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

²¹ Value sent as (value in dBm * 1000) + 270000

²² Value sent as (value in dBm * 1000) + 270000

- 82) SPA Multiple Upper Limit 1 End X (Frequency in Hz)
83) SPA Multiple Upper Limit 1 End X (Frequency in Hz) (lowest byte)
84) SPA Multiple Upper Limit 1 End Y (Power Level) (highest byte)²³
85) SPA Multiple Upper Limit 1 End Y (Power Level)
86) SPA Multiple Upper Limit 1 End Y (Power Level)
87) SPA Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
88-231) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 72-87 for format)
232) RBW Setting (highest byte)²⁴
233) RBW Setting
234) RBW Setting
235) RBW Setting (lowest byte)
236) VBW Setting (highest byte)²⁵
237) VBW Setting
238) VBW Setting
239) VBW Setting (lowest byte)
240) OCC BW Method²⁶
241) OCC BW % Value (highest byte)²⁷
242) OCC BW % Value
243) OCC BW % Value
244) OCC BW % Value (lowest byte)
245) OCC BW dBc (highest byte)²⁸
246) OCC BW dBc
247) OCC BW dBc
248) OCC BW dBc (lowest byte)
249) Attenuation (highest byte)
250) Attenuation
251) Attenuation
252) Attenuation (lowest byte)
253) Antenna Index(0-14)
254-269) Antenna Name (16 bytes in ASCII)
270) Status Byte 1: (0b = Off , 1b = On)
(LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
bits 6 - 7 : Not Used
271) Status Byte 2: (0b = Off, 1b = On)
(LSB) bit 0 : Transmission Measurement Cal Status (0 – Off, 1 – ON)
bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
bit 5 : Pre Amp Status On/Off
bit 6 : Dynamic Attenuation On/Off
bit 7 : Normalization ON/OFF (MS2711D only)
272) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)

²³ Value sent as (value in dBm * 1000) + 270000

²⁴ RBW frequency sent in Hz.

²⁵ VBW frequency sent in Hz.

²⁶ 00h = % of power, 01h = dB down

²⁷ 0 – 99%

²⁸ 0 – 120 dBc

- (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/BELOW²⁹
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 273) Status Byte 4 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW³⁰
- 274) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 275) Status Byte 6: (0b = Off, 1b = On)
- (LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (MS2711D Only)
bit 2 : SPA Cal Status On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7: Units Type (0b = Log 1b = Linear)
- 276) Status Byte 7: (0b = Off, 1b = On)
- (LSB) bit 0: Serial Port Echo Status On/Off
bit 1: Return Sweep Time On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off
- 277) Reference Level Offset³¹ (highest byte)
278) Reference Level Offset
279) Reference Level Offset
280) Reference Level Offset (lowest byte)
281) External Reference Frequency³²

²⁹ Beep level is always 1b for upper segmented limit line

³⁰ Beep level is always 0b for lower segmented limit line

³¹ Value sent as (value in dBm * 1000) + 270,000

³² 1 byte in MHz (i.e. 20 = 20MHz)

- 282) Signal Standard³³ (higher byte)
- 283) Signal Standard (lower byte)
- 284) Channel Selection³⁴ (highest byte)
- 285) Channel Selection (lowest byte)
- 286) Trigger Type³⁵
- 287) Interference Analysis Frequency (in Hz) (highest byte)
- 288) Interference Analysis Frequency (in Hz)
- 289) Interference Analysis Frequency (in Hz)
- 290) Interference Analysis Frequency (in Hz) (lowest byte)
- 291) Trigger Position (0 – 100%)
- 292) Min Sweep Time (in μ s) (highest byte)
- 293) Min Sweep Time (in μ s)
- 294) Min Sweep Time (in μ s)
- 295) Min Sweep Time (in μ s) (lowest byte)
- 296) Video Trigger Level³⁶ (highest byte)
- 297) Video Trigger Level
- 298) Video Trigger Level
- 299) Video Trigger Level (lowest byte)
- 300) Status Byte 8
 - (LSB) bit 0: Input Power Status (1b = Input Power Too High, 0b = Input Power Ok)
 - bit 1: Reserved
 - bits 2-7: Not Used
- 301) Status Byte 9
 - (LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
 - bit 7: Not Used
- 302) Status Byte 10: (0b = Off, 1b = On)
 - (LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
 - bit 2: Max Hold On/Off
 - bit 3: Min Hold On/Off
 - bits 4-7: Not Used
- 303) Impedance (00h = 50 Ω , 0Ah = 75 Ω Anritsu Adapter, 0Ch = 75 Ω Other Adapter)
- 304) Impedance Loss³⁷ (higher byte)
- 305) Impedance Loss (lower byte)
- 306) AM/FM Demod Type³⁸
- 307) AM/FM Demod Status (01h = On, 00h = Off)
- 308) AM/FM Demod Volume (0 to 100)
- 309) AM/FM Demod Frequency (in Hz) (highest byte)
- 310) AM/FM Demod Frequency (in Hz)
- 311) AM/FM Demod Frequency (in Hz)
- 312) AM/FM Demod Frequency (in Hz) (lowest byte)
- 313) AM/FM Demod Time (in ms) (highest byte)
- 314) AM/FM Demod Time (in ms)
- 315) AM/FM Demod Time (in ms)
- 316) AM/FM Demod Time (in ms) (lowest byte)
- 317) SSB BFO Offset³⁹ (highest byte)
- 318) SSB BFO Offset
- 319) SSB BFO Offset

³³ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

³⁴ “No Channel” is sent as FFFEh

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 dB * 1000), valid values are 0 to 20 dB

³⁸ AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper

³⁹ Value sent as ((value in Hz) – 10,000)

- 320) SSB BFO Offset (lowest byte)
- 321) Frequency Scale Factor⁴⁰ (higher byte)
- 322) Frequency Scale Factor (lower byte)
- 323) Frequency Range Minimum⁴¹ (highest byte)
- 324) Frequency Range Minimum
- 325) Frequency Range Minimum
- 326) Frequency Range Minimum (lowest byte)
- 327) Frequency Range Maximum⁴² (highest byte)
- 328) Frequency Range Maximum
- 329) Frequency Range Maximum
- 330) Frequency Range Maximum (lowest byte)
- 331) Marker Type⁴³
- 332-355) Signal Standard Name, 24bytes of ASCII
- 356-400) Not Used

For Power Meter Mode (Both option 5 and narrow band):

- 26) Power Meter Start Freq (highest byte)
- 27) Power Meter Start Freq
- 28) Power Meter Start Freq
- 29) Power Meter Start Freq (lowest byte)
- 30) Power Meter Stop Freq (highest byte)
- 31) Power Meter Stop Freq
- 32) Power Meter Stop Freq
- 33) Power Meter Stop Freq (lowest byte)
- 34) Power Meter Center Freq (highest byte)
- 35) Power Meter Center Freq
- 36) Power Meter Center Freq
- 37) Power Meter Center Freq (lowest byte)
- 38) Power Meter Span Freq (highest byte)
- 39) Power Meter Span Freq
- 40) Power Meter Span Freq
- 41) Power Meter Span Freq (lowest byte)
- 42) Signal Standard⁴⁴ (higher byte)
- 43) Signal Standard (lower byte)
- 44) Channel Selection⁴⁵ (higher byte)
- 45) Channel Selection (lower byte)
- 46) Power Meter Offset (highest byte)
- 47) Power Meter Offset
- 48) Power Meter Offset
- 49) Power Meter Offset (lowest byte)
- 50) Power Meter Relative (highest byte)⁴⁶
- 51) Power Meter Relative
- 52) Power Meter Relative
- 53) Power Meter Relative (lowest byte)
- 54) Power Meter Status (00h = Off, 01h = On)
- 55) Power Meter Unit (00h = Watts, 01h = dBm)
- 56) Power Meter Relative Status (00h = Off, 01h = On)
- 57) Power Meter Offset Status (00h = Off, 01h = On)

⁴⁰ In number of Hz

⁴¹ Scaled by Frequency Scale Factor

⁴² Scaled by Frequency Scale Factor

⁴³ 0 – Regular Marker, 1 – Noise Marker

⁴⁴ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

⁴⁵ “No Channel” is sent as FFFEh

⁴⁶ Value as ((value in dBm * 1000) + 100)

- 58) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
- 59) Frequency Scale Factor⁴⁷ (higher byte)
- 60) Frequency Scale Factor (lower byte)
- 61) Frequency Range Minimum⁴⁸ (highest byte)
- 62) Frequency Range Minimum
- 63) Frequency Range Minimum
- 64) Frequency Range Minimum (lowest byte)
- 65) Frequency Range Maximum⁴⁹ (highest byte)
- 66) Frequency Range Maximum
- 67) Frequency Range Maximum
- 68) Frequency Range Maximum (lowest byte)
- 69) Zero Status (00h = Off, 01h = On)
- 70) Zero Value⁵⁰ (highest byte)
- 71) Zero Value
- 72) Zero Value
- 73) Zero Value (lowest byte)
- 74-97) Signal Standard Name, 24 bytes of ASCII
- 98-120) Not Used

For T1 Mode:

- 26) T1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
- 27) T1 Framing Mode (01h: ESF, 02h: D4SF)
- 28) T1 Line Coding (01h: B8ZS, 02h: AMI)
- 29) T1 Clock Source (00h: External, 01h: Internal)
- 30) T1 Tx Level (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
- 31) T1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
- 32) T1 Loop Code (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
- 33) T1 CRC Method (00h: ANSI CRC, 01h: Japanese CRC)
- 34) T1 Loop Type (00h: In Band, 01h: Data Link)
- 35) T1 Pattern (higher byte)
- 36) T1 Pattern (lower byte) 01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
- 37) T1 Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
- 38) T1 Display Type (00h: Histogram, 01h: Raw Data)
- 39) T1 Impedance
- 40 - 55) First User Defined Loop Code Down (16 bytes)
- 56 - 71) Second User Defined Loop Code Down (16 bytes)
- 72 - 87) First User Defined Loop Code Up (16 bytes)
- 88 - 103) Second User Defined Loop Code Up (16 bytes)
- 104 - 135) User Defined Pattern (32 bytes)
- 136) T1 1st User Defined Loop Up (highest byte)
- 137) T1 1st User Defined Loop Up (lowest byte)
- 138) T1 2nd User Defined Loop Up (highest byte)
- 139) T1 2nd User Defined Loop Up (lowest byte)
- 140) T1 1st User Defined Loop Down (highest byte)
- 141) T1 1st User Defined Loop Down (lowest byte)
- 142) T1 2nd User Defined Loop Down (highest byte)
- 143) T1 2nd User Defined Loop Down (lowest byte)
- 144) T1 User Defined Pattern (highest byte)
- 145) T1 User Defined Pattern

⁴⁷ In number of Hz

⁴⁸ Scaled by Frequency Scale Factor

⁴⁹ Scaled by Frequency Scale Factor

⁵⁰ Value sent as ((value in dBm * 1000) + 100)

- 146) T1 User Defined Pattern
- 147) T1 User Defined Pattern (lowest Byte)
- 148) T1 Bit Error Insert Value (1-1000) (highest byte)
- 149) T1 Bit Error Insert Value (lowest byte)
- 150) T1 Frame Error Insert Value (1-1000) (highest byte)
- 151) T1 Frame Error Insert Value (lowest byte)
- 152) T1 BPV Error Insert Value (1-1000) (highest byte)
- 153) T1 BPV Error Insert Value (lowest byte)
- 154) T1 Graph Resolution⁵¹
- 155) T1 Measurement Duration⁵²
- 156) T1 Voltage Measurement Scale (00h: Vpp, 01h: dBdsx)
- 157) T1 Auto Framing Mode (00h: fixed framing, >00h: auto framing mode)
- (158 – 240) Not Used

For E1 Mode:

- 26) E1 Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
- 27) E1 Framing Mode (03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC)
- 28) E1 Line Coding (02h: AML, 03h: HDB3)
- 29) E1 Clock Source (00h: External, 01h: Internal)
- 30) E1 Tx Level
- 31) E1 Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
- 32) E1 Loop Code
- 33) E1 CRC Method
- 34) E1 Loop Type
- 35) E1 Pattern (highest byte)
- 36) E1 Pattern (lowest byte) (01h: PRBS-9, 02h: PRBS-11, 03h: PRBS-15, 04h: PRBS-20(O.151), 05h: PRBS-20(O.153), 06h: PRBS-23, 07h: QRSS, 08h: 1 in 8, 09h: 2 in 8, 0Ah: 3 in 8, 0Bh: All Ones, 0Ch: All Zeros, 0Dh: T1-DALY, 0Eh: User Defined)
- 37) E1 Pattern Invert (00h: Non-Inverted, 01h: Inverted)
- 38) E1 Display Type (00h: Histogram, 01h: Raw Data)
- 39) E1 Impedance (01h: 75 Ω, 02h: 120 Ω)
- 40 - 55) First User Defined Loop Code Down (16 bytes)
- 56 - 71) Second User Defined Loop Code Down (16 bytes)
- 72 - 87) First User Defined Loop Code Up (16 bytes)
- 88 - 103) Second User Defined Loop Code Up (16 bytes)
- 104 - 135) User Defined Pattern (32 bytes)
- 136) E1 1st User Defined Loop Up (highest byte)
- 137) E1 1st User Defined Loop Up (lowest byte)
- 138) E1 2nd User Defined Loop Up (highest byte)
- 139) E1 2nd User Defined Loop Up (lowest byte)
- 140) E1 1st User Defined Loop Down (highest byte)
- 141) E1 1st User Defined Loop Down (lowest byte)
- 142) E1 2nd User Defined Loop Down (highest byte)
- 143) E1 2nd User Defined Loop Down (lowest byte)
- 144) E1 User Defined Pattern (highest byte)
- 145) E1 User Defined Pattern
- 146) E1 User Defined Pattern
- 147) E1 User Defined Pattern (lowest byte)
- 148) E1 Bit Error Insert Value (1-1000) (higher byte)
- 149) E1 Bit Error Insert Value (lower byte)
- 150) E1 Frame Error Insert Value (1-1000) (higher byte)

⁵¹ Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁵² Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

- 151) E1 Frame Error Insert Value (lower byte)
- 152) E1 BPV Error Insert Value (1-1000) (higher byte)
- 153) E1 BPV Error Insert Value (lower byte)
- 154) E1 Graph Resolution⁵³
- 155) E1 Measurement Duration⁵⁴
- 156) E1 voltage measurement scale: 00h: Vpp, 01h: dBdsx
- 157-240) Not Used

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

⁵³ Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁵⁴ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

Select 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
-

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

This command is new to the MT8212A. Use it, instead of Control Byte #17, to access the new features.

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 Format⁵⁵
- 4) Not Used
- 5-11) Model Number (7 bytes in ASCII)

⁵⁵ 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD

- 12-15) Software Version (4 bytes ASCII)
- 16) Measurement Mode⁵⁶
- 17-20) Time/Date (in Long Integer⁵⁷)
- 21-30) Date in String Format (mm/dd/yyyy)
- 31-38) Time in String Format (hh:mm:ss)
- 39-54) Reference number stamp (16 bytes in ASCII)
- 55-56) # data points (130, 259 or 517 or 401 or 100)

For all “Cell Master VNA Modes” :

- 57) Start Frequency⁵⁸ (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
- 67) Minimum Frequency Step Size
- 68) Minimum Frequency Step Size (lowest byte)
- 69) Scale Top⁵⁹ (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 1⁶⁰ (higher byte)
- 78) Frequency Marker 1 (lower byte)
- 79) Frequency Marker 2 (higher byte)
- 80) Frequency Marker 2 (lower byte)
- 81) Frequency Marker 3 (higher byte)
- 82) Frequency Marker 3 (lower byte)
- 83) Frequency Marker 4 (higher byte)
- 84) Frequency Marker 4 (lower byte)
- 85) Frequency Marker 5 (higher byte)
- 86) Frequency Marker 5 (lower byte)
- 87) Frequency Marker 6 (higher byte)
- 88) Frequency Marker 6 (lower byte)
- 89) Single Limit⁶¹ (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 X⁶² (highest byte)

⁵⁶ Refer to Control Byte #3 “Select Measurement Mode” for detailed value.

⁵⁷ Time/Date long integer representation is in seconds since January 1, 1970

⁵⁸ Frequency units are Hz

⁵⁹ See Control Byte #4 “Set Cell Master Scale” for data format

⁶⁰ 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.

⁶¹ See Control Byte #6 “Set Cell Master VNA Single Limit” for data format.

- 96) Multiple Limit Start X
- 97) Multiple Limit Start X
- 98) Multiple Limit Start X (lowest byte)
- 99) Multiple Limit Start Y (higher byte)
- 100) Multiple Limit Start Y (lower byte)
- 101) Multiple Limit End X (highest byte)
- 102) Multiple Limit End X
- 103) Multiple Limit End X
- 104) Multiple Limit End X (lowest byte)
- 105) Multiple Limit End Y (higher byte)
- 106) Multiple Limit End Y (lower byte)
- 107–162) Repeat bytes 93-106 for segments 2-5
- 163) Start Distance⁶³ (highest byte)
- 164) Start Distance
- 165) Start Distance
- 166) Start Distance (lowest byte)
- 167) Stop Distance (highest byte)
- 168) Stop Distance
- 169) Stop Distance
- 170) Stop Distance (lowest byte)
- 171) Distance Marker 1⁶⁴ (higher byte)
- 172) Distance Marker 1 (lower byte)
- 173) Distance Marker 2 (higher byte)
- 174) Distance Marker 2 (lower byte)
- 175) Distance Marker 3 (higher byte)
- 176) Distance Marker 3 (lower byte)
- 177) Distance Marker 4 (higher byte)
- 178) Distance Marker 4 (lower byte)
- 179) Distance Marker 5 (higher byte)
- 180) Distance Marker 5 (lower byte)
- 181) Distance Marker 6 (higher byte)
- 182) Distance Marker 6 (lower byte)
- 183) Relative Propagation Velocity⁶⁵ (highest byte)
- 184) Relative Propagation Velocity
- 185) Relative Propagation Velocity
- 186) Relative Propagation Velocity (lowest byte)
- 187) Cable Loss⁶⁶ (highest byte)
- 188) Cable Loss
- 189) Cable Loss
- 190) Cable Loss (lowest byte)
- 191) Average Cable Loss⁶⁷ (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

⁶² See Control Byte #112 “Set Cell Master VNA Segmented Limit Lines” for data format.

⁶³ Distance data uses units 1/100,000m (or feet)

⁶⁴ 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.

⁶⁵ Relative Propagation Velocity uses units 1/100,000

⁶⁶ Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.

⁶⁷ Average Cable Loss is dB * 1000.

- 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)
- 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) VNA Signal Standard⁶⁸ (higher byte)
- 201) VNA Signal Standard (lower byte)
- 202-205) GPS Position – Latitude (long integer)⁶⁹
- 206-209) GPS Position – Longitude (long integer)
- 210-211) GPS Position – Altitude (short integer)
- 212) Signal Standard Link Type⁷⁰
- 213-236) Signal Standard Name, 24 bytes in ASCII
- 237-257) Cable Name, 21 bytes in ASCII
- 258-324) Not Used
- 325-1364) Sweep Data (130 points * 8 bytes/point = 1040 bytes)
- 325-2396) Sweep Data (259 points * 8 bytes/point = 2072 bytes)
- 325-4460) Sweep Data (517 points * 8 bytes/point = 4136 bytes)
- 8 bytes for each data point
 - 1. gamma⁷¹ (highest byte)
 - 2. gamma
 - 3. gamma
 - 4. gamma (lowest byte)
 - 5. phase⁷² (highest byte)

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

⁶⁹ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

⁷⁰ 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link

⁷¹ Gamma data uses 1/10,000 units.

- 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 Frequency⁷³ (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
- 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 Level⁷⁴ (highest byte)
- 78) Ref Level
- 79) Ref Level
- 80) Ref Level (lowest byte)
- 81) Scale per div⁷⁵ (highest byte)
- 82) Scale per div
- 83) Scale per div
- 84) Scale per div (lowest byte)
- 85) Frequency Marker 1⁷⁶ (higher byte)
- 86) Frequency Marker 1 (lower byte)
- 87) Frequency Marker 2 (higher byte)
- 88) Frequency Marker 2 (lower byte)
- 89) Frequency Marker 3 (higher byte)
- 90) Frequency Marker 3 (lower byte)
- 91) Frequency Marker 4 (higher byte)
- 92) Frequency Marker 4 (lower byte)
- 93) Frequency Marker 5 (higher byte)
- 94) Frequency Marker 5 (lower byte)
- 95) Frequency Marker 6 (higher byte)
- 96) Frequency Marker 6 (lower byte)

⁷² Phase data uses 1/10 degree unit.

⁷³ Frequency in Hz

⁷⁴ Value sent as (Value in dBm * 1000) + 270,000

⁷⁵ Value sent as (Value * 1000)

⁷⁶ Value sent as data point on display. Freq = (Point * Span / (Total Data Points - 1)) + Start Freq

- 97) Single Limit⁷⁷ (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 Level⁷⁸) (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)
- 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 % Value⁷⁹
- 271) OCC BW dBc⁸⁰
- 272) Attenuation⁸¹ (highest byte)
- 273) Attenuation
- 274) Attenuation
- 275) Attenuation (lowest byte)
- 276-291) Antenna Name(16 bytes in ASCII)
- 292) Status Byte 1: (0b = Off , 1b = On)
 (LSB) bit 0 : Marker 1 On/Off
 bit 1 : Marker 2 On/Off
 bit 2 : Marker 3 On/Off
 bit 3 : Marker 4 On/Off
 bit 4 : Marker 5 On/Off
 bit 5 : Marker 6 On/Off
 bits 6-7: Not Used
- 293) Status Byte 2: (0b = Off , 1b = On)
 (LSB) bit 0 : Not Used
 bit 1 : Marker 2 Delta On/Off
 bit 2 : Marker 3 Delta On/Off
 bit 3 : Marker 4 Delta On/Off

⁷⁷ Value sent as (Value in dBm * 1000) + 270,000

⁷⁸ Value sent as (value in dBm * 1000) + 270,000

⁷⁹ % value is 0-99

⁸⁰ dBc value 0 – 120 dBc

⁸¹ Value sent as (value in dB * 1000)

- bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
- bit 5 : Pre Amp Status On/Off
- bit 6 : Dynamic Attenuation On/Off
- bit 7: Normalization ON/OFF (MS2711D only)
- 294) Status Byte 3: (0b = Off, 1b = On)
 - (LSB) bit 0 : Antenna Factor Correction On/Off
 - bits 1-2 : Detection alg (00b = pos. peak 01b = RMS average 10b = neg. peak 11b = sampling mode)
 - bits 3-4 : Amplitude Units (Log) - (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV) (Linear) – (00b = Watts 01b = Volts)
 - bit 5 : Channel Power On/Off
 - bit 6 : Adjacent Channel Power On/Off
 - bit 7 : Units Type (0b = Log 1b = Linear)
- 295) Status Byte 4⁸²
 - (0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
 - (LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
 - bit 1 : Not Used
 - bit 2 : Single Limit On/Off
 - bit 3 : Single Limit Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Upper Segment 1 Status On/Off
 - bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW⁸³
 - bit 6 : Multiple Limit Upper Segment 2 Status On/Off
 - bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 296) Status Byte 5
 - (0b = Off/Beep if data is below line, 1b = On/Beep if data is above line)
 - (LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
 - bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
 - bit 2 : Multiple Limit Upper Segment 4 Status On/Off
 - bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Upper Segment 5 Status On/Off
 - bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
 - bit 6 : Multiple Limit Lower Segment 1 Status On/Off
 - bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW⁸⁴
- 297) Status Byte 6
 - (0b = Off/Beep if data is BELOW line, 1b = On/Beep if data is ABOVE line)
 - (LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
 - bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
 - bit 2 : Multiple Limit Lower Segment 3 Status On/Off
 - bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Lower Segment 4 Status On/Off
 - bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
 - bit 6 : Multiple Limit Lower Segment 5 Status On/Off
 - bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 298) Status Byte 7
 - (LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
 - bit 7: Not Used
- 299) Reference Level Offset ⁸⁵ (highest byte)
- 300) Reference Level Offset
- 301) Reference Level Offset
- 302) Reference Level Offset (lowest byte)

⁸² For bits 2, 1 and 0 (“X” is “don’t care”): 0X0=no limit, 1X0=single limit, 0X1=multiple limit, 1X1=multiple limit.

⁸³ Upper limits always trigger an error beep if data is ABOVE the limit segment, for example, this bit is always 1b.

⁸⁴ LOWER limits always trigger an error beep if data is BELOW the limit segment, for example, this bit is always 0b.

⁸⁵ Value sent as (value in dBm * 1000) + 270,000

- 303) External Reference Frequency ⁸⁶
- 304) Signal Standard⁸⁷ (highest byte)
- 305) Signal Standard (lowest byte)
- 306) Channel Selection⁸⁸ (highest byte)
- 307) Channel Selection (lowest byte)
- 308) Interference Analysis Cellular Standard⁸⁹
- 309) Interference Analysis Estimated Bandwidth (highest byte)
- 310) Interference Analysis Estimated Bandwidth
- 311) Interference Analysis Estimated Bandwidth
- 312) Interference Analysis Estimated Bandwidth (lowest byte)
- 313) Interference Analysis Frequency (in Hz) (highest byte)
- 314) Interference Analysis Frequency (in Hz)
- 315) Interference Analysis Frequency (in Hz)
- 316) Interference Analysis Frequency (in Hz) (lowest byte)
- 317-320) Reserved
- 321) Trigger Type⁹⁰
- 322) Trigger Position (0 – 100%)
- 323) Min Sweep Time (in μ s) (highest byte)
- 324) Min Sweep Time (in μ s)
- 325) Min Sweep Time (in μ s)
- 326) Min Sweep Time (in μ s) (lowest byte)
- 327) Video Trigger Level⁹¹ (highest byte)
- 328) Video Trigger Level
- 329) Video Trigger Level
- 330) Video Trigger Level (lowest byte)
- 331) Status Byte 8 (0b = Off, 1b = On)
 - (LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
 - bit 2: Max Hold On/Off
 - bit 3: Min Hold On/Off
 - bit 4: Transmission Mode Calibration On/Off (Option 21 Only)
 - bit 5: Bias Tee On/Off (Option 10, MS2711D Only)
 - bit 6: Occupied BW Measurement On/Off
 - bit 7: Not Used
- 332) Impedance (00h = 50 Ω , 0Ah = 75 Ω Anritsu Adapter, 0Ch = 75 Ω Other Adapter)
- 333) Impedance Loss⁹² (higher byte)
- 334) Impedance Loss (lower byte)
- 335) Frequency Scale Factor⁹³ (higher byte)
- 336) Frequency Scale Factor (lower byte)
- 337) Frequency Range Minimum⁹⁴ (highest byte)
- 338) Frequency Range Minimum
- 339) Frequency Range Minimum
- 340) Frequency Range Minimum (lowest byte)
- 341) Frequency Range Maximum⁹⁵ (highest byte)
- 342) Frequency Range Maximum

⁸⁶ 1 byte in MHz (i.e. 20 = 20MHz)

⁸⁷ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

⁸⁸ “No Channel” is sent as FFFEh

⁸⁹ 4 Standards – 00h = 1250KHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown FFh = Interference Analysis Measurement OFF

⁹⁰ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

⁹¹ Value sent as (value in dBm * 1000) + 270,000

⁹² Value sent as (value in dB * 1000), valid values are 0 to 20 dB

⁹³ In number of Hz

⁹⁴ Scaled by Frequency Scale Factor

⁹⁵ Scaled by Frequency Scale Factor

- 343) Frequency Range Maximum
- 344) Frequency Range Maximum (lowest byte)
- 345) Linked Trace Number (1-200)
- 346) Status Byte 9 (0b = Off, 1b = On)
 - (LSB) bit 0: C/I Measurement On/Off
 - bits 1-3: C/I Carrier Trace/Signal Type⁹⁶
 - bits 4-7: Not Used
- 347) C/I Calculated Power⁹⁷ (Carrier or Interference – NB FHSS⁹⁸) (highest byte)
- 348) C/I Calculated Power (Carrier or Interference – NB FHSS)
- 349) C/I Calculated Power (Carrier or Interference – NB FHSS)
- 350) C/I Calculated Power (Carrier or Interference – NB FHSS) (lowest byte)
- 351) C/I Calculated Power⁹⁹ (Interference – WB FHSS¹⁰⁰) (highest byte)
- 352) C/I Calculated Power (Interference – WB FHSS)
- 353) C/I Calculated Power (Interference – WB FHSS)
- 354) C/I Calculated Power (Interference – WB FHSS) (lowest byte)
- 355) C/I Calculated Power¹⁰¹ (Interference – Broadband¹⁰²) (highest byte)
- 356) C/I Calculated Power (Interference – Broadband)
- 357) C/I Calculated Power (Interference – Broadband)
- 358) C/I Calculated Power (Interference – Broadband) (lowest byte)
- 359) Occupied Bandwidth Power (Highest Byte)¹⁰³
- 360) Occupied Bandwidth Power
- 361) Occupied Bandwidth Power
- 362) Occupied Bandwidth Power (Lowest Byte)
- 363) Marker Type¹⁰⁴
- 364-367) GPS Position – Latitude (long integer)¹⁰⁵
- 368-371) GPS Position – Longitude (long integer)
- 372-373) GPS Position – Altitude (short integer)
- 374) Signal Standard Link Type¹⁰⁶
- 375-398) Signal Standard Name, 24 bytes in ASCII
- 399) Measure Offset Status
- 400-431) Not Used
- 432-2035) Sweep Data (401 points * 4 bytes/point= 1604 bytes)
 - 4 bytes for each data point
 - 1. dBm¹⁰⁷ (highest byte)
 - 2. dBm
 - 3. dBm
 - 4. dBm (lowest byte)

⁹⁶ 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference

⁹⁷ Value sent as (value in dBm * 1000) + 270,000

⁹⁸ If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference as a NB FHSS signal. Otherwise, these bytes represent the calculated Carrier power.

⁹⁹ Value sent as (value in dBm * 1000) + 270,000

¹⁰⁰ If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference as a WB FHSS signal. Otherwise, these bytes should be ignored.

¹⁰¹ Value sent as (value in dBm * 1000) + 270,000

¹⁰² If Status Byte 9, bytes 1-3 equal 111b, then value will be calculated power for the Interference as a Broadband signal. Otherwise, these bytes should be ignored.

¹⁰³ If Method is % of power then the value is db Down * 1000. If the method is db down, then the value is %

¹⁰⁴ 0 – Regular Marker, 1 – Noise Marker

¹⁰⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

¹⁰⁶ 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link

¹⁰⁷ Value sent as (value in dBm * 1000) + 270,000

For Power Meter Mode (both option 5 and narrow band):

- 57) Power Meter Mode (00h = Off, 01h = On)
- 58) Power Meter Unit (00h = dBm, 01h = Watts)
- 59) Start Frequency (in Hz) (highest byte)
- 60) Start Frequency (in Hz)
- 61) Start Frequency (in Hz)
- 62) Start Frequency (in Hz) (lowest byte)
- 63) Stop Frequency (in Hz) (highest byte)
- 64) Stop Frequency (in Hz)
- 65) Stop Frequency (in Hz)
- 66) Stop Frequency (in Hz) (lowest byte)
- 67) Center Frequency (in Hz) (highest byte)
- 68) Center Frequency (in Hz)
- 69) Center Frequency (in Hz)
- 70) Center Frequency (in Hz) (lowest byte)
- 71) Frequency Span (in Hz) (highest byte)
- 72) Frequency Span (in Hz)
- 73) Frequency Span (in Hz)
- 74) Frequency Span (in Hz) (lowest byte)
- 75) Power Offset Status (00h = Off, 01h = On)
- 76) Power Offset¹⁰⁸ (highest byte)
- 77) Power Offset
- 78) Power Offset
- 79) Power Offset (lowest byte)
- 80) Power Relative Status (00h = Off, 01h = On)
- 81) Power Relative Value¹⁰⁹ (highest byte)
- 82) Power Relative Value
- 83) Power Relative Value
- 84) Power Relative Value (lowest byte)
- 85) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
- 86) Power Zero Status (00h = Off, 01h = On)
- 87) External Reference Status (00h = Off, 01h = On)
- 88) External Reference Frequency (in Hz) (highest byte)
- 89) External Reference Frequency (in Hz)
- 90) External Reference Frequency (in Hz)
- 91) External Reference Frequency (in Hz) (lowest byte)
- 92) Signal Standard¹¹⁰ (higher byte)
- 93) Signal Standard (lower byte)
- 94) Channel Selection¹¹¹ (higher byte)
- 95) Channel Selection (lower byte)
- 96) Frequency Scale Factor¹¹² (higher byte)
- 97) Frequency Scale Factor (lower byte)
- 98) Frequency Range Minimum¹¹³ (highest byte)
- 99) Frequency Range Minimum
- 100) Frequency Range Minimum
- 101) Frequency Range Minimum (lowest byte)
- 102) Frequency Range Maximum¹¹⁴ (highest byte)
- 103) Frequency Range Maximum

¹⁰⁸ Value sent as (value in dB * 1000), valid values are 0 to 60 dB

¹⁰⁹ Value sent as (value in dBm * 1000)

¹¹⁰ Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh

¹¹¹ "No Channel" is sent as FFFEh

¹¹² In number of Hz

¹¹³ Scaled by Frequency Scale Factor

¹¹⁴ Scaled by Frequency Scale Factor

- 104) Frequency Range Maximum
- 105) Frequency Range Maximum (lowest byte)
- 106-109) GPS Position – Latitude (long integer)¹¹⁵
- 110-113) GPS Position – Longitude (long integer)
- 114-115) GPS Position – Altitude (short integer)
- 116) Signal Standard Link Type¹¹⁶
- 117-140) Signal Standard Name, 24 bytes in ASCII
- 141-150) Not Used
- 151) Power Meter Reading¹¹⁷ (highest byte)
- 152) Power Meter Reading
- 153) Power Meter Reading
- 154) Power Meter Reading (lowest byte)
- 155) Measure Offset Status

For T1 Tester / E1 Tester Mode:

- 57) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
- 58) Framing Mode¹¹⁸
- 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, 03h: BER, 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 Ω, 02h: 120 Ω)
- 68) Pattern¹¹⁹
- 69) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
- 70) Insert Bit Error Value (1-1000) (higher byte)
- 71) Insert Bit Error Value (lower byte)
- 72) Insert BPV Error Value (1-1000) (higher byte)
- 73) Insert BPV Error Value (lower byte)
- 74) Insert Frame Error Value (1-1000) (higher byte)
- 75) Insert Frame Error Value (lower byte)
- 76) Measurement Duration¹²⁰
- 77) Histogram Resolution¹²¹
- 78) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
- 79) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
- 80) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
- 81) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
- 82) BPV Error Count (highest byte)

¹¹⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

¹¹⁶ 1 – Uplink, 2 – Downlink, 3 – Both, 0 – Invalid Link

¹¹⁷ Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.

¹¹⁸ T1 Mode: 01h: ESF, 02h: D4SF

E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC

¹¹⁹ Pattern: 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

¹²⁰ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

¹²¹ Histogram Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

- 83) BPV Error Count
- 84) BPV Error Count
- 85) BPV Error Count (lowest byte)
- 86) CRC Error Count (highest byte)
- 87) CRC Error Count
- 88) CRC Error Count
- 89) CRC Error Count (lowest byte)
- 90) Frame Error Count (highest byte)
- 91) Frame Error Count
- 92) Frame Error Count
- 93) Frame Error Count (lowest byte)
- 94) LOF Error Count (highest byte)
- 95) LOF Error Count
- 96) LOF Error Count
- 97) LOF Error Count (lowest byte)
- 98) E Bit Error Count (E1 Only) (highest byte)
- 99) E Bit Error Count (E1 Only)
- 100) E Bit Error Count (E1 Only)
- 101) E Bit Error Count (E1 Only) (lowest byte)
- 102) Errored Seconds (highest byte)
- 103) Errored Seconds
- 104) Errored Seconds
- 105) Errored Seconds (lowest byte)
- 106) Bit Count (highest byte)
- 107) Bit Count
- 108) Bit Count
- 109) Bit Count (lowest byte)
- 110) Bit Errors (highest byte)
- 111) Bit Errors
- 112) Bit Errors
- 113) Bit Errors (lowest byte)
- 114) User Defined Pattern (convert to binary for pattern) (highest byte)
- 115) User Defined Pattern
- 116) User Defined Pattern
- 117) User Defined Pattern (lowest byte)
- 118 – 125) Measurement Start Time String (ASCII string: “HH:MM:SS”)
- 126 – 136) Measurement Stop Time String (ASCII string: “DD:HH:MM:SS”)
- 137 – 147) Elapsed Time String (ASCII string: “DD:HH:MM:SS”)
- 148 – 155) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
- 156 – 655) 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 corresponds 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 |

656) Vpp or dBdsx (high byte) Only in Vpp mode. See T1/E1 Vpp and dBdsx commands for data format.

657) Vpp or dBdsx (low byte)

658) T1 or E1 Receive Frequency in Hz (high byte) (Only in BER mode)

659) T1 or E1 Receive Frequency in Hz

660) T1 or E1 Receive Frequency in Hz

661) T1 or E1 Receive Frequency in Hz (low byte)

662-665) GPS Position – Latitude (long integer)¹²²
 666-669) GPS Position – Longitude (long integer)
 670-671) GPS Position – Altitude (short integer)
 672) DS0/E0 Channel Insert State. 1 == Insert ON, 0 == Insert OFF
 673) DS0/E0 Channel Number
 674– 675) DS0/E0 Audio Monitor Volume in %
 676– 677) DS0/E0 Send Level in dBm, 0 to – 30, offset by 30
 678– 679) DS0/E0 Send Frequency in Hz
 680– 681) DS0/E0 Receive Level in dBm, resolution 0.1 dB, range –40.0 to +3.0, offset by 401
 682– 683) DS0/E0 Receive Frequency in Hz
 684) Vpp Scale: 0 = Vpp, 1 = dBdsx
 685) Vpp Input Configuration: 0 = Terminated, 1 = Bridged
 686) Vpp Impedance: 0 = 100 ohms, 1 = 75 ohms, 2 = 120 ohms
 687) G.821 flag = 1 if SES, UAS and DGRM to follow
 688 – 689) Degraded Minutes (DGRM)
 690 – 693) Severely Errored Seconds (SES)
 694 – 697) Unavailable Seconds (UAS)
 698) Bit error insertion rate 1 through 7 where the number indicates a rate of 1E-x
 698– 750) Not used

For GSM Mode:

57) Scale Division (highest Byte)
 58) Scale Division (Lowest Byte)
 59) Center Frequency (Highest Byte)
 60) Center Frequency
 61) Center Frequency
 62) Center Frequency (Lowest Byte)
 63) External Reference Frequency (Highest Byte)
 64) External Reference Frequency
 65) External Reference Frequency
 66) External Reference Frequency (lowest Byte)
 67) Signal Standard (Highest Byte)
 68) Signal Standard (Lowest Byte)
 69) Display Type¹²³
 70) Display Units¹²⁴
 71) Power Offset (Highest Byte)
 72) Power Offset
 73) Power Offset
 74) Power Offset (Lowest Byte)
 75) Channel (Highest Byte)¹²⁵
 76) Channel (Lowest Byte)
 77-80) GPS Position – Latitude (long integer)¹²⁶
 81-84) GPS Position – Longitude (long integer)
 85-86) GPS Position – Altitude (short integer)
 87-88) GSM Signal Status¹²⁷

¹²² Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

¹²³ 0 – Spectrum, 1 – Frame View, 2 – Slot View

¹²⁴ 0 – dBm, 1 - Watts

¹²⁵ Invalid channels are sent as 0xFFFF

¹²⁶ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

- 89) GSM Measurement Status¹²⁸
- 90-113) Signal Standard Name, 24 bytes in ASCII
- 114) Measure Offset Status
- 115-126) Reserved
- 127) Measured Channel power (Highest Byte)¹²⁹
- 128) Measured Channel Power (Lowest Byte)
- 129) Measured Burst Power (Highest Byte)¹³⁰
- 130) Measured Burst Power (Lowest Byte)
- 131) Frequency Error (Highest Byte)
- 132) Frequency Error
- 133) Frequency Error
- 134) Frequency Error (lowest Byte)
- 135) Occupied Bandwidth (Highest Byte)
- 136) Occupied Bandwidth
- 137) Occupied Bandwidth
- 138) Occupied Bandwidth (Lowest Byte)
- 139) Measured TSC (Highest Byte)
- 140) Measured TSC (Lowest Byte)
- 141 – 156) Reserved
- 157- 959) Spectrum Data ¹³¹
- 960 – 1762) Frame View Data
- 1763 – 2565) Slot View Data

For CDMA Mode:

- 57) Scale Division (highest Byte)
- 58) Scale Division (Lowest Byte)
- 59) Center Frequency (highest Byte)
- 60) Center Frequency
- 61) Center Frequency
- 62) Center Frequency (Lowest Byte)
- 63) External Reference Frequency (highest Byte)
- 64) External Reference Frequency
- 65) External Reference Frequency
- 66) External Reference Frequency (Lowest Byte)
- 67) Measurement Length
- 68) PN Offset (Highest Byte)
- 69) PN Offset (Lowest Byte)
- 70) Status Byte 1
 - a. Bit 0 External Trigger Polarity¹³²
 - b. Bit 1 – Not Used
 - c. Bit 2 – Not Used
 - d. Bit 3 – Not Used
 - e. Bit 4 – Not Used
 - f. Bit 5 – Not Used
 - g. Bit 6 - Not Used
 - h. Bit 7 – Not Used

¹²⁷ MEAS OK 0x0000, LEVEL UNDER MASK 0x0001, SIGNAL ABNORMAL MASK 0x0002, TSC NOT FOUND MASK 0x0004, ADC OTR MASK 0x0010, OVERPOWER MASK 0x0020, LOCK FAIL MASK 0x0100, DDC NOT RESPONDING MASK 0x0200

¹²⁸ 0 if we have measured data available, 0xFF if we don't have measured data yet and the device is in the process of measuring data

¹²⁹ * 250 + 50000

¹³⁰ * 250 + 50000

¹³¹ 401 Points, 2 bytes per point

¹³² 0 – Falling Edge, 1 – Rising Edge

- 71) Status Byte 2
 - a. Bit 0 – Not Used
 - b. Bit 1 - Not Used
 - c. Bit 2 – Marker 6 Status
 - d. Bit 3 – Marker 5 Status
 - e. Bit 4- Marker 4 Status
 - f. Bit 5- Marker 3 Status
 - g. Bit 6- Marker 2 Status
 - h. Bit 7- Marker 1 Status
- 72) Status Byte 3 – Reserved
- 73) Marker 1 Position
- 74) Marker 2 Position
- 75) Marker 3 Position
- 76) Marker 4 Position
- 77) Marker 5 Position
- 78) Marker 6 Position
- 79) Signal Standard (Highest Byte)
- 80) Signal Standard (Lowest Byte)
- 81) Display Type¹³³
- 82) Units¹³⁴
- 83) Power Offset (Highest Byte)
- 84) Power Offset
- 85) Power Offset
- 86) Power Offset (Lowest Byte)
- 87) PN Increment
- 88) Channel (Highest Byte)¹³⁵
- 89) Channel (Lowest Byte)
- 90) PN Search Mode¹³⁶
- 91) CDMA Signal Status (Highest Byte)¹³⁷
- 92) CDMA Signal Status (Lowest Byte)
- 93) CDMA Measurement Status¹³⁸
- 94-117) Signal Standard Name, 24 bytes in ASCII
- 118-153) Reserved
- 154) Measured Rho (Highest Byte)¹³⁹
- 155) Measured Rho
- 156) Measured Rho
- 157) Measured Rho (Lowest Byte)
- 158) PN Offset (Highest Byte)¹⁴⁰
- 159) PN Offset
- 160) PN Offset
- 161) PN Offset (Lowest Byte)

¹³³ 0 – CDP, 1 – Text Only, 2 – CDP Bit Reverse, 3 – Over the Air Measurements

¹³⁴ 0 – dBm, 1 - Watts

¹³⁵ Invalid channels are sent as 0xFFFF

¹³⁶ Indicates the PN Search mode - GPS AUTO 0, GPS MANUAL 1, EXTERNAL AUTO 2, EXTERNAL MANUAL 3, UNTRIGGERED 4

¹³⁷ MEASUREMENT OK 0x0000, LEVEL UNDER MASK 0x0001, SIGNAL ABNORMAL MASK 0x0002, SHORT CODE NOT FOUND MASK 0x0004, AMPLIFIER SATURATION MASK 0x0008, ADC OTR MASK 0x0010, OVERPOWER MASK 0x0020, LOCK FAIL MASK 0x0100 , DDC NOT RESPONDING MASK 0x0200, NO EXTERNAL TRIGGER MASK 0x0400

¹³⁸ 0x00 indicates that the measurement is done and that there is valid data available. 0xFF indicates that the measurement is in process and there is no data available yet. All the measured values should be disregarded if this byte is 0xFF

¹³⁹ Rho multiplied by 65535

| | |
|------|--|
| 162) | Frequency Error (Highest Byte) ¹⁴¹ |
| 163) | Frequency Error |
| 164) | Frequency Error |
| 165) | Frequency Error (Lowest Byte) |
| 166) | Channel Power RMS (Highest Byte) ¹⁴² |
| 167) | Channel Power RMS |
| 168) | Channel Power RMS |
| 169) | Channel Power RMS (Lowest Byte) |
| 170) | Peak Power RMS (Highest Byte) ¹⁴³ |
| 171) | Peak Power RMS |
| 172) | Peak Power RMS |
| 173) | Peak Power RMS (Lowest Byte) |
| 174) | Carrier Feedthrough (Highest Byte) ¹⁴⁴ |
| 175) | Carrier Feedthrough |
| 176) | Carrier Feedthrough |
| 177) | Carrier Feedthrough (Lowest Byte) |
| 178) | Occupied Bandwidth (Highest Byte) ¹⁴⁵ |
| 179) | Occupied Bandwidth |
| 180) | Occupied Bandwidth |
| 181) | Occupied Bandwidth (Lowest Byte) |
| 182) | 1 st Pilot Scan power (highest Byte) ¹⁴⁶ |
| 183) | 1 st Pilot Scan power |
| 184) | 1 st Pilot Scan power |
| 185) | 1 st Pilot Scan power (Lowest Byte) |
| 186) | 2 nd Pilot Scan power (highest Byte) |
| 187) | 2 nd Pilot Scan power |
| 188) | 2 nd Pilot Scan power |
| 189) | 2 nd Pilot Scan power (Lowest Byte) |
| 190) | 3 rd Pilot Scan power (highest Byte) |
| 191) | 3 rd Pilot Scan power |
| 192) | 3 rd Pilot Scan power |
| 193) | 3 rd Pilot Scan power (Lowest Byte) |
| 194) | 4 th Pilot Scan power (highest Byte) |
| 195) | 4 th Pilot Scan power |
| 196) | 4 th Pilot Scan power |
| 197) | 4 th Pilot Scan power (Lowest Byte) |
| 198) | 5 th Pilot Scan power (highest Byte) |
| 199) | 5 th Pilot Scan power |
| 200) | 5 th Pilot Scan power |
| 201) | 5 th Pilot Scan power (Lowest Byte) |
| 202) | 6 th Pilot Scan power (highest Byte) |
| 203) | 6 th Pilot Scan power |
| 204) | 6 th Pilot Scan power |
| 205) | 6 th Pilot Scan power (Lowest Byte) |
| 206) | 7 th Pilot Scan power (highest Byte) |
| 207) | 7 th Pilot Scan power |
| 208) | 7 th Pilot Scan power |
| 209) | 7 th Pilot Scan power (Lowest Byte) |
| 210) | 1 st Pilot Scan PN (highest Byte) |

¹⁴¹ Frequency Error multiplied by 1000000

¹⁴² Channel power * 250 + 50000

¹⁴³ Peak power * 250 + 50000

¹⁴⁴ Carrier Feedthrough * 250 + 25000

¹⁴⁵ Occupied Bandwidth in Hz. Note: This is available only with Option 42(RF Measurements),

¹⁴⁶ Note: This is available only with Option 33(Over the Air Measurements). This applies to all 7 Pilot Scanned

- 211) 1st Pilot Scan PN (Lowest Byte)
- 212) 2nd Pilot Scan PN (highest Byte)
- 213) 2nd Pilot Scan PN (Lowest Byte)
- 214) 3rd Pilot Scan PN (highest Byte)
- 215) 3rd Pilot Scan PN (Lowest Byte)
- 216) 4th Pilot Scan PN (highest Byte)
- 217) 4th Pilot Scan PN (Lowest Byte)
- 218) 5th Pilot Scan PN (highest Byte)
- 219) 5th Pilot Scan PN (Lowest Byte)
- 220) 6th Pilot Scan PN (highest Byte)
- 221) 6th Pilot Scan PN (Lowest Byte)
- 222) 7th Pilot Scan PN (highest Byte)
- 223) 7th Pilot Scan PN (Lowest Byte)
- 224) Tau (Highest Byte)¹⁴⁷
- 225) Tau
- 226) Tau
- 227) Tau (Lowest Byte)
- 228) Noise Floor(Highest Byte)¹⁴⁸
- 229) Noise Floor
- 230) Noise Floor
- 231) Noise Floor (Lowest Byte)
- 232) Pilot Dominance (Highest Byte)¹⁴⁹
- 233) Pilot Dominance
- 234) Pilot Dominance
- 235) Pilot Dominance (Lowest Byte)
- 236) Multipath Power (Highest Byte)¹⁵⁰
- 237) Multipath Power
- 238) Multipath Power
- 239) Multipath Power (lowest Byte)
- 240-243) GPS Position – Latitude (long integer)¹⁵¹
- 244-247) GPS Position – Longitude (long integer)
- 248-249) GPS Position – Altitude (short integer)
- 250) Measure Offset Status
- 251 – 303) Reserved
- 304 – 815) CDP Data. 128 data points. Each data point in 4 bytes
- 816 – 943) Grouping Information. 128 Data points. Each data point in 1 byte
- 944 – 1071) Code information¹⁵²
- 1072 – 1839) RF Spectrum Data.¹⁵³

For Channel Scanner Mode:

- 57) Reference Level (highest Byte)
- 58) Reference Level

¹⁴⁷ Tau is sent as ((Tau in micro sec) + 30) * 10

¹⁴⁸ Noise floor is sent as (Noise floor in dB) * 250 + 50000

¹⁴⁹ Pilot Dominance is sent as (Value in dB) * 250 + 50000. Note: This is available only with option 33.(OTA Measurements)

¹⁵⁰ Multipath Power is sent as (Value in dB) * 250 + 50000 Note: This is available only with option 33.(OTA Measurements)

¹⁵¹ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

¹⁵² 0 - CDMA_PILOT, 1 - CDMA_PAGE, 2 - CDMA_SYNC, 3 - CDMA_QUICK_PAGE , 4 - CDMA_IS95_TRAFFIC, 5 - CDMA_CDMA2000, 6 - CDMA_UNKNOWN 7 - CDMA_NOISE

¹⁵³ 384 Data points, 2 bytes per point. Data sent as ((Value in dB) * 250) + 50000 Note: This is available only with option 42.(RF Measurements)

- 59) Reference Level
- 60) Reference Level (Lowest Byte)
- 61) Scale Division (Highest Byte)
- 62) Scale Division
- 63) Scale Division
- 64) Scale Division (Lowest Byte)
- 65) Start Frequency (Highest Byte)
- 66) Start Frequency
- 67) Start Frequency
- 68) Start Frequency (Lowest Byte)
- 69) Span Frequency (Highest Byte)
- 70) Span Frequency
- 71) Span Frequency
- 72) Span Frequency (Lowest Byte)
- 73) Channel Step (Highest Byte)
- 74) Channel Step (Lowest Byte)
- 75) Channel Frequency Step (Highest Byte)
- 76) Channel Frequency Step
- 77) Channel Frequency Step
- 78) Channel Frequency Step (Lowest Byte)
- 79) Number of Channels Displayed
- 80) External Reference Frequency¹⁵⁴
- 81) Display Type Channels or Frequencies¹⁵⁵
- 82) Display Type Graph or Text¹⁵⁶
- 83) Signal Standard (Highest Byte)
- 84) Signal Standard
- 85) Signal Standard
- 86) Signal Standard (Lowest Byte)
- 87-90) GPS Position – Latitude (long integer)¹⁵⁷
- 91-94) GPS Position – Longitude (long integer)
- 95-96) GPS Position – Altitude (short integer)
- 97) Start Channel (Highest Byte)
- 98) Start Channel
- 99) Start Channel
- 100) Start Channel (Lowest Byte)
- 101– 124) Signal Standard Name, 24 bytes in ASCII
- 125 – 152) Reserved
- 153– 272) Channel Scanner Data¹⁵⁸

For Interference Analyzer RSSI Mode

- 57) Center Frequency (Highest Byte)
- 58) Center Frequency
- 59) Center Frequency
- 60) Center Frequency (lowest Byte)
- 61) Reference Level (Highest Byte)
- 62) Reference Level
- 63) Reference Level

¹⁵⁴ Frequency in MHz, OFF if 0

¹⁵⁵ 0 – Channel, 1 - Frequency

¹⁵⁶ 0 – Graph, 1 - Text

¹⁵⁷ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

¹⁵⁸ 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as $(\text{value in dBm}) * 1000 + 270,000$

- 64) Reference Level (Lowest Byte)
- 65) Scale (Highest Byte)
- 66) Scale
- 67) Scale
- 68) Scale (Lowest Byte)
- 69) RBW (Highest Byte)
- 70) RBW
- 71) RBW
- 72) RBW (Lowest Byte)
- 73) VBW (highest Byte)
- 74) VBW
- 75) VBW
- 76) VBW (Lowest Byte)
- 77) Status Byte 1
 - a. Bit 0 - Detection Algorithm (Lowest Bit)¹⁵⁹
 - b. Bit 1 - Detection Algorithm
 - c. Bit 2 - Detection Algorithm (Highest Bit)
 - d. Bit 3 - Not Used
 - e. Bit 4 - Not Used
 - f. Bit 5 - Not Used
 - g. Bit 6 - Not Used
- 78) Reference Level Offset (Highest Byte)
- 79) Reference Level Offset
- 80) Reference Level Offset
- 81) Reference Level Offset (Lowest Byte)
- 82) External Reference Frequency¹⁶⁰
- 83) Signal Standard (Highest Byte)
- 84) Signal Standard (Lowest Byte)
- 85) Channel (Highest Byte)¹⁶¹
- 86) Channel (Lowest Byte)
- 87) Min RSSI Measured (Highest Byte)
- 88) Min RSSI Measured
- 89) Min RSSI Measured
- 90) Min RSSI Measured (Lowest Byte)
- 91) Max RSSI Measured (Highest Byte)
- 92) Max RSSI Measured
- 93) Max RSSI Measured
- 94) Max RSSI Measured (Lowest Byte)
- 95) Measure Duration (Highest Byte)¹⁶²
- 96) Measure Duration
- 97) Measure Duration
- 98) Measure Duration (Lowest Byte)
- 99) Sweep Point Interval(Highest Byte)¹⁶³
- 100) Sweep Point Interval
- 101) Sweep Point Interval
- 102) Sweep Point Interval (Lowest Byte)
- 103 - 106) GPS Position – Latitude (long integer)¹⁶⁴

¹⁵⁹ 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode

¹⁶⁰ Frequency in MHz, OFF if 0

¹⁶¹ Invalid channels are sent as 0xFFFF

¹⁶² Measure Duration time in minutes

¹⁶³ Sweep Point Interval time in milliseconds

¹⁶⁴ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

- 107-110) GPS Position – Longitude (long integer)
- 111-112) GPS Position – Altitude (short integer)
- 113) Signal Standard
- 114-117) Start GPS Position – Latitude (long integer)¹⁶⁵
- 118-121) Start GPS Position – Longitude (long integer)
- 122-123) Start GPS Position – Altitude (short integer)
- 124) Attenuation (Highest Byte)¹⁶⁶
- 125) Attenuation
- 126) Attenuation
- 127) Attenuation (Lowest Byte)
- 128 – 151) Signal Standard Name, 24 bytes in ASCII
- 152) Measure Offset Status
- 153 – 207) Reserved
- 208 – 3415) RSSI Sweep data¹⁶⁷

For EVDO Mode

- 57) Scale Division (highest Byte)
- 58) Scale Division (Lowest Byte)
- 59) Center Frequency (highest Byte)
- 60) Center Frequency
- 61) Center Frequency
- 62) Center Frequency (Lowest Byte)
- 63) External Reference Frequency (highest Byte)
- 64) External Reference Frequency
- 65) External Reference Frequency
- 66) External Reference Frequency (Lowest Byte)
- 67) Measurement Speed
- 68) PN Offset (Highest Byte)
- 69) PN Offset (Lowest Byte)
- 70) Status Byte 1
 - a. Bit 0 - External Trigger Polarity¹⁶⁸
 - b. Bit 1 – CDP Display Type¹⁶⁹
 - c. Bit 2 – RF Meas Display Type¹⁷⁰
 - d. Bit 3 – Idle Slot¹⁷¹
 - e. Bit 4 – Rho Overall 2 status¹⁷²
 - f. Bit 5 – Not Used
 - g. Bit 6 - Not Used
 - h. Bit 7 – Not Used
- 71) Status Byte 2
 - a. Bit 0 – Not Used
 - b. Bit 1 - Not Used
 - c. Bit 2 – Marker 6 Status
 - d. Bit 3 – Marker 5 Status

¹⁶⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

¹⁶⁶ Attenuation is sent as (Att in dB * 1000)

¹⁶⁷ Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPS position.

¹⁶⁸ 0 – Falling Edge, 1 – Rising Edge

¹⁶⁹ 0 – Mac, 1 - Data

¹⁷⁰ 0 – Idle, 1 - Active

¹⁷¹ 0 – Slot is not idle, 1- Idle Slot

¹⁷² 0 – Not valid 1- Valid Rho Overall 2 Value

- e. Bit 4- Marker 4 Status
 - f. Bit 5- Marker 3 Status
 - g. Bit 6- Marker 2 Status
 - h. Bit 7- Marker 1 Status
- 72) Status Byte 3 – Reserved
- 73) Marker 1 Position
- 74) Marker 2 Position
- 75) Marker 3 Position
- 76) Marker 4 Position
- 77) Marker 5 Position
- 78) Marker 6 Position
- 79) Signal Standard (Highest Byte)
- 80) Signal Standard (Lowest Byte)
- 81) Display Type¹⁷³
- 82) Units¹⁷⁴
- 83) Power Offset (Highest Byte)
- 84) Power Offset
- 85) Power Offset
- 86) Power Offset (Lowest Byte)
- 87) Data Modulation¹⁷⁵
- 88) Channel (Highest Byte)¹⁷⁶
- 89) Channel (Lowest Byte)
- 90) PN Search Mode¹⁷⁷
- 91) EVDO Signal Status (Highest Byte)¹⁷⁸
- 92) EVDO Signal Status (Lowest Byte)
- 93) EVDO Measurement Status¹⁷⁹
- 94-117) Signal Standard Name, 24 bytes in ASCII
- 118) Data Marker¹⁸⁰
- a) Bit 0 – Marker 1
 - b) Bit 1 – Marker 2
 - c) Bit 2 – Marker 3
 - d) Bit 3 – Marker 4
 - e) Bit 4 – Marker 5
 - f) Bit 5 – Marker 6
 - g) Bit 6 – Reserved
 - h) Bit 7 - Reserved
- 119-153) Reserved
- 154) Rho Pilot (Highest Byte)¹⁸¹
- 155) Rho Pilot
- 156) Rho Pilot

¹⁷³ 0 – CDP, 1 – Text Only, 2 – CDP Bit Reverse, 3 – Over the Air Measurements

¹⁷⁴ 0 – dBm, 1 - Watts

¹⁷⁵ 0 – Auto, 1 – QPSK, 2 – 8-PSK, 4 – 16-QAM

¹⁷⁶ Invalid channels are sent as 0xFFFF

¹⁷⁷ Indicates the PN Search mode - GPS AUTO 0, GPS MANUAL 1, EXTERNAL AUTO 2, EXTERNAL MANUAL 3, UNTRIGGERED 4

¹⁷⁸ MEASUREMENT OK 0x0000, LEVEL UNDER MASK 0x0001, SIGNAL ABNORMAL MASK 0x0002, SHORT CODE NOT FOUND MASK 0x0004, AMPLIFIER SATURATION MASK 0x0008, ADC OTR MASK 0x0010, OVERPOWER MASK 0x0020, LOCK FAIL MASK 0x0100 , DDC NOT RESPONDING MASK 0x0200, NO EXTERNAL TRIGGER MASK 0x0400

¹⁷⁹ 0x00 indicates that the measurement is done and that there is valid data available. 0xFF indicates that the measurement is in process and there is no data available yet. All the measured values should be disregarded if this byte is 0xFF

¹⁸⁰ If the marker was turned on in the Data CDP, the status bit of that particular marker will be 1, otherwise 0

¹⁸¹ Rho multiplied by 65535

| | |
|------|--|
| 157) | Rho Pilot (Lowest Byte) |
| 158) | Rho Overall 1(Highest Byte) ¹⁸² |
| 159) | Rho Overall 1 |
| 160) | Rho Overall 1 |
| 161) | Rho Overall 1 (Lowest Byte) |
| 162) | Rho Overall 2 (Highest Byte) ¹⁸³ |
| 163) | Rho Overall 2 |
| 164) | Rho Overall 2 |
| 165) | Rho Overall 2 (Lowest Byte) |
| 166) | PN Offset (Highest Byte) ¹⁸⁴ |
| 167) | PN Offset |
| 168) | PN Offset |
| 169) | PN Offset (Lowest Byte) |
| 170) | Frequency Error (Highest Byte) ¹⁸⁵ |
| 171) | Frequency Error |
| 172) | Frequency Error |
| 173) | Frequency Error (Lowest Byte) |
| 174) | Channel Power RMS (Highest Byte) ¹⁸⁶ |
| 175) | Channel Power RMS |
| 176) | Channel Power RMS |
| 177) | Channel Power RMS (Lowest Byte) |
| 178) | Carrier Feedthrough (Highest Byte) ¹⁸⁷ |
| 179) | Carrier Feedthrough |
| 180) | Carrier Feedthrough |
| 181) | Carrier Feedthrough (Lowest Byte) |
| 182) | Occupied Bandwidth (Highest Byte) ¹⁸⁸ |
| 183) | Occupied Bandwidth |
| 184) | Occupied Bandwidth |
| 185) | Occupied Bandwidth (Lowest Byte) |
| 186) | 1 st Pilot Scan power (highest Byte) ¹⁸⁹ |
| 187) | 1 st Pilot Scan power |
| 188) | 1 st Pilot Scan power |
| 189) | 1 st Pilot Scan power (Lowest Byte) |
| 190) | 2 nd Pilot Scan power (highest Byte) |
| 191) | 2 nd Pilot Scan power |
| 192) | 2 nd Pilot Scan power |
| 193) | 2 nd Pilot Scan power (Lowest Byte) |
| 194) | 3 rd Pilot Scan power (highest Byte) |
| 195) | 3 rd Pilot Scan power |
| 196) | 3 rd Pilot Scan power |
| 197) | 3 rd Pilot Scan power (Lowest Byte) |
| 198) | 4 th Pilot Scan power (highest Byte) |
| 199) | 4 th Pilot Scan power |
| 200) | 4 th Pilot Scan power |
| 201) | 4 th Pilot Scan power (Lowest Byte) |
| 202) | 5 th Pilot Scan power (highest Byte) |
| 203) | 5 th Pilot Scan power |

¹⁸² Rho multiplied by 65535

¹⁸³ Rho multiplied by 65535

¹⁸⁵ Frequency Error multiplied by 1000000

¹⁸⁶ Channel power * 250 + 50000

¹⁸⁷ Carrier Feedthrough * 250 + 25000

¹⁸⁸ Occupied Bandwidth in Hz. Note: This is available only with Option 62(RF Measurements),

¹⁸⁹ Note: This is available only with Option 34(Over the Air Measurements). This applies to all 7 Pilot Scanned

| | |
|------|---|
| 204) | 5 th Pilot Scan power |
| 205) | 5 th Pilot Scan power (Lowest Byte) |
| 206) | 6 th Pilot Scan power (highest Byte) |
| 207) | 6 th Pilot Scan power |
| 208) | 6 th Pilot Scan power |
| 209) | 6 th Pilot Scan power (Lowest Byte) |
| 210) | 7 th Pilot Scan power (highest Byte) |
| 211) | 7 th Pilot Scan power |
| 212) | 7 th Pilot Scan power |
| 213) | 7 th Pilot Scan power (Lowest Byte) |
| 214) | 1 st Pilot Scan PN (highest Byte) |
| 215) | 1 st Pilot Scan PN (Lowest Byte) |
| 216) | 2 nd Pilot Scan PN (highest Byte) |
| 217) | 2 nd Pilot Scan PN (Lowest Byte) |
| 218) | 3 rd Pilot Scan PN (highest Byte) |
| 219) | 3 rd Pilot Scan PN (Lowest Byte) |
| 220) | 4 th Pilot Scan PN (highest Byte) |
| 221) | 4 th Pilot Scan PN (Lowest Byte) |
| 222) | 5 th Pilot Scan PN (highest Byte) |
| 223) | 5 th Pilot Scan PN (Lowest Byte) |
| 224) | 6 th Pilot Scan PN (highest Byte) |
| 225) | 6 th Pilot Scan PN (Lowest Byte) |
| 226) | 7 th Pilot Scan PN (highest Byte) |
| 227) | 7 th Pilot Scan PN (Lowest Byte) |
| 228) | Tau (Highest Byte) ¹⁹⁰ |
| 229) | Tau |
| 230) | Tau |
| 231) | Tau (Lowest Byte) |
| 232) | Noise Floor(Highest Byte) ¹⁹¹ |
| 233) | Noise Floor |
| 234) | Noise Floor |
| 235) | Noise Floor (Lowest Byte) |
| 236) | Pilot Dominance (Highest Byte) ¹⁹² |
| 237) | Pilot Dominance |
| 238) | Pilot Dominance |
| 239) | Pilot Dominance (Lowest Byte) |
| 240) | Multipath Power (Highest Byte) ¹⁹³ |
| 241) | Multipath Power |
| 242) | Multipath Power |
| 243) | Multipath Power (lowest Byte) |
| 244) | Pilot Mac Power – Average (Highest Byte) |
| 245) | Pilot Mac Power – Average |
| 246) | Pilot Mac Power – Average |
| 247) | Pilot Mac Power – Average (Lowest Byte) |
| 248) | Pilot Mac Power – Active(Highest Byte) |
| 249) | Pilot Mac Power – Active |
| 250) | Pilot Mac Power – Active |
| 251) | Pilot Mac Power – Active (Lowest Byte) |
| 252) | Pilot Mac Power – Idle (Highest Byte) |

¹⁹⁰ Tau is sent as ((Tau in micro sec) + 30) * 10

¹⁹¹ Noise floor is sent as (Noise floor in dB) * 250 + 50000

¹⁹² Pilot Dominance is sent as (Value in dB) * 250 + 50000. Note: This is available only with option 33.(OTA Measurements)

¹⁹³ Multipath Power is sent as (Value in dB) * 250 + 50000 Note: This is available only with option 33.(OTA Measurements)

- 253) Pilot Mac Power – Idle
- 254) Pilot Mac Power – Idle
- 255) Pilot Mac Power – Idle (Lowest Byte)
- 256) Pilot Power - Average (Highest Byte)
- 257) Pilot Power - Average
- 258) Pilot Power - Average
- 259) Pilot Power - Average (Lowest Byte)
- 260) Pilot Power - Active (Highest Byte)
- 261) Pilot Power - Active
- 262) Pilot Power - Active
- 263) Pilot Power - Active (Lowest Byte)
- 264) Pilot Power - Idle (Highest Byte)
- 265) Pilot Power - Idle
- 266) Pilot Power - Idle
- 267) Pilot Power - Idle (Lowest Byte)
- 268) Data Power - Average (Highest Byte)
- 269) Data Power - Average
- 270) Data Power - Average
- 271) Data Power - Average (Lowest Byte)
- 272) Data Power - Active (Highest Byte)
- 273) Data Power - Active
- 274) Data Power - Active
- 275) Data Power - Active (Lowest Byte)
- 276) Data Power - Idle (Highest Byte)
- 277) Data Power - Idle
- 278) Data Power - Idle
- 279) Data Power - Idle (Lowest Byte)
- 280) EVM (Highest Byte)
- 281) EVM (Lowest Byte)
- 282) Measured Data Modulation Type
- 283) Idle Activity (Highest Byte)¹⁹⁴
- 284) Idle Activity (Lowest Byte)
- 285) Active Activity (Highest Byte)
- 286) Active Activity (Lowest Byte)
- 287) Measured CDP MAC Treshold (Highest Byte)¹⁹⁵
- 288) Measured CDP MAC Treshold
- 289) Measured CDP MAC Treshold
- 290) Measured CDP MAC Treshold (Lowest Byte)
- 291-294) GPS Position – Latitude (long integer)¹⁹⁶
- 295-298) GPS Position – Longitude (long integer)
- 299-300) GPS Position – Altitude (short integer)
- 301) Measure Offset Status
- 302 – 400) Reserved
- 401 – 720) CDP Mac. 64 data points¹⁹⁷.
- 721 – 848)CDP Data¹⁹⁸
- 849 – 1616) RF Spectrum Data.¹⁹⁹

¹⁹⁴ Sent in % * 100

¹⁹⁵ Sent as (Value in db * 250) + 50000

¹⁹⁶ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

¹⁹⁷ Each data point in 5 bytes. First Byte is Code Information, following 4 bytes are code power. Code Information – 0 – Not Used, 1 – EVDO Control Info, 2 – EVDO Odd Code, 3 – EVDO Even Code, 4 - Noise

¹⁹⁸ 32 Points. 4 bytes per point. First 16 points are the I data and the following 16 are the Q Data

1617 – 2384) Idle Power vs Time Data²⁰⁰
2385 – 3152)Active Power vs Time Data²⁰¹

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) Current Instrument Date Format²⁰²

4) Model # (unsigned integer, 13h for Cell Master model MT8212A)

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

Cell Master Returns (Invalid sweep location): 1 byte

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

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 (0 or 1)

00h = Off

01h = On

1. 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 Spectrum Analyzer mode.

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

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

Bytes to Follow: 3 bytes

1) “A” trace display (00h = A only, 01h = A-B, 02h = A+B)

2) “B” trace status (00h = Off, 01h = On)

3) “B” trace number

0 = save current “A” data into “B” buffer, use that as “B”

1-200 = trace number

255 = no “B” trace defined

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

¹⁹⁹ 384 Data points, 2 bytes per point. Data sent as ((Value in dB) * 250) + 50000 Note: This is available only with option 62.(RF Measurements)

²⁰⁰ 384 Points, 2 Bytes per point. Data sent as ((Value in dB) * 250) + 50000 Note: This is available only with option 62.(RF Measurements)

²⁰¹ 384 Points, 2 Bytes per point. Data sent as ((Value in dB) * 250) + 50000 Note: This is available only with option 62.(RF Measurements)

²⁰² 00h = MM/DD/YYYY, 01h = DD/MM/YYYY, 02h = YYYY/MM/DD

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

This command is new to the MT8212A. Use it, instead of Control Bytes #26 and #28, to access the new features.

Description: Uploads a sweep trace to the Cell Master.

Bytes to Follow:

For All Modes:

- 1-2) # of following bytes
- 3) Measurement Mode²⁰³
- 4-7) Time/Date (in Long Integer)
- 8-17) Date in String Format (MM/DD/YYYY)
- 18-25) Time in String Format (HH:MM:SS)
- 26-41) Reference number stamp (16 ASCII bytes)
- 42-43) # of data points (130, 259, 517 or 401 or 100)

For VNA Modes:

- 44) Start Frequency (highest byte)²⁰⁴
- 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)²⁰⁵
- 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 (higher byte)²⁰⁶
- 65) Frequency Marker 1 (lower byte)
- 66) Frequency Marker 2 (higher byte)
- 67) Frequency Marker 2 (lower byte)
- 68) Frequency Marker 3 (higher byte)
- 69) Frequency Marker 3 (lower byte)
- 70) Frequency Marker 4 (higher byte)
- 71) Frequency Marker 4 (lower byte)
- 72) Frequency Marker 5 (higher byte)
- 73) Frequency Marker 5 (lower byte)
- 74) Frequency Marker 6 (higher byte)
- 75) Frequency Marker 6 (lower byte)
- 76) Single Limit Line Value (highest byte)²⁰⁷

²⁰³ See Control Byte #3 “Set Measurement Mode” for available measurement modes.

²⁰⁴ Frequency in Hz

²⁰⁵ See Control Byte #4, “Set Cell Master VNA Scale” for data format.

²⁰⁶ Marker point = (Number of data points – 1) * (marker freq – start freq) / (stop freq – start freq)

²⁰⁷ See Control Byte #6, “Set Cell Master VNA Single Limit” for data format

- 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)²⁰⁸
- 83) Multiple Limit Start X
- 84) Multiple Limit Start X
- 85) Multiple Limit Start X (lowest byte)
- 86) Multiple Limit Start Y (higher byte)
- 87) Multiple Limit Start Y (lower byte)
- 88) Multiple Limit End X (highest byte)
- 89) Multiple Limit End X
- 90) Multiple Limit End X
- 91) Multiple Limit End X (lowest byte)
- 92) Multiple Limit End Y (higher byte)
- 93) Multiple Limit End Y (lower byte)
- 94-149) Repeat bytes 80-93 for segments 2-5
- 150) Start Distance (highest byte)²⁰⁹
- 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 (higher byte)²¹⁰
- 159) Distance Marker 1 (lower byte)
- 160) Distance Marker 2 (higher byte)
- 161) Distance Marker 2 (lower byte)
- 162) Distance Marker 3 (higher byte)
- 163) Distance Marker 3 (lower byte)
- 164) Distance Marker 4 (higher byte)
- 165) Distance Marker 4 (lower byte)
- 166) Distance Marker 5 (higher byte)
- 167) Distance Marker 5 (lower byte)
- 168) Distance Marker 6 (higher byte)
- 169) Distance Marker 6 (lower byte)
- 170) Relative Propagation Velocity (highest byte)²¹¹
- 171) Relative Propagation Velocity
- 172) Relative Propagation Velocity
- 173) Relative Propagation Velocity (lowest byte)
- 174) Cable Loss (highest byte)²¹²
- 175) Cable Loss
- 176) Cable Loss
- 177) Cable Loss (lowest byte)
- 178) Average Cable Loss²¹³ (highest byte)
- 179) Average Cable Loss
- 180) Average Cable Loss

²⁰⁸ See Control Byte #112, “Set Cell Master VNA Segmented Limit Lines” for data format.

²⁰⁹ Distance data uses units 1/100,000m or 1/100,000 ft

²¹⁰ Marker point = (# of data points – 1) * (marker dist – start dist) / (stop dist – start dist)

²¹¹ Relative Propagation Velocity uses units 1/100,000

²¹² Cable Loss uses units 1/100,000 dB/m or 1/100,000 dB/ft

²¹³ Average Cable Loss is dB * 1000.

- 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 - Nomina- Side Lobe
 1 0 - Low Si-e Lobe
 – 1 1 - Minimu- 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) VNA Signal Standard²¹⁴ (higher byte)
- 188) VNA Signal Standard (lower byte)
- 189-192) GPS Position – Latitude (long integer)²¹⁵
- 193-196) GPS Position – Longitude (long integer)
- 197-198) GPS Position – Altitude (short integer)
- 199) Reserved
- 200-223) Signal Standard Name, 24 bytes in ASCII
- 224-244) Cable Name, 21 bytes in ASCII
- 245-314) Not Used
- 315-1354) Sweep Data (130 points * 8 bytes/point= 1040 bytes)
- 315-2386) (259 points * 8 bytes/point= 2072 bytes)
- 315-4450) (517 points * 8 bytes/point= 4136 bytes)
- 8 bytes for each data point
1. Gamma²¹⁶ (highest byte)
 2. Gamma

²¹⁴ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

²¹⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

²¹⁶ Gamma uses units scaled to 1/10,000

3. Gamma
4. Gamma (lowest byte)
5. Phase²¹⁷ (highest byte)
6. Phase
7. Phase
8. Phase (lowest byte)

Notes:

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

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

Phase compares the reflected to the incident (reference)

For Spectrum Analyzer Mode:

- 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 Level²¹⁸ (highest byte)
- 61) Ref Level
- 62) Ref Level
- 63) Ref Level (lowest byte)
- 64) Scale per div²¹⁹ (highest byte)
- 65) Scale per div
- 66) Scale per div
- 67) Scale per div (lowest byte)
- 68) Marker 1²²⁰ (higher byte)
- 69) Marker 1 (lower byte)
- 70) Marker 2 (higher byte)
- 71) Marker 2 (lower byte)
- 72) Marker 3 (higher byte)
- 73) Marker 3 (lower byte)
- 74) Marker 4 (higher byte)
- 75) Marker 4 (lower byte)
- 76) Marker 5 (higher byte)
- 77) Marker 5 (lower byte)
- 78) Marker 6 (higher byte)
- 79) Marker 6 (lower byte)
- 80) Single Limit²²¹ (highest byte)

²¹⁷ Phase is transmitted in 1/10ths of a degree

²¹⁸ Value sent as (value in dBm * 1000) + 270,000

²¹⁹ Value sent as (value * 1000)

²²⁰ Marker values are sent as # of data point on display.

See Control Byte #102, "Set Spectrum Analyzer Marker" for calculation of data point.

- 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 Setting²²² (highest byte)
- 245) RBW Setting
- 246) RBW Setting
- 247) RBW Setting (lowest byte)
- 248) VBW Setting²²³ (highest byte)
- 249) VBW Setting
- 250) VBW Setting
- 251) VBW Setting (lowest byte)
- 252) OCC BW Method (00h = % of power, 01h = dB down)
- 253) OCC BW % Value (0-99)
- 254) OCC BW dBc (0-120)
- 255) Attenuation²²⁴ (highest byte)
- 256) Attenuation
- 257) Attenuation
- 258) Attenuation (lowest byte)
- 259-274) Name (16 bytes in ASCII)
- 1.4 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
- 275) Status Byte 2: (0b = Off, 1b = On)
 - (LSB) bit 0 : Not Used
 - bit 1 : Marker 2 Delta On/Off
 - bit 2 : Marker 3 Delta On/Off
 - bit 3 : Marker 4 Delta On/Off
 - bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
 - bit 5 : Pre Amp Status On/Off

²²¹ All amplitude values are sent as (value in dBm * 1000) + 270,000

²²² Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000, 1,000,000

²²³ Valid frequencies (in Hz) are 100, 300, 1,000, 3,000, 10,000, 30,000, 100,000, 300,000

²²⁴ Value sent as (value * 1000)

- bit 6 : Dynamic Attenuation On/Off
- bit 7 : Normalization ON/OFF (MS2711D Only)
- 276) Status Byte 3: (0b = Off, 1b = On)
 - (LSB) bit 0 : Antenna Factor Correction On/Off
 - bits 1-2 : Detection alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak, 11 = Sampling Mode)
 - bits 3-4 : Amplitude Units (log) (00b = dBm 01b = dBV 10b = dBmV 11b = dBuV) (Linear) – (00b = Watts 01b = Volts)
 - bit 5: Channel Power On/Off
 - bit 6: Adjacent Channel Power Ratio On/Off
 - bit 7 : Units Type (0b = Log 1b = Linear)
- 277) 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
- 278) 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
- 279) 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
- 280) Status Byte 7
 - (LSB) bits 0-6: Number of Sweeps to Average (1-25, 1 implies averaging OFF)
 - bit 7 : Not Used
- 281) Reference Level Offset²²⁵ (highest byte)
- 282) Reference Level Offset
- 283) Reference Level Offset
- 284) Reference Level Offset (lowest byte)
- 285) External Reference Frequency²²⁶
- 286) Signal Standard²²⁷ (higher byte)
- 287) Signal Standard (lower byte)
- 288) Channel Selection²²⁸ (higher byte)

²²⁵ Value sent as (Value in dBm * 1000) + 270,000

²²⁶ byte in MHz (i.e. 20 = 20MHz)

²²⁷ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFeh.

- 289) Channel Selection (lower byte)
- 290) Interference Analysis Cellular Standard²²⁹
- 291) Interference Analysis Estimated Bandwidth (highest byte)
- 292) Interference Analysis Estimated Bandwidth
- 293) Interference Analysis Estimated Bandwidth
- 294) Interference Analysis Estimated Bandwidth (lowest byte)
- 295) Interference Analysis Frequency (in Hz) (highest byte)
- 296) Interference Analysis Frequency (in Hz)
- 297) Interference Analysis Frequency (in Hz)
- 298) Interference Analysis Frequency (in Hz) (lowest byte)
- 300-303) Reserved
- 304) Trigger Type²³⁰
- 305) Trigger Position (0 – 100%)
- 306) Min Sweep Time (in μ s) (highest byte)
- 307) Min Sweep Time (in μ s)
- 308) Min Sweep Time (in μ s)
- 309) Min Sweep Time (in μ s) (lowest byte)
- 310) Video Trigger Level²³¹ (highest byte)
- 311) Video Trigger Level
- 312) Video Trigger Level
- 313) Video Trigger Level (lowest byte)
- 314) Status Byte 8 (0b = Off, 1b = On)
 - (LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
 - bit 2: Max Hold On/Off
 - bit 3: Min Hold On/Off
 - bit 4: Transmission Mode Calibration Status (Option 21 Only)
 - bit 5: Bias Tee On/Off (Option 10, MS2711D Only)
 - bit 6: Occupied BW Measurement On/Off
 - bit 7: Not Used
- 315) Impedance (00h = 50 Ω , 0Ah = 75 Ω Anritsu Adapter, 0Ch = 75 Ω Other Adapter)
- 316) Impedance Loss²³² (higher byte)
- 317) Impedance Loss (lower byte)
- 318) Frequency Scale Factor²³³ (higher byte)
- 319) Frequency Scale Factor (lower byte)
- 320) Frequency Range Minimum²³⁴ (highest byte)
- 321) Frequency Range Minimum
- 322) Frequency Range Minimum
- 323) Frequency Range Minimum (lowest byte)
- 324) Frequency Range Maximum²³⁵ (highest byte)
- 325) Frequency Range Maximum
- 326) Frequency Range Maximum
- 327) Frequency Range Maximum (lowest byte)
- 328) Linked Trace Number (1-200)
- 329) Status Byte 9 (0b = Off, 1b = On)
 - (LSB) bit 0: C/I Measurement On/Off

²²⁸ “No Channel” is sent as FFFh.

²²⁹ 4 Standards – 00h = 1250KHZ CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown FFh = Interference Analysis Measurement OFF

²³⁰ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

²³¹ Value sent as (Value in dBm * 1000) + 270,000

²³² Value sent as (value in dB * 1000), valid values are 0 to 20 dB

²³³ In number of Hz

²³⁴ Scaled by Frequency Scale Factor

²³⁵ Scaled by Frequency Scale Factor

- bits 1-3: C/I Carrier Trace/Signal Type²³⁶
bits 4-7: Not Used
- 330) C/I Calculated Power²³⁷ (Carrier or Interference – NB FHSS²³⁸) (highest byte)
 - 331) C/I Calculated Power (Carrier or Interference – NB FHSS)
 - 332) C/I Calculated Power (Carrier or Interference – NB FHSS)
 - 333) C/I Calculated Power (Carrier or Interference – NB FHSS) (lowest byte)
 - 334) C/I Calculated Power²³⁹ (Interference – WB FHSS²⁴⁰) (highest byte)
 - 335) C/I Calculated Power (Interference – WB FHSS)
 - 336) C/I Calculated Power (Interference – WB FHSS)
 - 337) C/I Calculated Power (Interference – WB FHSS) (lowest byte)
 - 338) C/I Calculated Power²⁴¹ (Interference – Broadband²⁴²) (highest byte)
 - 339) C/I Calculated Power (Interference – Broadband)
 - 340) C/I Calculated Power (Interference – Broadband)
 - 341) C/I Calculated Power (Interference – Broadband) (lowest byte)
 - 342) Marker Type²⁴³
 - 343-346) GPS Position – Latitude (long integer)²⁴⁴
 - 347-350) GPS Position – Longitude (long integer)
 - 351-352) GPS Position – Altitude (short integer)
 - 353) Reserved
 - 354-377) Signal Standard Name, 24 bytes in ASCII
 - 378) Measure Offset Status
 - 379-400) Not Used
 - 401-2004) Sweep Data (401 points * 4 bytes/point = 1604 bytes)
 - 4 bytes for each data point
 - 1. dBm²⁴⁵ (highest byte)
 - 2. dBm
 - 3. dBm
 - 4. dBm (lowest byte)

For T1/E1 Modes:

- 44) Receive Input (00h: Terminate, 01h: Bridged, 02h: Monitor)
- 45) Framing Mode²⁴⁶
- 46) Line Coding (01h: B8ZS, 02h: AMI, 03h: HDB3)
- 47) Tx Level (Valid for T1 Only) (01h: 0 dB, 02h: -7.5 dB, 03h: -15 dB)
- 48) Clock Source (00h: External, 01h: Internal)
- 49) Error Insert Type (00h: Frame Error, 01h: BPV, 02h: Bit Errors, 04h: RAI, 05h: AIS)
- 50) Loop Code (Valid for T1 Only) (00h: CSU, 01h: NIU, 02h: User 1, 03h: User 2)
- 51) Loop Type (Valid for T1 Only) (00h: In Band, 01h: Data Link)

²³⁶ 000b = Carrier – NB FHSS, 001b = Carrier – WB FHSS, 010b = Carrier – Broadband, 111b = Interference

²³⁷ Value sent as (value in dBm * 1000) + 270,000

²³⁸ If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes represent the calculated Carrier power.

²³⁹ Value sent as (value in dBm * 1000) + 270,000

²⁴⁰ If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes should be ignored.

²⁴¹ Value sent as (value in dBm * 1000) + 270,000

²⁴² If Status Byte 9, bytes 1-3 equal 111b, then signal will be calculated power for the Interference – NB FHSS trace. Otherwise, these bytes should be ignored.

²⁴³ 0 – Regular Marker, 1 – Noise Marker

²⁴⁴ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

²⁴⁵ Value sent as (Value in dBm * 1000) + 270,000

²⁴⁶ T1 Mode: 01h: ESF, 02h: D4SF

E1 Mode: 03h: PCM30, 04h: PCM30CRC, 05h: PCM31, 06h: PCM31CRC

- 52) CRC Method (Valid for T1 Only) (00h: ANSI CRC, 01h: Japanese CRC)
- 53) Display Type (00h: Histogram, 01h: Raw Data)
- 54) Impedance (Valid for E1 Only) (01h: 75 Ω , 02h: 120 Ω)
- 55) Pattern²⁴⁷
- 56) Pattern Invert Status (00h: Non-Inverted, 01h: Inverted)
- 57) Insert Bit Error Value (1-1000) (higher byte)
- 58) Insert Bit Error Value (lower byte)
- 59) Insert BPV Error Value (1-1000) (higher byte)
- 60) Insert BPV Error Value (lower byte)
- 61) Insert Frame Error Value (1-1000) (higher byte)
- 62) Insert Frame Error Value (lower byte)
- 63) Measurement Duration²⁴⁸
- 64) Histogram Resolution²⁴⁹
- 65) Frame Sync Status (00h: In Sync, 01h: Out-of-Sync)
- 66) Pattern Sync Status (00h: In Sync, 01h: Out-of-Sync)
- 67) Carrier Status (00h: In Sync, 01h: Out-of-Sync)
- 68) Rx Alarms (bit 0: Receiving AIS, bit 1: Receiving RAI, bit 2: Receiving E1 MMF error)
- 69) BPV Error Count (highest byte)
- 70) BPV Error Count
- 71) BPV Error Count
- 72) BPV Error Count (lowest byte)
- 73) CRC Error Count (highest byte)
- 74) CRC Error Count
- 75) CRC Error Count
- 76) CRC Error Count (lowest byte)
- 77) Frame Error Count (highest byte)
- 78) Frame Error Count
- 79) Frame Error Count
- 80) Frame Error Count (lowest byte)
- 81) LOF Error Count (highest byte)
- 82) LOF Error Count
- 83) LOF Error Count
- 84) LOF Error Count (lowest byte)
- 85) E Bit Error Count (E1 Only) (highest byte)
- 86) E Bit Error Count (E1 Only)
- 87) E Bit Error Count (E1 Only)
- 88) E Bit Error Count (E1 Only) (lowest byte)
- 89) Errored Seconds (highest byte)
- 90) Errored Seconds
- 91) Errored Seconds
- 92) Errored Seconds (lowest byte)
- 93) Bit Count (highest byte)
- 94) Bit Count
- 95) Bit Count
- 96) Bit Count (lowest byte)
- 97) Bit Errors (highest byte)
- 98) Bit Errors
- 99) Bit Errors

²⁴⁷ Pattern: 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

²⁴⁸ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

²⁴⁹ Histogram Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

- 100) Bit Errors (lowest byte)
- 101) User Defined Pattern (convert to binary for pattern) (highest byte)
- 102) User Defined Pattern
- 103) User Defined Pattern
- 104) User Defined Pattern (lowest byte)
- 105 – 112) Measurement Start Time String (ASCII string: “HH:MM:SS”)
- 113 – 123) Measurement Stop Time String (ASCII string: “DD:HH:MM:SS”)
- 124 – 134) Elapsed Time String (ASCII string: “DD:HH:MM:SS”)
- 135 – 142) Bit Error Rate String (ASCII string in engineering format: x.xxE-xx)
- 143 – 642) 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 corresponds 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 |

- 643) Vpp or dBdsx (high byte)
- 644) Vpp or dBdsx (low byte)
- 645) T1 or E1 Receive Frequency in Hz (high byte)
- 646) T1 or E1 Receive Frequency in Hz
- 647) T1 or E1 Receive Frequency in Hz
- 648) T1 or E1 Receive Frequency in Hz (low byte)
- 649-652) GPS Position – Latitude (long integer)²⁵⁰
- 653-656) GPS Position – Longitude (long integer)
- 657-658) GPS Position – Altitude (short integer)
- 659) DS0/E0 Insert State, 1 == Insert ON, 0 == Insert OFF
- 660) DS0/E0 Channel Number
- 661– 662) DS0/E0 Audio Monitor Volume in %
- 663– 664) DS0/E0 Send Level in dBm from 0 to –30, offset by 30
- 665– 666) DS0/E0 Send Frequency in Hz, 100 to 3000 Hz.
- 667– 668) DS0/E0 Receive Level from -40.0 to +3.0 dBm, offset by 401
- 669– 670) DS0/E0 Receive Frequency in Hz
- 671) Vpp Scale: 0 = Vpp, 1 = dBdsx
- 672) Vpp Input Configuration: 0 = Terminated, 1 = Bridged
- 673) Vpp Input Impedance: 1 = 75 ohms, 2 = 120 ohms
- 674 – 675) Degraded Minutes (DGRM)
- 676 – 679) Severely Errored Seconds (SES)
- 680 –683) Unavailable Seconds (UAS)
- 684-687) GPS Position – Latitude (long integer)²⁵¹
- 688-691) GPS Position – Longitude (long integer)
- 692-693) GPS Position – Altitude (short integer)
- 694 – 737) Not Used

For Power Meter:

- 44) Power Monitor Mode (00h = Off, 01h = On)
- 45) Power Meter Unit (00h = dBm, 01h = Watts)
- 46) Start Frequency²⁵² (highest byte)

²⁵⁰ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

²⁵¹ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

²⁵² Scaled by Frequency Scale Factor (bytes 96-97)

- 47) Start Frequency
- 48) Start Frequency
- 49) Start Frequency (lowest byte)
- 50) Stop Frequency²⁵³ (highest byte)
- 51) Stop Frequency
- 52) Stop Frequency
- 53) Stop Frequency (lowest byte)
- 54) Center Frequency²⁵⁴ (highest byte)
- 55) Center Frequency
- 56) Center Frequency
- 57) Center Frequency (lowest byte)
- 58) Frequency Span²⁵⁵ (highest byte)
- 59) Frequency Span
- 60) Frequency Span
- 61) Frequency Span (lowest byte)
- 62) Power Offset Status (00h = Off, 01h = On)
- 63) Power Offset²⁵⁶ (highest byte)
- 64) Power Offset
- 65) Power Offset
- 66) Power Offset (lowest byte)
- 67) Power Relative Status (00h = Off, 01h = On)
- 68) Power Relative Value²⁵⁷ (highest byte)
- 69) Power Relative Value
- 70) Power Relative Value
- 71) Power Relative Value (lowest byte)
- 72) RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
- 73) Power Zero Status (00h = Off, 01h = On)
- 74) External Reference Status (00h = Off, 01h = On)
- 75) External Reference Frequency (in Hz) (highest byte)
- 76) External Reference Frequency (in Hz)
- 77) External Reference Frequency (in Hz)
- 78) External Reference Frequency (in Hz) (lowest byte)
- 79) Signal Standard²⁵⁸ (higher byte)
- 80) Signal Standard (lower byte)
- 81) Channel Selection²⁵⁹ (higher byte)
- 82) Channel Selection (lower byte)
- 83) Frequency Scale Factor²⁶⁰ (higher byte)
- 84) Frequency Scale Factor (lower byte)
- 85) Frequency Range Minimum²⁶¹ (highest byte)
- 86) Frequency Range Minimum
- 87) Frequency Range Minimum
- 88) Frequency Range Minimum (lowest byte)
- 89) Frequency Range Maximum²⁶² (highest byte)
- 90) Frequency Range Maximum
- 91) Frequency Range Maximum

²⁵³ Scaled by Frequency Scale Factor (bytes 96-97)

²⁵⁴ Scaled by Frequency Scale Factor (bytes 96-97)

²⁵⁵ Scaled by Frequency Scale Factor (bytes 96-97)

²⁵⁶ Value sent as (value in dB * 1000), valid values are 0 to 60 dB

²⁵⁷ Value sent as (value in dBm * 1000)

²⁵⁸ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

²⁵⁹ “No Channel” is sent as FFFEh

²⁶⁰ In number of Hz

²⁶¹ Scaled by Frequency Scale Factor

²⁶² Scaled by Frequency Scale Factor

- 92) Frequency Range Maximum (lowest byte)
- 93-96) GPS Position – Latitude (long integer)²⁶³
- 97-100) GPS Position – Longitude (long integer)
- 101-102) GPS Position – Altitude (short integer)
- 103) Reserved
- 104 – 127) Signal Standard Name, 24 bytes in ASCII
- 128 – 150) Not Used
- 151) Power Meter Reading²⁶⁴ (highest byte)
- 152) Power Meter Reading
- 153) Power Meter Reading
- 154) Power Meter Reading (lowest byte)
- 155) Measure Offset Status

For GSM Mode:

- 44) Scale Division (highest Byte)
- 45) Scale Division (Lowest Byte)
- 46) Center Frequency (Highest Byte)
- 47) Center Frequency
- 48) Center Frequency
- 49) Center Frequency (Lowest Byte)
- 50) External Reference Frequency (Highest Byte)
- 51) External Reference Frequency
- 52) External Reference Frequency
- 53) External Reference Frequency (lowest Byte)
- 54) Signal Standard (Highest Byte)
- 55) Signal Standard (Lowest Byte)
- 56) Display Type²⁶⁵
- 57) Display Units²⁶⁶
- 58) Power Offset (Highest Byte)
- 59) Power Offset
- 60) Power Offset
- 61) Power Offset (Lowest Byte)
- 62) Channel (Highest Byte)²⁶⁷
- 63) Channel (Lowest Byte)
- 64-67) GPS Position – Latitude (long integer)²⁶⁸
- 68-71) GPS Position – Longitude (long integer)
- 72-73) GPS Position – Altitude (short integer)
- 74-76) Reserved
- 77-100) Signal Standard Name, 24bytes in ASCII
- 101) Measure Offset Status
- 102 – 113) Reserved
- 114) Measured Channel power (Highest Byte)
- 115) Measured Channel Power (Lowest Byte)
- 116) Measured Burst Power (Highest Byte)
- 117) Measured Burst Power (Lowest Byte)

²⁶³ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

²⁶⁴ Power sent as (power in dBm * 1000). Use two's-complement method to decode negative power levels.

²⁶⁵ 0 – Spectrum, 1 – Frame View, 2 – Slot View

²⁶⁶ 0 – dBm, 1 - Watts

²⁶⁷ Invalid channels are sent as 0xFFFF

²⁶⁸ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

- 118) Frequency Error (Highest Byte)
- 119) Frequency Error
- 120) Frequency Error
- 121) Frequency Error (lowest Byte)
- 122) Occupied Bandwidth (Highest Byte)
- 123) Occupied Bandwidth
- 124) Occupied Bandwidth
- 125) Occupied Bandwidth (Lowest Byte)
- 126) TSC (MSB)
- 127) TSC(LSB)
- 128 – 143) Reserved
- 144- 945) Spectrum Data ²⁶⁹
- 946 – 1747) Frame View Data
- 1748 – 2549) Slot View Data

For CDMA Mode:

- 44) Scale Division (highest Byte)
- 45) Scale Division (Lowest Byte)
- 46) Center Frequency (highest Byte)
- 47) Center Frequency
- 48) Center Frequency
- 49) Center Frequency (Lowest Byte)
- 50) External Reference Frequency (highest Byte)
- 51) External Reference Frequency
- 52) External Reference Frequency
- 53) External Reference Frequency (Lowest Byte)
- 54) Measurement Length
- 55) PN Offset (Highest Byte)
- 56) PN Offset (Lowest Byte)
- 57) Status Byte 1
 - i. Bit 0 External Trigger Polarity²⁷⁰
 - j. Bit 1 – Not Used
 - k. Bit 2 – Not Used
 - l. Bit 3 – Not Used
 - m. Bit 4 – Not Used
 - n. Bit 5 – Not Used
 - o. Bit 6 - Not Used
 - p. Bit 7 – Not Used
- 58) Status Byte 2
 - q. Bit 0 – Not Used
 - r. Bit 1 - Not Used
 - s. Bit 2 – Marker 6 Status
 - t. Bit 3 – Marker 5 Status
 - u. Bit 4- Marker 4 Status
 - v. Bit 5- Marker 3 Status
 - w. Bit 6- Marker 2 Status
 - x. Bit 7- Marker 1 Status
- 59) Status Byte 3 – Reserved
- 60) Marker 1 Position
- 61) Marker 2 Position
- 62) Marker 3 Position
- 63) Marker 4 Position
- 64) Marker 5 Position

²⁶⁹ 401 Points, 2 bytes per point

²⁷⁰ 0 – Falling Edge, 1 – Rising Edge

- 65) Marker 6 Position
- 66) Signal Standard (Highest Byte)
- 67) Signal Standard (Lowest Byte)
- 68) Display Type²⁷¹
- 69) Units²⁷²
- 70) Power Offset (Highest Byte)
- 71) Power Offset
- 72) Power Offset
- 73) Power Offset (Lowest Byte)
- 74) PN Increment
- 75) Channel (Highest Byte)²⁷³
- 76) Channel (Lowest Byte)
- 77) PN search mode
- 78) Reserved
- 79) Reserved
- 80) Reserved
- 81 – 104) Signal Standard Name, 24bytes in ASCII
- 105 – 140) Reserved
- 141) Measured Rho (Highest Byte)²⁷⁴
- 142) Measured Rho
- 143) Measured Rho
- 144) Measured Rho (Lowest Byte)
- 145) PN Offset (Highest Byte)²⁷⁵
- 146) PN Offset
- 147) PN Offset
- 148) PN Offset (Lowest Byte)
- 149) Frequency Error (Highest Byte)²⁷⁶
- 150) Frequency Error
- 151) Frequency Error
- 152) Frequency Error (Lowest Byte)
- 153) Channel Power RMS (Highest Byte)²⁷⁷
- 154) Channel Power RMS
- 155) Channel Power RMS
- 156) Channel Power RMS (Lowest Byte)
- 157) Peak Power RMS (Highest Byte)²⁷⁸
- 158) Peak Power RMS
- 159) Peak Power RMS
- 160) Peak Power RMS (Lowest Byte)
- 161) Carrier Feedthrough (Highest Byte)²⁷⁹
- 162) Carrier Feedthrough
- 163) Carrier Feedthrough
- 164) Carrier Feedthrough (Lowest Byte)
- 165) Occupied Bandwidth (Highest Byte)²⁸⁰
- 166) Occupied Bandwidth
- 167) Occupied Bandwidth

²⁷¹ 0 – CDP, 1 – Text Only, 2 – CDP Bit Reverse, 3 – Over the Air Measurements

²⁷² 0 – dBm, 1 - Watts

²⁷³ Invalid channels are sent as 0xFFFF

²⁷⁴ Rho multiplied by 65535

²⁷⁶ Frequency Error multiplied by 1000000

²⁷⁷ Channel power * 250 + 50000

²⁷⁸ Peak power * 250 + 50000

²⁷⁹ Carrier Feedthrough * 250 + 25000

²⁸⁰ Occupied Bandwidth in Hz

| | |
|------|---|
| 168) | Occupied Bandwidth (Lowest Byte) |
| 169) | 1 st Pilot Scan power (highest Byte) |
| 170) | 1 st Pilot Scan power |
| 171) | 1 st Pilot Scan power |
| 172) | 1 st Pilot Scan power (Lowest Byte) |
| 173) | 2 nd Pilot Scan power (highest Byte) |
| 174) | 2 nd Pilot Scan power |
| 175) | 2 nd Pilot Scan power |
| 176) | 2 nd Pilot Scan power (Lowest Byte) |
| 177) | 3 rd Pilot Scan power (highest Byte) |
| 178) | 3 rd Pilot Scan power |
| 179) | 3 rd Pilot Scan power |
| 180) | 3 rd Pilot Scan power (Lowest Byte) |
| 181) | 4 th Pilot Scan power (highest Byte) |
| 182) | 4 th Pilot Scan power |
| 183) | 4 th Pilot Scan power |
| 184) | 4 th Pilot Scan power (Lowest Byte) |
| 185) | 5 th Pilot Scan power (highest Byte) |
| 186) | 5 th Pilot Scan power |
| 187) | 5 th Pilot Scan power |
| 188) | 5 th Pilot Scan power (Lowest Byte) |
| 189) | 6 th Pilot Scan power (highest Byte) |
| 190) | 6 th Pilot Scan power |
| 191) | 6 th Pilot Scan power |
| 192) | 6 th Pilot Scan power (Lowest Byte) |
| 193) | 7 th Pilot Scan power (highest Byte) |
| 194) | 7 th Pilot Scan power |
| 195) | 7 th Pilot Scan power |
| 196) | 7 th Pilot Scan power (Lowest Byte) |
| 197) | 1 st Pilot Scan PN (highest Byte) |
| 198) | 1 st Pilot Scan PN (Lowest Byte) |
| 199) | 2 nd Pilot Scan PN (highest Byte) |
| 200) | 2 nd Pilot Scan PN (Lowest Byte) |
| 201) | 3 rd Pilot Scan PN (highest Byte) |
| 202) | 3 rd Pilot Scan PN (Lowest Byte) |
| 203) | 4 th Pilot Scan PN (highest Byte) |
| 204) | 4 th Pilot Scan PN (Lowest Byte) |
| 205) | 5 th Pilot Scan PN (highest Byte) |
| 206) | 5 th Pilot Scan PN (Lowest Byte) |
| 207) | 6 th Pilot Scan PN (highest Byte) |
| 208) | 6 th Pilot Scan PN (Lowest Byte) |
| 209) | 7 th Pilot Scan PN (highest Byte) |
| 210) | 7 th Pilot Scan PN (Lowest Byte) |
| 211) | Tau (Highest Byte) ²⁸¹ |
| 212) | Tau |
| 213) | Tau |
| 214) | Tau (Lowest Byte) |
| 215) | Noise Floor(Highest Byte) ²⁸² |
| 216) | Noise Floor |
| 217) | Noise Floor |
| 218) | Noise Floor (Lowest Byte) |
| 219) | Pilot Dominance (Highest Byte) ²⁸³ |

²⁸¹ Tau is sent as ((Tau in micro sec) +30) * 10

²⁸² Noise floor is sent as (Noise floor in dB) * 250 + 50000

²⁸³ Pilot Dominance is sent as (Value in dB) * 250 + 50000

- 220) Pilot Dominance
- 221) Pilot Dominance
- 222) Pilot Dominance (Lowest Byte)
- 223) Multipath Power (Highest Byte)²⁸⁴
- 224) Multipath Power
- 225) Multipath Power
- 226) Multipath Power (lowest Byte)
- 227-230) GPS Position – Latitude (long integer)²⁸⁵
- 231-234) GPS Position – Longitude (long integer)
- 235-236) GPS Position – Altitude (short integer)
- 237) Measure Offset Status
- 238-287) Reserved
- 288 -799) CDP Data. 128 data points. Each data point in 4 bytes
- 800-927) Grouping Information. 128 Data points. Each data point in 1 byte
- 928-1055) Code information²⁸⁶
- 1056-1823) RF Spectrum Data.²⁸⁷

For Channel Scanner Mode:

- 44) Reference Level (highest Byte)
- 45) Reference Level
- 46) Reference Level
- 47) Reference Level (Lowest Byte)
- 48) Scale Division (Highest Byte)
- 49) Scale Division
- 50) Scale Division
- 51) Scale Division (Lowest Byte)
- 52) Start Frequency (Highest Byte)
- 53) Start Frequency
- 54) Start Frequency
- 55) Start Frequency (Lowest Byte)
- 56) Span Frequency (Highest Byte)
- 57) Span Frequency
- 58) Span Frequency
- 59) Span Frequency (Lowest Byte)
- 60) Channel Step (Highest Byte)
- 61) Channel Step (Lowest Byte)
- 62) Channel Frequency Step (Highest Byte)
- 63) Channel Frequency Step
- 64) Channel Frequency Step
- 65) Channel Frequency Step (Lowest Byte)
- 66) Number of Channels Displayed
- 67) External Reference Frequency²⁸⁸
- 68) Display Type Channels or Frequencies²⁸⁹
- 69) Display Type Graph or Text²⁹⁰
- 70) Signal Standard (Highest Byte)

²⁸⁴ Multipath Power is sent as (Value in dB) * 250 + 50000

²⁸⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = int(abs(value)/1,000,000); Minute = (float)(abs(value)%1,000,000)/10,000

²⁸⁶ 0 - CDMA_PILOT, 1 - CDMA_PAGE, 2 - CDMA_SYNC, 3 - CDMA_QUICK_PAGE , 4 - CDMA_IS95_TRAFFIC, 5 - CDMA_CDMA2000, 6 - CDMA_UNKNOWN 7 - CDMA_NOISE

²⁸⁷ 384 Data points, 2 bytes per point. Data sent as ((Value in dB) * 250) + 50000

²⁸⁸ Frequency in MHz, OFF if 0

²⁸⁹ 0 – Channel, 1 - Frequency

²⁹⁰ 0 – Graph, 1 - Text

- 71) Signal Standard (Lowest Byte)
- 72-75) GPS Position – Latitude (long integer)²⁹¹
- 76-79) GPS Position – Longitude (long integer)
- 80-81) GPS Position – Altitude (short integer)
- 82) Start Channel (Highest Byte)
- 83) Start Channel
- 84) Start Channel
- 85) Start Channel (Lowest Byte)
- 86 – 109) Signal Standard Name, 24bytes in ASCII
- 110 – 137) Reserved
- 138– 257) Channel Scanner Data²⁹²

For Interference Analyzer RSSI Mode

- 44) Center Frequency (Highest Byte)
- 45) Center Frequency
- 46) Center Frequency
- 47) Center Frequency (lowest Byte)
- 48) Reference Level (Highest Byte)
- 49) Reference Level
- 50) Reference Level
- 51) Reference Level (Lowest Byte)
- 52) Scale (Highest Byte)
- 53) Scale
- 54) Scale
- 55) Scale (Lowest Byte)
- 56) RBW (Highest Byte)
- 57) RBW
- 58) RBW
- 59) RBW (Lowest Byte)
- 60) VBW (highest Byte)
- 61) VBW
- 62) VBW
- 63) VBW (Lowest Byte)
- 64) Status Byte 1
 - a. Bit 0 - Detection Algorithm (Lowest Bit)²⁹³
 - b. Bit 1 - Detection Algorithm
 - c. Bit 2 - Detection Algorithm (Highest Bit)
 - d. Bit 3 - Not Used
 - e. Bit 4 - Not Used
 - f. Bit 5 - Not Used
 - g. Bit 6 - Not Used
- 65) Reference Level Offset (Highest Byte)
- 66) Reference Level Offset
- 67) Reference Level Offset
- 68) Reference Level Offset (Lowest Byte)
- 69) External Reference Frequency²⁹⁴
- 70) Signal Standard (Highest Byte)
- 71) Signal Standard (Lowest Byte)

²⁹¹ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

²⁹² 20 points, 6 bytes per point. First 2 bytes are channel numbers(Invalid channels sent as 0xFFFF) and 4 bytes are values. Value sent as $(\text{value in dBm}) * 1000 + 270,000$

²⁹³ 000 - Positive Peak, 010 – RMS Averaging, 100 – Negative Peak, 110 – Sampling Mode

²⁹⁴ Frequency in MHz, OFF if 0

- 72) Channel (Highest Byte)²⁹⁵
- 73) Channel (Lowest Byte)
- 74) Min RSSI Measured (Highest Byte)
- 75) Min RSSI Measured
- 76) Min RSSI Measured
- 77) Min RSSI Measured (Lowest Byte)
- 78) Max RSSI Measured (Highest Byte)
- 79) Max RSSI Measured
- 80) Max RSSI Measured
- 81) Max RSSI Measured (Lowest Byte)
- 82) Measure Duration (Highest Byte)²⁹⁶
- 83) Measure Duration
- 84) Measure Duration
- 85) Measure Duration (Lowest Byte)
- 86) Sweep Point Interval(Highest Byte)²⁹⁷
- 87) Sweep Point Interval
- 88) Sweep Point Interval
- 89) Sweep Point Interval (Lowest Byte)
- 90 - 93) GPS Position – Latitude (long integer)²⁹⁸
- 94-97) GPS Position – Longitude (long integer)
- 98-99) GPS Position – Altitude (short integer)
- 100) Signal Standard
- 101-104) Start GPS Position – Latitude (long integer)²⁹⁹
- 105-108) Start GPS Position – Longitude (long integer)
- 109-110) Start GPS Position – Altitude (short integer)
- 111) Attenuation (Highest Byte)³⁰⁰
- 112) Attenuation
- 113) Attenuation
- 114) Attenuation (Lowest Byte)
- 115– 138) Signal Standard Name, 24bytes in ASCII
- 139) Measure Offset Status
- 140– 194) Reserved
- 195 – 3402) RSSI Sweep data³⁰¹

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

²⁹⁵ Invalid channels are sent as 0xFFFF

²⁹⁶ Measure Duration time in minutes

²⁹⁷ Sweep Point Interval time in milliseconds

²⁹⁸ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

²⁹⁹ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

³⁰⁰ Attenuation is sent as (Att in dB * 1000)

³⁰¹ Sweep Data contains 401 display points, 8 bytes per display point. The first 4 bytes are the amplitude, the next 2 bytes are the latitude increments from the start GPS position and the following 2 bytes are the longitude increments from the Start GPS position.

Get Options – Control Byte #37 (25h)

Description: Queries the option(s) installed on the 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) Statyte #1 (0b = Off, 1b = On)
 1. (LSB) bit 0 : Unit (0b - Watt/%- 1b - dBm/dBr)
bit 2 : Relative Mode On/Off
bit 3: Offset Mode On/Off
bit 4: Zero Mode On/Off
bits 5-7: Not Used
 - 2) RMS Averaging Status³⁰²
 - 3 - 6) Re-ative Mode Reference Power Level in dBm
 - 7 - 10) Of-set Mode Power Level
 - 11 - 14) Z-ro Mode Power Level
 - 15 - 18) A-solute Power Level
 - 19 - 22) P-wer
 - 23 --26) Ce-er Frequency
 - 27 - 30) S-an Frequency

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

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
-

³⁰² RMS Averaging – 00h = Off, 01h = Low, 02h = Medium, 03h = High

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

Bytes to Follow: 1 byte

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

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.

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

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

- 1) 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.

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

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)
-

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

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

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

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

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

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

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

Bytes to Follow: 2 bytes

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

Cell Master Returns: 1 byte

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

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

Description: Return Smart Battery status.

Bytes to Follow: 0 bytes

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)

Note:

The Smart Battery Data Spec can be found at <http://www.sbs-forum.org/specs/index.html>

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

Description: Sets the minimum sweep time (in μ s) 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 μ s) (highest byte)
- 2) Minimum Sweep Time (in μ s)
- 3) Minimum Sweep Time (in μ s)
- 4) Minimum Sweep Time (in μ s) (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) Savetime setup On/Off
00h = Off (default)
01h = On

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 2 bytes

- 1) Measurement Mode³⁰³
- 2) Setup Number
0 = Run time setup
1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
1 – 5 = Saved setups for most other modes
255 = Default setup

Site Master Returns:

For All Modes:

- 1) Number of Following Bytes (higher byte)
- 2) Number of Following Bytes (lower byte)
- 3) Measurement Mode³⁰⁴
- 14-26) Not Used

³⁰³ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

³⁰⁴ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

For Site Master VNA Modes:

- 21) Number of Data Points (higher byte)
- 22) Number of Data Points (lower byte)
- 23) VNA Start Frequency (in Hz) (highest byte)
- 24) VNA Start Frequency
- 25) VNA Start Frequency
- 26) VNA Start Frequency (lowest byte)
- 27) VNA Stop Frequency (in Hz) (highest byte)
- 28) VNA Stop Frequency
- 29) VNA Stop Frequency
- 30) VNA Stop Frequency (lowest byte)
- 31) Return Loss Scale Start (higher byte)³⁰⁵
- 32) Return Loss Scale Start (lower byte)
- 33) Return Loss Scale Stop (higher byte)
- 34) Return Loss Scale Stop (lower byte)
- 35) SWR Scale Start (higher byte)³⁰⁶
- 36) SWR Scale Start (lower byte)
- 37) SWR Scale Stop (higher byte)
- 38) SWR Scale Stop (lower byte)
- 39) Cable Loss Scale Start (higher byte)³⁰⁷
- 40) Cable Loss Scale Start (lower byte)
- 41) Cable Loss Scale Stop (higher byte)
- 42) Cable Loss Scale Stop (lower byte)
- 43) DTF-RL Scale Start (higher byte)³⁰⁸
- 44) DTF-RL Scale Start (lower byte)
- 45) DTF-RL Scale Stop (higher byte)
- 46) DTF-RL Scale Stop (lower byte)
- 47) DTF-SWR Scale Start (higher byte)³⁰⁹
- 48) DTF-SWR Scale Start (lower byte)
- 49) DTF-SWR Scale Stop (higher byte)
- 50) DTF-SWR Scale Stop (lower byte)
- 51) VNA Frequency Marker 1 (higher byte)³¹⁰
- 52) VNA Frequency Marker 1 (lower byte)
- 53) VNA Frequency Marker 2 (higher byte)
- 54) VNA Frequency Marker 2 (lower byte)
- 55) VNA Frequency Marker 3 (higher byte)
- 56) VNA Frequency Marker 3 (lower byte)
- 57) VNA Frequency Marker 4 (higher byte)
- 58) VNA Frequency Marker 4 (lower byte)
- 59) VNA Frequency Marker 5 (higher byte)
- 60) VNA Frequency Marker 5 (lower byte)
- 61) VNA Frequency Marker 6 (higher byte)
- 62) VNA Frequency Marker 6 (lower byte)
- 63) Return Loss Single Limit (higher byte)³¹¹
- 64) Return Loss Single Limit (lower byte)
- 65) SWR Single Limit (higher byte)³¹²

³⁰⁵ See “Set Site Master VNA Scale” Control Byte #4 for data format.

³⁰⁶ See “Set Site Master VNA Scale” Control Byte #4 for data format.

³⁰⁷ See “Set Site Master VNA Scale” Control Byte #4 for data format.

³⁰⁸ See “Set Site Master VNA Scale” Control Byte #4 for data format.

³⁰⁹ See “Set Site Master VNA Scale” Control Byte #4 for data format.

³¹⁰ 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.

³¹¹ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

- 66) SWR Single Limit (lower byte)
- 67) Cable Loss Single Limit (higher byte)³¹³
- 68) Cable Loss Single Limit (lower byte)
- 69) DTF-RL Single Limit (higher byte)³¹⁴
- 70) DTF-RL Single Limit (lower byte)
- 71) DTF-SWR Single Limit (higher byte)³¹⁵
- 72) DTF-SWR Single Limit (lower byte)
- 73) Return Loss Multiple Limit Segment # (1)
- 74) Return Loss Multiple Limit Segment Status (00h = Off, 01h = On)
- 75) Return Loss Multiple Limit Segment Start X (highest byte)³¹⁶
- 76) Return Loss Multiple Limit Segment Start X
- 77) Return Loss Multiple Limit Segment Start X
- 78) Return Loss Multiple Limit Segment Start X (lowest byte)
- 79) Return Loss Multiple Limit Segment Start Y (higher byte)
- 80) Return Loss Multiple Limit Segment Start Y (lowest byte)
- 81) Return Loss Multiple Limit Segment End X (highest byte)
- 82) Return Loss Multiple Limit Segment End X
- 83) Return Loss Multiple Limit Segment End X
- 84) Return Loss Multiple Limit Segment End X (lowest byte)
- 85) Return Loss Multiple Limit Segment End Y (higher byte)
- 86) Return Loss Multiple Limit Segment End Y (lowest byte)
- 87-142) Repeat bytes 63 – 76 for segments 2 – 5
- 143-212) Repeat bytes 63 – 132 for SWR Multiple Limit
- 213-282) Repeat bytes 63 – 132 for Cable Loss Multiple Limit
- 283-352) Repeat bytes 63 – 132 for DTF-RL Multiple Limit
- 353-422) Repeat bytes 63 – 132 for DTF-SWR Multiple Limit
- 423) Start Distance (highest byte)³¹⁷
- 424) Start Distance
- 425) Start Distance
- 426) Start Distance (lowest byte)
- 427) Stop Distance (highest byte)
- 428) Stop Distance
- 429) Stop Distance
- 430) Stop Distance (lowest byte)
- 431) Distance Marker 1 (higher byte)³¹⁸
- 432) Distance Marker 1 (lower byte)
- 433) Distance Marker 2 (higher byte)
- 434) Distance Marker 2 (lower byte)
- 435) Distance Marker 3 (higher byte)
- 436) Distance Marker 3 (lower byte)
- 437) Distance Marker 4 (higher byte)
- 438) Distance Marker 4 (lower byte)
- 439) Distance Marker 5 (higher byte)
- 440) Distance Marker 5 (lower byte)
- 441) Distance Marker 6 (higher byte)
- 442) Distance Marker 6 (lower byte)
- 443) Relative Propagation Velocity (highest byte)³¹⁹

³¹² See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

³¹³ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

³¹⁴ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

³¹⁵ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

³¹⁶ See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format.

³¹⁷ Distance data uses units 1/100,000m or 1/100,000 ft

³¹⁸ 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.

- 444) Relative Propagation Velocity
 445) Relative Propagation Velocity
 446) Relative Propagation Velocity (lowest byte)
 447) Cable Loss (highest byte)³²⁰
 448) Cable Loss
 449) Cable Loss
 450) Cable Loss (lowest byte)
 451) Average Cable Loss³²¹ (highest byte)
 452) Average Cable Loss
 453) Average Cable Loss
 454) Average Cable Loss (lowest byte)
 455) Status Byte 1: (0b = Off , 1b = On)
 (LSB) bit 0 : Site Master Marker 1 On/Off
 bit 1 : Site Master Marker 2 On/Off
 bit 2 : Site Master Marker 3 On/Off
 bit 3 : Site Master Marker 4 On/Off
 bit 4 : Site Master Marker 5 On/Off
 bit 5 : Site Master Marker 6 On/Off
 bits 6- 7 : Not Used
 456) Status Byte 2: (0b = Off, 1b = On)
 (LSB) bit 0 : Not Used
 bit 1 : Site Master Marker 2 Delta On/Off
 bit 2 : Site Master Marker 3 Delta On/Off
 bit 3 : Site Master Marker 4 Delta On/Off
 bits 4-7: Not Used
 457) Status Byte 3: (0b = Off , 1b = On)
 (LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)
 bit 1 : Site Master Limit Beep On/Off
 bits 2-6 : Not Used
 bit 7 : Site Master Single Limit Status On/Off
 458) Status Byte 4:
 (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
 459) Status Byte 5: (0b = Off, 1b = On)
 (LSB) bit 0 : Fixed CW Mode On/Off
 bit 1 : Single Sweep On/Off
 bit 2 : Trace Overlay On/Off
 bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
 bits 4-6: Not Used
 bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)
 460) VNA Signal Standard³²² (higher byte)
 461) VNA Signal Standard (lower byte)
 462) Cable Index
 463) Cable Folder³²³

³¹⁹ Relative Propagation Velocity uses units 1/100,000.

³²⁰ Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.

³²¹ Average Cable Loss is dB * 1000.

³²² Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

³²³ 00h=Standard at 1000 MHz, 01h=Standard at 2000 MHz, 02h=Standard at 2500 MHz, 03h=Custom

464) Trace Overlay Index (1-200)
465-550) Not Used

For Spectrum Analyzer Mode:

- 21) Spectrum Analyzer Start Frequency³²⁴ (highest byte)
- 22) Spectrum Analyzer Start Frequency
- 23) Spectrum Analyzer Start Frequency
- 24) Spectrum Analyzer Start Frequency (lowest byte)
- 25) Spectrum Analyzer Stop Frequency³²⁵ (highest byte)
- 26) Spectrum Analyzer Stop Frequency
- 27) Spectrum Analyzer Stop Frequency
- 28) Spectrum Analyzer Stop Frequency (lowest byte)
- 29) Spectrum Analyzer Center Frequency³²⁶ (highest byte)
- 30) Spectrum Analyzer Center Frequency
- 31) Spectrum Analyzer Center Frequency
- 32) Spectrum Analyzer Center Frequency (lowest byte)
- 33) Spectrum Analyzer Frequency Span³²⁷ (highest byte)
- 34) Spectrum Analyzer Frequency Span
- 35) Spectrum Analyzer Frequency Span
- 36) Spectrum Analyzer Frequency Span (lowest byte)
- 37) Ref Level (highest byte)³²⁸
- 38) Ref Level
- 39) Ref Level
- 40) Ref Level (lowest byte)
- 41) Scale per div (highest byte)³²⁹
- 42) Scale per div
- 43) Scale per div
- 44) Scale per div (lowest byte)
- 45) Spectrum Analyzer Frequency Marker 1 (higher byte)³³⁰
- 46) Spectrum Analyzer Frequency Marker 1 (lower byte)
- 47) Spectrum Analyzer Frequency Marker 2 (higher byte)
- 48) Spectrum Analyzer Frequency Marker 2 (lower byte)
- 49) Spectrum Analyzer Frequency Marker 3 (higher byte)
- 50) Spectrum Analyzer Frequency Marker 3 (lower byte)
- 51) Spectrum Analyzer Frequency Marker 4 (higher byte)
- 52) Spectrum Analyzer Frequency Marker 4 (lower byte)
- 53) Spectrum Analyzer Frequency Marker 5 (higher byte)
- 54) Spectrum Analyzer Frequency Marker 5 (lower byte)
- 55) Spectrum Analyzer Frequency Marker 6 (higher byte)
- 56) Spectrum Analyzer Frequency Marker 6 (lower byte)
- 57) Spectrum Analyzer Single Limit (highest byte)³³¹
- 58) Spectrum Analyzer Single Limit
- 59) Spectrum Analyzer Single Limit
- 60) Spectrum Analyzer Single Limit (lowest byte)
- 61) SPA Multiple Upper Limit 1 Start X³³² (highest byte)

³²⁴ Scaled by Frequency Scale Factor (bytes 301-302)

³²⁵ Scaled by Frequency Scale Factor (bytes 301-302)

³²⁶ Scaled by Frequency Scale Factor (bytes 301-302)

³²⁷ Scaled by Frequency Scale Factor (bytes 301-302)

³²⁸ Value sent as (value in dBm * 1000) + 270,000)

³²⁹ Value sent as (value * 1000)

³³⁰ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

³³¹ Value sent as (value in dBm * 1000) + 270000

³³² Scaled by Frequency Scale Factor (bytes 301-302)

- 62) SPA Multiple Upper Limit 1 Start X
- 63) SPA Multiple Upper Limit 1 Start X
- 64) SPA Multiple Upper Limit 1 Start X (lowest byte)
- 65) SPA Multiple Upper Limit 1 Start Y (Power Level) (highest byte)³³³
- 66) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 67) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 68) SPA Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
- 69) SPA Multiple Upper Limit 1 End X³³⁴ (highest byte)
- 70) SPA Multiple Upper Limit 1 End X
- 71) SPA Multiple Upper Limit 1 End X
- 72) SPA Multiple Upper Limit 1 End X (lowest byte)
- 73) SPA Multiple Upper Limit 1 End Y (Power Level) (highest byte)³³⁵
- 74) SPA Multiple Upper Limit 1 End Y (Power Level)
- 75) SPA Multiple Upper Limit 1 End Y (Power Level)
- 76) SPA Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
- 77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
- 221) RBW Setting (highest byte)³³⁶
- 222) RBW Setting
- 223) RBW Setting
- 224) RBW Setting (lowest byte)
- 225) VBW Setting (highest byte)³³⁷
- 226) VBW Setting
- 227) VBW Setting
- 228) VBW Setting (lowest byte)
- 229) OCC BW Method³³⁸
- 230) OCC BW % Value³³⁹
- 231) OCC BW dBc³⁴⁰
- 232) Attenuation
- 233) Antenna Index (0-14)
- 234-249) Antenna Name (16 bytes in ASCII)
- 250) Status Byte 1: (0b = Off , 1b = On)
 - (LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
 - bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
 - bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
 - bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
 - bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
 - bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
 - bits 6 - 7 : Not Used
- 251) Status Byte 2: (0b = Off, 1b = On)
 - (LSB) bit 0 : Not Used
 - bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
 - bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
 - bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
 - bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
 - bit 5 : Pre Amp Status On/Off
 - bit 6 : Dynamic Attenuation On/Off
 - bit 7 : Normalization On/Off

³³³ Value sent as (value in dBm * 1000) + 270000

³³⁴ Scaled by Frequency Scale Factor (bytes 301-302)

³³⁵ Value sent as (value in dBm * 1000) + 270000

³³⁶ RBW frequency sent in Hz.

³³⁷ VBW frequency sent in Hz.

³³⁸ 00h = % of power, 01h = dB down

³³⁹ 0 – 99%

³⁴⁰ 0 – 120 dBc

- 252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
bit 1 : SPA Single Limit Beep On/Off
bit 2 : SPA Single Limit Status On/Off
bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW³⁴¹
bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 253) Status Byte 4: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW³⁴²
- 254) Status Byte 5: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
(LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 255) Status Byte 6: (0b = Off, 1b = On)
(LSB) bit 0 : Antenna Factors Correction On/Off
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)
- 256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off
- 257) Reference Level Offset³⁴³ (highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (lowest byte)
261) External Reference Frequency³⁴⁴

³⁴¹ Beep level is always 1b for upper segmented limit line

³⁴² Beep level is always 0b for lower segmented limit line

³⁴³ Value sent as (value in dBm * 1000) + 270,000

- 262) Signal Standard³⁴⁵ (higher byte)
- 263) Signal Standard (lower byte)
- 264) Channel Selection³⁴⁶ (higher byte)
- 265) Channel Selection (lower byte)
- 266) Trigger Type³⁴⁷
- 267) Interference Analysis Frequency³⁴⁸ (highest byte)
- 268) Interference Analysis Frequency
- 269) Interference Analysis Frequency
- 270) Interference Analysis Frequency (lowest byte)
- 271) Trigger Position (0 – 100%)
- 272) Min Sweep Time (in μ s) (highest byte)
- 273) Min Sweep Time (in μ s)
- 274) Min Sweep Time (in μ s)
- 275) Min Sweep Time (in μ s) (lowest byte)
- 276) Video Trigger Level³⁴⁹ (highest byte)
- 277) Video Trigger Level
- 278) Video Trigger Level
- 279) Video Trigger Level (lowest byte)
- 280) Status Byte 8
(LSB) bit 0: Reserved
bits 1-7: Not Used
- 281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
- 282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off
bit 5: External Reference Frequency On/Off
bits 6-7: Not Used
- 283) Impedance (00h = 50 Ω , 10h = 75 Ω Anritsu Adapter, 12h = 75 Ω Other Adapter)
- 284) Impedance Loss³⁵⁰ (higher byte)
- 285) Impedance Loss (lower byte)
- 286) AM/FM Demod Type³⁵¹
- 287) AM/FM Demod Status (01h = On, 00h = Off)
- 288) AM/FM Demod Volume (0 to 100)
- 289) AM/FM Demod Frequency³⁵² (highest byte)
- 290) AM/FM Demod Frequency
- 291) AM/FM Demod Frequency
- 292) AM/FM Demod Frequency (lowest byte)
- 293) AM/FM Demod Time (in ms) (highest byte)
- 294) AM/FM Demod Time (in ms)
- 295) AM/FM Demod Time (in ms)
- 296) AM/FM Demod Time (in ms) (lowest byte)

³⁴⁴ 1 byte in MHz (i.e. 20 = 20MHz)

³⁴⁵ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

³⁴⁶ “No Channel” is sent as FFFEh

³⁴⁷ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

³⁴⁸ Scaled by Frequency Scale Factor (bytes 301-302)

³⁴⁹ Value sent as (value in dBm * 1000) + 270,000

³⁵⁰ Value sent as (value in dB * 1000), valid values are 0 to 20 dB

³⁵¹ AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper

³⁵² Scaled by Frequency Scale Factor (bytes 301-302)

- 297) SSB BFO Offset³⁵³ (highest byte)
- 298) SSB BFO Offset
- 299) SSB BFO Offset
- 300) SSB BFO Offset (lowest byte)
- 301) Frequency Scale Factor³⁵⁴ (higher byte)
- 302) Frequency Scale Factor (lower byte)
- 303) Frequency Range Minimum³⁵⁵ (highest byte)
- 304) Frequency Range Minimum
- 305) Frequency Range Minimum
- 306) Frequency Range Minimum (lowest byte)
- 307) Frequency Range Maximum³⁵⁶ (highest byte)
- 308) Frequency Range Maximum
- 309) Frequency Range Maximum
- 310) Frequency Range Maximum (lowest byte)
- 311) Marker Type³⁵⁷
- 312) Channel Power Int BW³⁵⁸ (highest byte)
- 313) Channel Power Int BW
- 314) Channel Power Int BW
- 315) Channel Power Int BW (lowest byte)
- 316) ACPR Main Channel BW³⁵⁹ (highest byte)
- 317) ACPR Main Channel BW
- 318) ACPR Main Channel BW
- 319) ACPR Main Channel BW (lowest byte)
- 320) ACPR Adjacent Channel BW³⁶⁰ (highest byte)
- 321) ACPR Adjacent Channel BW
- 322) ACPR Adjacent Channel BW
- 323) ACPR Adjacent Channel BW (lowest byte)
- 324) ACPR Channel Spacing³⁶¹ (highest byte)
- 325) ACPR Channel Spacing
- 326) ACPR Channel Spacing
- 327) ACPR Channel Spacing (lowest byte)
- 328) Interference Analysis Cell Std³⁶²
- 329) Interference Analysis Est. BW³⁶³ (highest byte)
- 330) Interference Analysis Est. BW
- 331) Interference Analysis Est. BW
- 332) Interference Analysis Est. BW (lowest byte)
- 333) Trace B Trace Id³⁶⁴
- 334-500) Not Used

For Transmission Mode (Option 21):

- 21) Start Frequency³⁶⁵ (highest byte)

³⁵³ Value sent as ((value in Hz) – 10,000)

³⁵⁴ In number of Hz

³⁵⁵ Scaled by Frequency Scale Factor (bytes 301-302)

³⁵⁶ Scaled by Frequency Scale Factor (bytes 301-302)

³⁵⁷ 00h = Regular Marker, 01h = Noise Marker

³⁵⁸ Scaled by Frequency Scale Factor (bytes 301-302)

³⁵⁹ Scaled by Frequency Scale Factor (bytes 301-302)

³⁶⁰ Scaled by Frequency Scale Factor (bytes 301-302)

³⁶¹ Scaled by Frequency Scale Factor (bytes 301-302)

³⁶² 4 Standards – 00h = 1250 kHz CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh = Interference Analysis Measurement OFF

³⁶³ Frequency in Hz

³⁶⁴ FFh indicates no trace selected

³⁶⁵ Scaled by Frequency Scale Factor (bytes 244-245)

- 22) Start Frequency
- 23) Start Frequency
- 24) Start Frequency (lowest byte)
- 25) Stop Frequency³⁶⁶ (highest byte)
- 26) Stop Frequency
- 27) Stop Frequency
- 28) Stop Frequency (lowest byte)
- 29) Center Frequency³⁶⁷ (highest byte)
- 30) Center Frequency
- 31) Center Frequency
- 32) Center Frequency (lowest byte)
- 33) Frequency Span³⁶⁸ (highest byte)
- 34) Frequency Span
- 35) Frequency Span
- 36) Frequency Span (lowest byte)
- 37) Ref Level (highest byte)³⁶⁹
- 38) Ref Level
- 39) Ref Level
- 40) Ref Level (lowest byte)
- 41) Scale per div (highest byte)³⁷⁰
- 42) Scale per div
- 43) Scale per div
- 44) Scale per div (lowest byte)
- 45) Frequency Marker 1 (higher byte)³⁷¹
- 46) Frequency Marker 1 (lower byte)
- 47) Frequency Marker 2 (higher byte)
- 48) Frequency Marker 2 (lower byte)
- 49) Frequency Marker 3 (higher byte)
- 50) Frequency Marker 3 (lower byte)
- 51) Frequency Marker 4 (higher byte)
- 52) Frequency Marker 4 (lower byte)
- 53) Frequency Marker 5 (higher byte)
- 54) Frequency Marker 5 (lower byte)
- 55) Frequency Marker 6 (higher byte)
- 56) Frequency Marker 6 (lower byte)
- 57) Single Limit (highest byte)³⁷²
- 58) Single Limit
- 59) Single Limit
- 60) Single Limit (lowest byte)
- 61) Multiple Upper Limit 1 Start X³⁷³ (highest byte)
- 62) Multiple Upper Limit 1 Start X
- 63) Multiple Upper Limit 1 Start X
- 64) Multiple Upper Limit 1 Start X (lowest byte)
- 65) Multiple Upper Limit 1 Start Y (Power Level) (highest byte)³⁷⁴
- 66) Multiple Upper Limit 1 Start Y (Power Level)

³⁶⁶ Scaled by Frequency Scale Factor (bytes 244-245)

³⁶⁷ Scaled by Frequency Scale Factor (bytes 244-245)

³⁶⁸ Scaled by Frequency Scale Factor (bytes 244-245)

³⁶⁹ Value sent as (value in dBm * 1000) + 270,000)

³⁷⁰ Value sent as (value * 1000)

³⁷¹ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

³⁷² Value sent as (value in dBm * 1000) + 270000

³⁷³ Scaled by Frequency Scale Factor (bytes 244-245)

³⁷⁴ Value sent as (value in dBm * 1000) + 270000

- 67) Multiple Upper Limit 1 Start Y (Power Level)
- 68) Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
- 69) Multiple Upper Limit 1 End X³⁷⁵ (highest byte)
- 70) Multiple Upper Limit 1 End X
- 71) Multiple Upper Limit 1 End X
- 72) Multiple Upper Limit 1 End X (lowest byte)
- 73) Multiple Upper Limit 1 End Y (Power Level) (highest byte)³⁷⁶
- 74) Multiple Upper Limit 1 End Y (Power Level)
- 75) Multiple Upper Limit 1 End Y (Power Level)
- 76) Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
- 77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
- 221) RBW Setting (highest byte)³⁷⁷
- 222) RBW Setting
- 223) RBW Setting
- 224) RBW Setting (lowest byte)
- 225) VBW Setting (highest byte)³⁷⁸
- 226) VBW Setting
- 227) VBW Setting
- 228) VBW Setting (lowest byte)
- 229) Attenuation
- 230) Status Byte 1: (0b = Off , 1b = On)
 - (LSB) bit 0 : Marker 1 On/Off
 - bit 1 : Marker 2 On/Off
 - bit 2 : Marker 3 On/Off
 - bit 3 : Marker 4 On/Off
 - bit 4 : Marker 5 On/Off
 - bit 5 : Marker 6 On/Off
 - bits 6 - 7 : Not Used
- 231) Status Byte 2: (0b = Off, 1b = On)
 - (LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
 - bit 1 : Marker 2 Delta On/Off
 - bit 2 : Marker 3 Delta On/Off
 - bit 3 : Marker 4 Delta On/Off
 - bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
 - bit 5 : Pre Amp Status On/Off
 - bit 6 : Dynamic Attenuation On/Off
 - bit 7 : Not Used
- 232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
 - (LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
 - bit 1 : Single Limit Beep On/Off
 - bit 2 : Single Limit Status On/Off
 - bit 3 : Single Limit Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Upper Segment 1 Status On/Off
 - bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW³⁷⁹
 - bit 6 : Multiple Limit Upper Segment 2 Status On/Off
 - bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 233) Status Byte 4: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)

³⁷⁵ Scaled by Frequency Scale Factor (bytes 244-245)

³⁷⁶ Value sent as (value in dBm * 1000) + 270000

³⁷⁷ RBW frequency sent in Hz.

³⁷⁸ VBW frequency sent in Hz.

³⁷⁹ Beep level is always 1b for upper segmented limit 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/BELOW³⁸⁰
- 234) Status Byte 5 : (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
bit 2 : Multiple Limit Lower Segment 3 Status On/Off
bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
bit 4 : Multiple Limit Lower Segment 4 Status On/Off
bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
bit 6 : Multiple Limit Lower Segment 5 Status On/Off
bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 235) Status Byte 6: (0b = Off, 1b = On)
- (LSB) bit 0 : Not Used
bit 1 : Bias Tee On/Off (Option 10)
bit 2 : External Reference Freq On/Off
bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
(Linear) – 00b = Watts 01b = Volts
bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b =
Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)
- 236) External Reference Frequency³⁸¹
- 237) Signal Standard³⁸² (higher byte)
- 238) Signal Standard (lower byte)
- 239) Channel Selection³⁸³ (higher byte)
- 240) Channel Selection (lower byte)
- 241) Trigger Type³⁸⁴
- 242) Status Byte 7
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
- 243) Status Byte 8: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: RBW Coupling (1b = Auto, 0b = Manual)
bit 5: VBW Coupling (1b = Auto, 0b = Manual)
bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 7: View B On/Off
- 244) Frequency Scale Factor³⁸⁵ (higher byte)
- 245) Frequency Scale Factor (lower byte)
- 246) Frequency Range Minimum³⁸⁶ (highest byte)
- 247) Frequency Range Minimum

³⁸⁰ Beep level is always 0b for lower segmented limit line

³⁸¹ 1 byte in MHz (i.e. 20 = 20MHz)

³⁸² Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

³⁸³ “No Channel” is sent as FFFEh

³⁸⁴ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

³⁸⁵ In number of Hz

³⁸⁶ Scaled by Frequency Scale Factor (bytes 244-245)

- 248) Frequency Range Minimum
- 249) Frequency Range Minimum (lowest byte)
- 250) Frequency Range Maximum³⁸⁷ (highest byte)
- 251) Frequency Range Maximum
- 252) Frequency Range Maximum
- 253) Frequency Range Maximum (lowest byte)
- 254) Marker Type³⁸⁸
- 255) Trace B Trace Id³⁸⁹
- 256) Status Byte 9
 - (LSB) bit 0: Reserved
 - bits 1-7: Not Used
- 257-400) Not Used

For Power Meter Mode (narrow band only):

- 21) Power Meter Start Freq³⁹⁰ (highest byte)
- 22) Power Meter Start Freq
- 23) Power Meter Start Freq
- 24) Power Meter Start Freq³⁹¹ (lowest byte)
- 25) Power Meter Stop Freq (highest byte)
- 26) Power Meter Stop Freq
- 27) Power Meter Stop Freq
- 28) Power Meter Stop Freq (lowest byte)
- 29) Power Meter Center Freq³⁹² (highest byte)
- 30) Power Meter Center Freq
- 31) Power Meter Center Freq
- 32) Power Meter Center Freq (lowest byte)
- 33) Power Meter Span³⁹³ (highest byte)
- 34) Power Meter Span
- 35) Power Meter Span
- 36) Power Meter Span (lowest byte)
- 37) Signal Standard³⁹⁴ (higher byte)
- 38) Signal Standard (lower byte)
- 39) Channel Selection³⁹⁵ (higher byte)
- 40) Channel Selection (lower byte)
- 41) Power Meter Offset³⁹⁶ (highest byte)
- 42) Power Meter Offset
- 43) Power Meter Offset
- 44) Power Meter Offset (lowest byte)
- 45) Power Meter Relative (highest byte)³⁹⁷
- 46) Power Meter Relative
- 47) Power Meter Relative
- 48) Power Meter Relative (lowest byte)
- 49) Not Used
- 50) Power Meter Unit (00h = Watts, 01h = dBm)

³⁸⁷ Scaled by Frequency Scale Factor (bytes 244-245)

³⁸⁸ 00h = Regular Marker, 01h = Noise Marker

³⁸⁹ FFh indicates no trace selected

³⁹⁰ Scaled by Frequency Scale Factor (bytes 54-55)

³⁹¹ Scaled by Frequency Scale Factor (bytes 54-55)

³⁹² Scaled by Frequency Scale Factor (bytes 54-55)

³⁹³ Scaled by Frequency Scale Factor (bytes 54-55)

³⁹⁴ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

³⁹⁵ “No Channel” is sent as FFFEh

³⁹⁶ Value sent as (value in dB * 1000)

³⁹⁷ Value sent as ((value in dBm * 1000) + 100)

- 51) Power Meter Relative Status (00h = Off, 01h = On)
- 52) Power Meter Offset Status (00h = Off, 01h = On)
- 53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
- 54) Frequency Scale Factor³⁹⁸ (higher byte)
- 55) Frequency Scale Factor (lower byte)
- 56) Frequency Range Minimum³⁹⁹ (highest byte)
- 57) Frequency Range Minimum
- 58) Frequency Range Minimum
- 59) Frequency Range Minimum (lowest byte)
- 60) Frequency Range Maximum⁴⁰⁰ (highest byte)
- 61) Frequency Range Maximum
- 62) Frequency Range Maximum
- 63) Frequency Range Maximum (lowest byte)
- 64) Zero Status (00h = Off, 01h = On)
- 65) Zero Value⁴⁰¹ (highest byte)
- 66) Zero Value
- 67) Zero Value
- 68) Zero Value (lowest byte)
- 69-120) Not Used

For T1 Mode (Option 50):

- 21) T1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
- 22) T1 Framing Mode (01h = ESF, 02h = D4SF)
- 23) T1 Line Coding (01h = B8ZS, 02h = AMI)
- 24) T1 Clock Source (00h = External, 01h = Internal)
- 25) T1 Tx Level (01h = 0 dB, 02h = -7.5 dB, 03h = -15 dB)
- 26) T1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
- 27) T1 Loop Code (00h = CSU, 01h = NIU, 02h = User 1, 03h = User 2)
- 28) T1 CRC Method (00h = ANSI CRC, 01h = Japanese CRC)
- 29) T1 Loop Type (00h = In Band, 01h = Data Link)
- 30) T1 Pattern (higher byte)
- 31) T1 Pattern (lower byte) 01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
- 32) T1 Pattern Invert Status (00h = Non-Inverted, 01h = Inverted)
- 33) T1 Display Type (00h = Histogram, 01h = Raw Data)
- 34) T1 Impedance
- 35 - 50) First User Defined Loop Code Down (16 bytes)
- 51 - 66) Second User Defined Loop Code Down (16 bytes)
- 67 - 82) First User Defined Loop Code Up (16 bytes)
- 83 - 98) Second User Defined Loop Code Up (16 bytes)
- 99 - 130) User Defined Pattern (32 bytes)
- 131) T1 1st User Defined Loop Up (highest byte)
- 132) T1 1st User Defined Loop Up (lowest byte)
- 133) T1 2nd User Defined Loop Up (highest byte)
- 134) T1 2nd User Defined Loop Up (lowest byte)
- 135) T1 1st User Defined Loop Down (highest byte)
- 136) T1 1st User Defined Loop Down (lowest byte)
- 137) T1 2nd User Defined Loop Down (highest byte)
- 138) T1 2nd User Defined Loop Down (lowest byte)
- 139) T1 User Defined Pattern (highest byte)

³⁹⁸ In number of Hz

³⁹⁹ Scaled by Frequency Scale Factor

⁴⁰⁰ Scaled by Frequency Scale Factor

⁴⁰¹ Value sent as ((value in dBm * 1000) + 100)

- 140) T1 User Defined Pattern
- 141) T1 User Defined Pattern
- 142) T1 User Defined Pattern (lowest Byte)
- 143) T1 Bit Error Insert Value (1-1000) (highest byte)
- 144) T1 Bit Error Insert Value (lowest byte)
- 145) T1 Frame Error Insert Value (1-1000) (highest byte)
- 146) T1 Frame Error Insert Value (lowest byte)
- 147) T1 BPV Error Insert Value (1-1000) (highest byte)
- 148) T1 BPV Error Insert Value (lowest byte)
- 149) T1 Graph Resolution⁴⁰²
- 150) T1 Measurement Duration⁴⁰³
- 151) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
- 152) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
- 153) T1 Auto Pattern Sync Status (00h = Off, 01h = On)
- 154) Vpp Input Config (00h = Terminate, 01h = Bridged)
- 155) Data Logging Status (00h = Off, 01h = On)
- 156 – 250) Not Used

For E1 Mode (Option 50):

- 21) E1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
- 22) E1 Framing Mode (03h = PCM30, 04h = PCM30CRC, 05h = PCM31, 06h = PCM31CRC)
- 23) E1 Line Coding (02h = AMI, 03h = HDB3)
- 24) E1 Clock Source (00h = External, 01h = Internal)
- 25) E1 Tx Level
- 26) E1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
- 27) E1 Loop Code
- 28) E1 CRC Method
- 29) E1 Loop Type
- 30) E1 Pattern (higher byte)
- 31) E1 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)
- 32) E1 Pattern Invert (00h = Non-Inverted, 01h = Inverted)
- 33) E1 Display Type (00h = Histogram, 01h = Raw Data)
- 34) E1 Impedance (01h = 75 Ω, 02h = 120 Ω)
- 35 - 50) First User Defined Loop Code Down (16 bytes)
- 51 - 66) Second User Defined Loop Code Down (16 bytes)
- 67 - 82) First User Defined Loop Code Up (16 bytes)
- 83 - 98) Second User Defined Loop Code Up (16 bytes)
- 99 - 130) User Defined Pattern (32 bytes)
- 131) E1 1st User Defined Loop Up (higher byte)
- 132) E1 1st User Defined Loop Up (lower byte)
- 133) E1 2nd User Defined Loop Up (higher byte)
- 134) E1 2nd User Defined Loop Up (lower byte)
- 135) E1 1st User Defined Loop Down (higher byte)
- 136) E1 1st User Defined Loop Down (lower byte)
- 137) E1 2nd User Defined Loop Down (higher byte)
- 138) E1 2nd User Defined Loop Down (lower byte)
- 139) E1 User Defined Pattern (highest byte)
- 140) E1 User Defined Pattern
- 141) E1 User Defined Pattern

⁴⁰² Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁴⁰³ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

- 142) E1 User Defined Pattern (lowest byte)
- 143) E1 Bit Error Insert Value (1-1000) (higher byte)
- 144) E1 Bit Error Insert Value (lower byte)
- 145) E1 Frame Error Insert Value (1-1000) (higher byte)
- 146) E1 Frame Error Insert Value (lower byte)
- 147) E1 BPV Error Insert Value (1-1000) (higher byte)
- 148) E1 BPV Error Insert Value (lower byte)
- 149) E1 Graph Resolution⁴⁰⁴
- 150) E1 Measurement Duration⁴⁰⁵
- 151) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
- 152) E1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
- 153) E1 Auto Pattern Sync Status (00h = Off, 01h = On)
- 154) Vpp Input Config (00h = Terminate, 01h = Bridged)
- 155) Data Logging Status (00h = Off, 01h = On)
- 156) E1 Vpp Input Impedance (01h = 75 Ω, 02h = 120 Ω)
- 157-250) Not Used

For CDMA Mode

- 21) Scale Division (Highest Byte)
- 22) Scale Division (Lowest Byte)
- 23) Center Frequency (Highest Byte)
- 24) Center Frequency
- 25) Center Frequency
- 26) Center Frequency (Lowest Byte)
- 27) External Reference Frequency
- 28) Marker 1
- 29) Marker 2
- 30) Marker 3
- 31) Marker 4
- 32) Marker 5
- 33) Marker 6
- 34) PN Search length
- 35) Measurement Speed
- 36) PN Offset (Highest Byte)
- 37) PN Offset (Lowest Byte)
- 38) Power Offset (Highest Byte)
- 39) Power Offset
- 40) Power Offset
- 41) Power Offset (Lowest Byte)
- 42) External Reference Frequency Status
- 43) Marker 1 Status
- 44) Marker 2 Status
- 45) Marker 3 Status
- 46) Marker 4 Status
- 47) Marker 5 Status
- 48) Marker 6 Status
- 49) Radio Configuration
- 50) Trigger Polarity
- 51) Display Type
- 52) Units
- 53) PN Search Mode

⁴⁰⁴ Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h: 45 sec, 05h: 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁴⁰⁵ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

- 54) Bit Reverse Status
- 55) Signal Standard (Highest Byte)
- 56) Signal Standard (Lowest Byte)
- 57) PN Increment
- 58 – 125)Reserved

For EVDO Mode

- 21) Scale Division (Highest Byte)
 - 22) Scale Division (Lowest Byte)
 - 23) Center Frequency (Highest Byte)
 - 24) Center Frequency
 - 25) Center Frequency
 - 26) Center Frequency (Lowest Byte)
 - 27) External Reference Frequency
 - 28) Marker 1
 - 29) Marker 2
 - 30) Marker 3
 - 31) Marker 4
 - 32) Marker 5
 - 33) Marker 6
 - 34) PN Search length
 - 35) Measurement Speed
 - 36) PN Offset (Highest Byte)
 - 37) PN Offset (Lowest Byte)
 - 38) Power Offset (Highest Byte)
 - 39) Power Offset
 - 40) Power Offset
 - 41) Power Offset (Lowest Byte)
 - 42) External Reference Frequency Status
 - 43) Marker 1 Status
 - 44) Marker 2 Status
 - 45) Marker 3 Status
 - 46) Marker 4 Status
 - 47) Marker 5 Status
 - 48) Marker 6 Status
 - 49) Data Modulation Type
 - 50) Trigger Polarity
 - 51) Display Type
 - 52) Units
 - 53) PN Search Mode
 - 54) CDP Display Type
 - 55) RF Display Type
 - 56) Signal Standard (Highest Byte)
 - 57) Signal Standard (Lowest Byte)
 - 58) PN Increment
 - 59 – 125)Reserved
-

Upload Setup – Control Byte #66 (42h)

Description: Receives parameters defining a setup and saves them in the memory location associated with the specified setup number. Since different modes have different numbers of setup locations available, the command requires the mode be specified as well as the setup number.

Setup numbers as follows:

- 0 = Run time setup
- 1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
- 1 – 5 = Saved setups for most other modes

Bytes to Follow: 2 bytes

For All Modes:

- 1) Number of Following Bytes (higher byte)
- 2) Number of Following Bytes (lower byte)
- 3) Measurement Mode⁴⁰⁶
- 4) Setup Number in which to store setup
- 14-27) Not Used

For Site Master VNA Modes:

- 21) Number of Data Points (higher byte)
- 22) Number of Data Points (lower byte)
- 23) VNA Start Frequency (in Hz) (highest byte)
- 24) VNA Start Frequency
- 25) VNA Start Frequency
- 26) VNA Start Frequency (lowest byte)
- 27) VNA Stop Frequency (in Hz) (highest byte)
- 28) VNA Stop Frequency
- 29) VNA Stop Frequency
- 30) VNA Stop Frequency (lowest byte)
- 31) Return Loss Scale Start (higher byte)⁴⁰⁷
- 32) Return Loss Scale Start (lower byte)
- 33) Return Loss Scale Stop (higher byte)
- 34) Return Loss Scale Stop (lower byte)
- 35) SWR Scale Start (higher byte)⁴⁰⁸
- 36) SWR Scale Start (lower byte)
- 37) SWR Scale Stop (higher byte)
- 38) SWR Scale Stop (lower byte)
- 39) Cable Loss Scale Start (higher byte)⁴⁰⁹
- 40) Cable Loss Scale Start (lower byte)
- 41) Cable Loss Scale Stop (higher byte)
- 42) Cable Loss Scale Stop (lower byte)
- 43) DTF-RL Scale Start (higher byte)⁴¹⁰
- 44) DTF-RL Scale Start (lower byte)
- 45) DTF-RL Scale Stop (higher byte)
- 46) DTF-RL Scale Stop (lower byte)
- 47) DTF-SWR Scale Start (higher byte)⁴¹¹
- 48) DTF-SWR Scale Start (lower byte)
- 49) DTF-SWR Scale Stop (higher byte)
- 50) DTF-SWR Scale Stop (lower byte)

⁴⁰⁶ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁴⁰⁷ See “Set Site Master VNA Scale” Control Byte #4 for data format.

⁴⁰⁸ See “Set Site Master VNA Scale” Control Byte #4 for data format.

⁴⁰⁹ See “Set Site Master VNA Scale” Control Byte #4 for data format.

⁴¹⁰ See “Set Site Master VNA Scale” Control Byte #4 for data format.

⁴¹¹ See “Set Site Master VNA Scale” Control Byte #4 for data format.

- 51) VNA Frequency Marker 1 (higher byte)⁴¹²
- 52) VNA Frequency Marker 1(lower byte)
- 53) VNA Frequency Marker 2 (higher byte)
- 54) VNA Frequency Marker 2 (lower byte)
- 55) VNA Frequency Marker 3 (higher byte)
- 56) VNA Frequency Marker 3 (lower byte)
- 57) VNA Frequency Marker 4 (higher byte)
- 58) VNA Frequency Marker 4 (lower byte)
- 59) VNA Frequency Marker 5 (higher byte)
- 60) VNA Frequency Marker 5 (lower byte)
- 61) VNA Frequency Marker 6 (higher byte)
- 62) VNA Frequency Marker 6 (lower byte)
- 63) Return Loss Single Limit (higher byte)⁴¹³
- 64) Return Loss Single Limit (lower byte)
- 65) SWR Single Limit (higher byte)⁴¹⁴
- 66) SWR Single Limit (lower byte)
- 67) Cable Loss Single Limit (higher byte)⁴¹⁵
- 68) Cable Loss Single Limit (lower byte)
- 69) DTF-RL Single Limit (higher byte)⁴¹⁶
- 70) DTF-RL Single Limit (lower byte)
- 71) DTF-SWR Single Limit (higher byte)⁴¹⁷
- 72) DTF-SWR Single Limit (lower byte)
- 73) Return Loss Multiple Limit Segment # (1)
- 74) Return Loss Multiple Limit Segment Status (00h = Off, 01h = On)
- 75) Return Loss Multiple Limit Segment Start X (highest byte)⁴¹⁸
- 76) Return Loss Multiple Limit Segment Start X
- 77) Return Loss Multiple Limit Segment Start X
- 78) Return Loss Multiple Limit Segment Start X (lowest byte)
- 79) Return Loss Multiple Limit Segment Start Y (higher byte)
- 80) Return Loss Multiple Limit Segment Start Y (lowest byte)
- 81) Return Loss Multiple Limit Segment End X (highest byte)
- 82) Return Loss Multiple Limit Segment End X
- 83) Return Loss Multiple Limit Segment End X
- 84) Return Loss Multiple Limit Segment End X (lowest byte)
- 85) Return Loss Multiple Limit Segment End Y (higher byte)
- 86) Return Loss Multiple Limit Segment End Y (lowest byte)
- 87-142) Repeat bytes 63 – 76 for segments 2 – 5
- 143-212) Repeat bytes 63 – 132 for SWR Multiple Limit
- 213-282) Repeat bytes 63 – 132 for Cable Loss Multiple Limit
- 283-352) Repeat bytes 63 – 132 for DTF-RL Multiple Limit
- 353-422) Repeat bytes 63 – 132 for DTF-SWR Multiple Limit
- 423) Start Distance (highest byte)⁴¹⁹
- 424) Start Distance
- 425) Start Distance
- 426) Start Distance (lowest byte)
- 427) Stop Distance (highest byte)

⁴¹² 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.

⁴¹³ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

⁴¹⁴ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

⁴¹⁵ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

⁴¹⁶ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

⁴¹⁷ See Control Byte #6, “Set Site Master VNA Single Limit” for data format.

⁴¹⁸ See Control Byte #112, “Set Site Master VNA Segmented Limit Lines” for data format.

⁴¹⁹ Distance data uses units 1/100,000m or 1/100,000 ft

- 428) Stop Distance
- 429) Stop Distance
- 430) Stop Distance (lowest byte)
- 431) Distance Marker 1 (higher byte)⁴²⁰
- 432) Distance Marker 1 (lower byte)
- 433) Distance Marker 2 (higher byte)
- 434) Distance Marker 2 (lower byte)
- 435) Distance Marker 3 (higher byte)
- 436) Distance Marker 3 (lower byte)
- 437) Distance Marker 4 (higher byte)
- 438) Distance Marker 4 (lower byte)
- 439) Distance Marker 5 (higher byte)
- 440) Distance Marker 5 (lower byte)
- 441) Distance Marker 6 (higher byte)
- 442) Distance Marker 6 (lower byte)
- 443) Relative Propagation Velocity (highest byte)⁴²¹
- 444) Relative Propagation Velocity
- 445) Relative Propagation Velocity
- 446) Relative Propagation Velocity (lowest byte)
- 447) Cable Loss (highest byte)⁴²²
- 448) Cable Loss
- 449) Cable Loss
- 450) Cable Loss (lowest byte)
- 451) Average Cable Loss⁴²³ (highest byte)
- 452) Average Cable Loss
- 453) Average Cable Loss
- 454) Average Cable Loss (lowest byte)
- 455) Status Byte 1: (0b = Off , 1b = On)
 - (LSB) bit 0 : Site Master Marker 1 On/Off
 - bit 1 : Site Master Marker 2 On/Off
 - bit 2 : Site Master Marker 3 On/Off
 - bit 3 : Site Master Marker 4 On/Off
 - bit 4 : Site Master Marker 5 On/Off
 - bit 5 : Site Master Marker 6 On/Off
 - bits 6- 7 : Not Used
- 456) Status Byte 2: (0b = Off, 1b = On)
 - (LSB) bit 0 : Not Used
 - bit 1 : Site Master Marker 2 Delta On/Off
 - bit 2 : Site Master Marker 3 Delta On/Off
 - bit 3 : Site Master Marker 4 Delta On/Off
 - bits 4-7: Not Used
- 457) Status Byte 3: (0b = Off , 1b = On)
 - (LSB) bit 0 : Site Master Limit Type (0b = Single, 1b = Multiple)
 - bit 1 : Site Master Limit Beep On/Off
 - bits 2-6 : Not Used
 - bit 7 : Site Master Single Limit Status On/Off
- 458) Status Byte 4:
 - (LSB) bits 0 - 1 : DTF Windowing Mode
 - bit: 1 0
 - | |

⁴²⁰ 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.

⁴²¹ Relative Propagation Velocity uses units 1/100,000.

⁴²² Cable loss uses units 1/100,000 dB/m or 1/100,000 dB/ft.

⁴²³ Average Cable Loss is dB * 1000.

- 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
- 459) Status Byte 5: (0b = Off, 1b = On)
 - (LSB) bit 0 : Fixed CW Mode On/Off
 - bit 1 : Single Sweep On/Off
 - bit 2 : Trace Overlay On/Off
 - bit 3 : Measurement Unit Metric/English (0b = English, 1b = Metric)
 - bits 4-6: Not Used
 - bit 7 : Cal Mode (0b = OSL Cal, 1b = FlexCal)
- 460) VNA Signal Standard⁴²⁴ (higher byte)
- 461) VNA Signal Standard (lower byte)
- 462) Cable Index
- 463) Cable Folder⁴²⁵
- 464) Trace Overlay Index (1-200)
- 465-550) Not Used

For Spectrum Analyzer Mode:

- 21) Spectrum Analyzer Start Frequency⁴²⁶ (highest byte)
- 22) Spectrum Analyzer Start Frequency
- 23) Spectrum Analyzer Start Frequency
- 24) Spectrum Analyzer Start Frequency (lowest byte)
- 25) Spectrum Analyzer Stop Frequency⁴²⁷ (highest byte)
- 26) Spectrum Analyzer Stop Frequency
- 27) Spectrum Analyzer Stop Frequency
- 28) Spectrum Analyzer Stop Frequency (lowest byte)
- 29) Spectrum Analyzer Center Frequency⁴²⁸ (highest byte)
- 30) Spectrum Analyzer Center Frequency
- 31) Spectrum Analyzer Center Frequency
- 32) Spectrum Analyzer Center Frequency (lowest byte)
- 33) Spectrum Analyzer Frequency Span⁴²⁹ (highest byte)
- 34) Spectrum Analyzer Frequency Span
- 35) Spectrum Analyzer Frequency Span
- 36) Spectrum Analyzer Frequency Span (lowest byte)
- 37) Ref Level (highest byte)⁴³⁰
- 38) Ref Level
- 39) Ref Level
- 40) Ref Level (lowest byte)
- 41) Scale per div (highest byte)⁴³¹
- 42) Scale per div
- 43) Scale per div
- 44) Scale per div (lowest byte)
- 45) Spectrum Analyzer Frequency Marker 1 (higher byte)⁴³²

⁴²⁴ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

⁴²⁵ 00h=Standard at 1000 MHz, 01h=Standard at 2000 MHz, 02h=Standard at 2500 MHz, 03h=Custom

⁴²⁶ Scaled by Frequency Scale Factor (bytes 301-302)

⁴²⁷ Scaled by Frequency Scale Factor (bytes 301-302)

⁴²⁸ Scaled by Frequency Scale Factor (bytes 301-302)

⁴²⁹ Scaled by Frequency Scale Factor (bytes 301-302)

⁴³⁰ Value sent as (value in dBm * 1000) + 270,000)

⁴³¹ Value sent as (value * 1000)

⁴³² Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

- 46) Spectrum Analyzer Frequency Marker 1 (lower byte)
- 47) Spectrum Analyzer Frequency Marker 2 (higher byte)
- 48) Spectrum Analyzer Frequency Marker 2 (lower byte)
- 49) Spectrum Analyzer Frequency Marker 3 (higher byte)
- 50) Spectrum Analyzer Frequency Marker 3 (lower byte)
- 51) Spectrum Analyzer Frequency Marker 4 (higher byte)
- 52) Spectrum Analyzer Frequency Marker 4 (lower byte)
- 53) Spectrum Analyzer Frequency Marker 5 (higher byte)
- 54) Spectrum Analyzer Frequency Marker 5 (lower byte)
- 55) Spectrum Analyzer Frequency Marker 6 (higher byte)
- 56) Spectrum Analyzer Frequency Marker 6 (lower byte)
- 57) Spectrum Analyzer Single Limit (highest byte)⁴³³
- 58) Spectrum Analyzer Single Limit
- 59) Spectrum Analyzer Single Limit
- 60) Spectrum Analyzer Single Limit (lowest byte)
- 61) SPA Multiple Upper Limit 1 Start X⁴³⁴ (highest byte)
- 62) SPA Multiple Upper Limit 1 Start X
- 63) SPA Multiple Upper Limit 1 Start X
- 64) SPA Multiple Upper Limit 1 Start X (lowest byte)
- 65) SPA Multiple Upper Limit 1 Start Y (Power Level) (highest byte)⁴³⁵
- 66) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 67) SPA Multiple Upper Limit 1 Start Y (Power Level)
- 68) SPA Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
- 69) SPA Multiple Upper Limit 1 End X⁴³⁶ (highest byte)
- 70) SPA Multiple Upper Limit 1 End X
- 71) SPA Multiple Upper Limit 1 End X
- 72) SPA Multiple Upper Limit 1 End X (lowest byte)
- 73) SPA Multiple Upper Limit 1 End Y (Power Level) (highest byte)⁴³⁷
- 74) SPA Multiple Upper Limit 1 End Y (Power Level)
- 75) SPA Multiple Upper Limit 1 End Y (Power Level)
- 76) SPA Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
- 77-220) SPA Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 61-76 for format)
- 221) RBW Setting (highest byte)⁴³⁸
- 222) RBW Setting
- 223) RBW Setting
- 224) RBW Setting (lowest byte)
- 225) VBW Setting (highest byte)⁴³⁹
- 226) VBW Setting
- 227) VBW Setting
- 228) VBW Setting (lowest byte)
- 229) OCC BW Method⁴⁴⁰
- 230) OCC BW % Value⁴⁴¹
- 231) OCC BW dBc⁴⁴²
- 232) Attenuation
- 233) Antenna Index (0-14)

⁴³³ Value sent as (value in dBm * 1000) + 270000

⁴³⁴ Scaled by Frequency Scale Factor (bytes 301-302)

⁴³⁵ Value sent as (value in dBm * 1000) + 270000

⁴³⁶ Scaled by Frequency Scale Factor (bytes 301-302)

⁴³⁷ Value sent as (value in dBm * 1000) + 270000

⁴³⁸ RBW frequency sent in Hz.

⁴³⁹ VBW frequency sent in Hz.

⁴⁴⁰ 00h = % of power, 01h = dB down

⁴⁴¹ 0 – 99%

⁴⁴² 0 – 120 dBc

- 234-249) Antenna Name (16 bytes in ASCII)
- 250) Status Byte 1: (0b = Off, 1b = On)
 (LSB) bit 0 : Spectrum Analyzer Mode Marker 1 On/Off
 bit 1 : Spectrum Analyzer Mode Marker 2 On/Off
 bit 2 : Spectrum Analyzer Mode Marker 3 On/Off
 bit 3 : Spectrum Analyzer Mode Marker 4 On/Off
 bit 4 : Spectrum Analyzer Mode Marker 5 On/Off
 bit 5 : Spectrum Analyzer Mode Marker 6 On/Off
 bits 6 - 7 : Not Used
- 251) Status Byte 2: (0b = Off, 1b = On)
 (LSB) bit 0 : Not Used
 bit 1 : Spectrum Analyzer Mode Marker 2 Delta On/Off
 bit 2 : Spectrum Analyzer Mode Marker 3 Delta On/Off
 bit 3 : Spectrum Analyzer Mode Marker 4 Delta On/Off
 bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
 bit 5 : Pre Amp Status On/Off
 bit 6 : Dynamic Attenuation On/Off
 bit 7 : Normalization On/Off
- 252) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
 1b = On/Beep if data is ABOVE line)
 (LSB) bit 0 : SPA Limit Type (0b = Single, 1b = Multiple)
 bit 1 : SPA Single Limit Beep On/Off
 bit 2 : SPA Single Limit Status On/Off
 bit 3 : SPA Single Limit Beep Level ABOVE/BELOW
 bit 4 : SPA Multiple Limit Upper Segment 1 Status On/Off
 bit 5 : SPA Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW⁴⁴³
 bit 6 : SPA Multiple Limit Upper Segment 2 Status On/Off
 bit 7 : SPA Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 253) Status Byte 4: (0b = Off/Beep if data is BELOW line ,
 1b = On/Beep if data is ABOVE line)
 (LSB) bit 0 : SPA Multiple Limit Upper Segment 3 Status On/Off
 bit 1 : SPA Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
 bit 2 : SPA Multiple Limit Upper Segment 4 Status On/Off
 bit 3 : SPA Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
 bit 4 : SPA Multiple Limit Upper Segment 5 Status On/Off
 bit 5 : SPA Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
 bit 6 : SPA Multiple Limit Lower Segment 1 Status On/Off
 bit 7 : SPA Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW⁴⁴⁴
- 254) Status Byte 5: (0b = Off/Beep if data is BELOW line ,
 1b = On/Beep if data is ABOVE line)
 (LSB) bit 0 : SPA Multiple Limit Lower Segment 2 Status On/Off
 bit 1 : SPA Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
 bit 2 : SPA Multiple Limit Lower Segment 3 Status On/Off
 bit 3 : SPA Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
 bit 4 : SPA Multiple Limit Lower Segment 4 Status On/Off
 bit 5 : SPA Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
 bit 6 : SPA Multiple Limit Lower Segment 5 Status On/Off
 bit 7 : SPA Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 255) Status Byte 6: (0b = Off, 1b = On)
 (LSB) bit 0 : Antenna Factors Correction On/Off
 bit 1 : Bias Tee On/Off (Option 10)
 bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
 bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV

⁴⁴³ Beep level is always 1b for upper segmented limit line

⁴⁴⁴ Beep level is always 0b for lower segmented limit line

- bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
bit 7 : Units Type (0b = Log 1b = Linear)
- 256) Status Byte 7: (0b = Off, 1b = On)
(LSB) bit 0: Interference Analysis On/Off
bit 1: C/I Measurement On/Off
bit 2: RBW Coupling (1b = Auto, 0b = Manual)
bit 3: VBW Coupling (1b = Auto, 0b = Manual)
bit 4: Attenuation Coupling (1b = Auto, 0b = Manual)
bit 5: Channel Power On/Off
bit 6: Adjacent Channel Power On/Off
bit 7: Occupied BW Measurement On/Off
- 257) Reference Level Offset⁴⁴⁵ (highest byte)
258) Reference Level Offset
259) Reference Level Offset
260) Reference Level Offset (lowest byte)
261) External Reference Frequency⁴⁴⁶
262) Signal Standard⁴⁴⁷ (higher byte)
263) Signal Standard (lower byte)
264) Channel Selection⁴⁴⁸ (higher byte)
265) Channel Selection (lower byte)
266) Trigger Type⁴⁴⁹
267) Interference Analysis Frequency⁴⁵⁰ (highest byte)
268) Interference Analysis Frequency
269) Interference Analysis Frequency
270) Interference Analysis Frequency (lowest byte)
271) Trigger Position (0 – 100%)
272) Min Sweep Time (in μ s) (highest byte)
273) Min Sweep Time (in μ s)
274) Min Sweep Time (in μ s)
275) Min Sweep Time (in μ s) (lowest byte)
276) Video Trigger Level⁴⁵¹ (highest byte)
277) Video Trigger Level
278) Video Trigger Level
279) Video Trigger Level (lowest byte)
280) Status Byte 8
(LSB) bit 0: Reserved
bits 1-7: Not Used
- 281) Status Byte 9
(LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
bit 7: Not Used
- 282) Status Byte 10: (0b = Off, 1b = On)
(LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
bit 2: Max Hold On/Off
bit 3: Min Hold On/Off
bit 4: View B On/Off
bit 5: External Reference Frequency On/Off
bits 6-7: Not Used

⁴⁴⁵ Value sent as (value in dBm * 1000) + 270,000

⁴⁴⁶ 1 byte in MHz (i.e. 20 = 20MHz)

⁴⁴⁷ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

⁴⁴⁸ “No Channel” is sent as FFFEh

⁴⁴⁹ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

⁴⁵⁰ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁵¹ Value sent as (value in dBm * 1000) + 270,000

- 283) Impedance (00h = 50Ω, 10h = 75Ω Anritsu Adapter, 12h = 75Ω Other Adapter)
- 284) Impedance Loss⁴⁵² (higher byte)
- 285) Impedance Loss (lower byte)
- 286) AM/FM Demod Type⁴⁵³
- 287) AM/FM Demod Status (01h = On, 00h = Off)
- 288) AM/FM Demod Volume (0 to 100)
- 289) AM/FM Demod Frequency⁴⁵⁴ (highest byte)
- 290) AM/FM Demod Frequency
- 291) AM/FM Demod Frequency
- 292) AM/FM Demod Frequency (lowest byte)
- 293) AM/FM Demod Time (in ms) (highest byte)
- 294) AM/FM Demod Time (in ms)
- 295) AM/FM Demod Time (in ms)
- 296) AM/FM Demod Time (in ms) (lowest byte)
- 297) SSB BFO Offset⁴⁵⁵ (highest byte)
- 298) SSB BFO Offset
- 299) SSB BFO Offset
- 300) SSB BFO Offset (lowest byte)
- 301) Frequency Scale Factor⁴⁵⁶ (higher byte)
- 302) Frequency Scale Factor (lower byte)
- 303) Frequency Range Minimum⁴⁵⁷ (highest byte)
- 304) Frequency Range Minimum
- 305) Frequency Range Minimum
- 306) Frequency Range Minimum (lowest byte)
- 307) Frequency Range Maximum⁴⁵⁸ (highest byte)
- 308) Frequency Range Maximum
- 309) Frequency Range Maximum
- 310) Frequency Range Maximum (lowest byte)
- 311) Marker Type⁴⁵⁹
- 312) Channel Power Int BW⁴⁶⁰ (highest byte)
- 313) Channel Power Int BW
- 314) Channel Power Int BW
- 315) Channel Power Int BW (lowest byte)
- 316) ACPR Main Channel BW⁴⁶¹ (highest byte)
- 317) ACPR Main Channel BW
- 318) ACPR Main Channel BW
- 319) ACPR Main Channel BW (lowest byte)
- 320) ACPR Adjacent Channel BW⁴⁶² (highest byte)
- 321) ACPR Adjacent Channel BW
- 322) ACPR Adjacent Channel BW
- 323) ACPR Adjacent Channel BW (lowest byte)
- 324) ACPR Channel Spacing⁴⁶³ (highest byte)

⁴⁵² Value sent as (value in dB * 1000), valid values are 0 to 20 dB

⁴⁵³ AM/FM Demod Type: 00h = FM-Wide Band, 01h = FM-Narrow Band, 02h = AM, 03h = SSB Lower, 04h = SSB Upper

⁴⁵⁴ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁵⁵ Value sent as ((value in Hz) – 10,000)

⁴⁵⁶ In number of Hz

⁴⁵⁷ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁵⁸ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁵⁹ 00h = Regular Marker, 01h = Noise Marker

⁴⁶⁰ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁶¹ Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁶² Scaled by Frequency Scale Factor (bytes 301-302)

⁴⁶³ Scaled by Frequency Scale Factor (bytes 301-302)

- 325) ACPR Channel Spacing
- 326) ACPR Channel Spacing
- 327) ACPR Channel Spacing (lowest byte)
- 328) Interference Analysis Cell Std⁴⁶⁴
- 329) Interference Analysis Est. BW⁴⁶⁵ (highest byte)
- 330) Interference Analysis Est. BW
- 331) Interference Analysis Est. BW
- 332) Interference Analysis Est. BW (lowest byte)
- 333) Trace B Trace Id⁴⁶⁶
- 334-500) Not Used

For Transmission Mode (Option 21 Only):

- 21) Start Frequency⁴⁶⁷ (highest byte)
- 22) Start Frequency
- 23) Start Frequency
- 24) Start Frequency (lowest byte)
- 25) Stop Frequency⁴⁶⁸ (highest byte)
- 26) Stop Frequency
- 27) Stop Frequency
- 28) Stop Frequency (lowest byte)
- 29) Center Frequency⁴⁶⁹ (highest byte)
- 30) Center Frequency
- 31) Center Frequency
- 32) Center Frequency (lowest byte)
- 33) Frequency Span⁴⁷⁰ (highest byte)
- 34) Frequency Span
- 35) Frequency Span
- 36) Frequency Span (lowest byte)
- 37) Ref Level (highest byte)⁴⁷¹
- 38) Ref Level
- 39) Ref Level
- 40) Ref Level (lowest byte)
- 41) Scale per div (highest byte)⁴⁷²
- 42) Scale per div
- 43) Scale per div
- 44) Scale per div (lowest byte)
- 45) Frequency Marker 1 (higher byte)⁴⁷³
- 46) Frequency Marker 1 (lower byte)
- 47) Frequency Marker 2 (higher byte)
- 48) Frequency Marker 2 (lower byte)
- 49) Frequency Marker 3 (higher byte)
- 50) Frequency Marker 3 (lower byte)
- 51) Frequency Marker 4 (higher byte)

⁴⁶⁴ 4 Standards – 00h = 1250 kHz CDMA, 01h = GSM, 02h = TDMA, 03h = AMPS, 04h = Unknown, FFh =

Interference Analysis Measurement OFF

⁴⁶⁵ Frequency in Hz

⁴⁶⁶ FFh indicates to trace selected

⁴⁶⁷ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁶⁸ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁶⁹ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁷⁰ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁷¹ Value sent as (value in dBm * 1000) + 270,000

⁴⁷² Value sent as (value * 1000)

⁴⁷³ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points – 1)) + start frequency.

- 52) Frequency Marker 4 (lower byte)
- 53) Frequency Marker 5 (higher byte)
- 54) Frequency Marker 5 (lower byte)
- 55) Frequency Marker 6 (higher byte)
- 56) Frequency Marker 6 (lower byte)
- 57) Single Limit (highest byte)⁴⁷⁴
- 58) Single Limit
- 59) Single Limit
- 60) Single Limit (lowest byte)
- 61) Multiple Upper Limit 1 Start X⁴⁷⁵ (highest byte)
- 62) Multiple Upper Limit 1 Start X
- 63) Multiple Upper Limit 1 Start X
- 64) Multiple Upper Limit 1 Start X (lowest byte)
- 65) Multiple Upper Limit 1 Start Y (Power Level) (highest byte)⁴⁷⁶
- 66) Multiple Upper Limit 1 Start Y (Power Level)
- 67) Multiple Upper Limit 1 Start Y (Power Level)
- 68) Multiple Upper Limit 1 Start Y (Power Level) (lowest byte)
- 69) Multiple Upper Limit 1 End X⁴⁷⁷ (highest byte)
- 70) Multiple Upper Limit 1 End X
- 71) Multiple Upper Limit 1 End X
- 72) Multiple Upper Limit 1 End X (lowest byte)
- 73) Multiple Upper Limit 1 End Y (Power Level) (highest byte)⁴⁷⁸
- 74) Multiple Upper Limit 1 End Y (Power Level)
- 75) Multiple Upper Limit 1 End Y (Power Level)
- 76) Multiple Upper Limit 1 End Y (Power Level) (lowest byte)
- 77-220) Multiple Upper Limits 2-5, SA Multiple Lower Limits 1-5 (see bytes 67-82 for format)
- 221) RBW Setting (highest byte)⁴⁷⁹
- 222) RBW Setting
- 223) RBW Setting
- 224) RBW Setting (lowest byte)
- 225) VBW Setting (highest byte)⁴⁸⁰
- 226) VBW Setting
- 227) VBW Setting
- 228) VBW Setting (lowest byte)
- 229) Attenuation
- 230) Status Byte 1: (0b = Off , 1b = On)
 (LSB) bit 0 : Marker 1 On/Off
 bit 1 : Marker 2 On/Off
 bit 2 : Marker 3 On/Off
 bit 3 : Marker 4 On/Off
 bit 4 : Marker 5 On/Off
 bit 5 : Marker 6 On/Off
 bits 6 - 7 : Not Used
- 231) Status Byte 2: (0b = Off, 1b = On)
 (LSB) bit 0 : S21 Spa Cal Status (0 – Cal OFF, 1 – Cal ON)
 bit 1 : Marker 2 Delta On/Off
 bit 2 : Marker 3 Delta On/Off
 bit 3 : Marker 4 Delta On/Off

⁴⁷⁴ Value sent as (value in dBm * 1000) + 270000

⁴⁷⁵ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁷⁶ Value sent as (value in dBm * 1000) + 270000

⁴⁷⁷ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁷⁸ Value sent as (value in dBm * 1000) + 270000

⁴⁷⁹ RBW frequency sent in Hz.

⁴⁸⁰ VBW frequency sent in Hz.

- bit 4 : Pre Amp Mode (0b = Manual, 1b = Auto)
 - bit 5 : Pre Amp Status On/Off
 - bit 6 : Dynamic Attenuation On/Off
 - bit 7 : Not Used
- 232) Status Byte 3: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : Limit Type (0b = Single, 1b = Multiple)
- bit 1 : Single Limit Beep On/Off
 - bit 2 : Single Limit Status On/Off
 - bit 3 : Single Limit Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Upper Segment 1 Status On/Off
 - bit 5 : Multiple Limit Upper Segment 1 Beep Level ABOVE/BELOW⁴⁸¹
 - bit 6 : Multiple Limit Upper Segment 2 Status On/Off
 - bit 7 : Multiple Limit Upper Segment 2 Beep Level ABOVE/BELOW
- 233) Status Byte 4: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : Multiple Limit Upper Segment 3 Status On/Off
- bit 1 : Multiple Limit Upper Segment 3 Beep Level ABOVE/BELOW
 - bit 2 : Multiple Limit Upper Segment 4 Status On/Off
 - bit 3 : Multiple Limit Upper Segment 4 Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Upper Segment 5 Status On/Off
 - bit 5 : Multiple Limit Upper Segment 5 Beep Level ABOVE/BELOW
 - bit 6 : Multiple Limit Lower Segment 1 Status On/Off
 - bit 7 : Multiple Limit Lower Segment 1 Beep Level ABOVE/BELOW⁴⁸²
- 234) Status Byte 5: (0b = Off/Beep if data is BELOW line ,
1b = On/Beep if data is ABOVE line)
- (LSB) bit 0 : Multiple Limit Lower Segment 2 Status On/Off
- bit 1 : Multiple Limit Lower Segment 2 Beep Level ABOVE/BELOW
 - bit 2 : Multiple Limit Lower Segment 3 Status On/Off
 - bit 3 : Multiple Limit Lower Segment 3 Beep Level ABOVE/BELOW
 - bit 4 : Multiple Limit Lower Segment 4 Status On/Off
 - bit 5 : Multiple Limit Lower Segment 4 Beep Level ABOVE/BELOW
 - bit 6 : Multiple Limit Lower Segment 5 Status On/Off
 - bit 7 : Multiple Limit Lower Segment 5 Beep Level ABOVE/BELOW
- 235) Status Byte 6: (0b = Off, 1b = On)
- (LSB) bit 0 : External Reference Frequency On/Off
- bit 1 : Bias Tee On/Off (Option 10)
 - bit 2 : Amplitude Units (Linear) – 00b = Watts 01b = Volts
 - bits 3-4 : Amplitude Units (Log) - 00b = dBm 01b = dBV 10b = dBmV 11b = dBuV
 - bits 5-6 : Detection Alg (00b = pos. peak 01b = RMS Averaging 10b = neg. peak 11b = Sampling Mode)
 - bit 7 : Units Type (0b = Log 1b = Linear)
- 236) External Reference Frequency⁴⁸³
- 237) Signal Standard⁴⁸⁴ (higher byte)
- 238) Signal Standard (lower byte)
- 239) Channel Selection⁴⁸⁵ (higher byte)
- 240) Channel Selection (lower byte)
- 241) Trigger Type⁴⁸⁶
- 242) Status Byte 7

⁴⁸¹ Beep level is always 1b for upper segmented limit line

⁴⁸² Beep level is always 0b for lower segmented limit line

⁴⁸³ 1 byte in MHz (i.e. 20 = 20MHz)

⁴⁸⁴ Index into Standard List (use control byte #89 to retrieve the ASCII string name). “No Standard” sent as FFFEh

⁴⁸⁵ “No Channel” is sent as FFFEh

⁴⁸⁶ Trigger Type – 00h = Single, 01h = Free Run, 02h = Video, 03h = External

- (LSB) bits 0-6: Number of sweeps to average (1-25, 1 implies averaging OFF)
- bit 7: Not Used
- 243) Status Byte 8: (0b = Off, 1b = On)
 - (LSB) bits 0-1: Trace Math Operation (00b = A only, 01b = A-B, 10b = A+B)
 - bit 2: Max Hold On/Off
 - bit 3: Min Hold On/Off
 - bit 4: RBW Coupling (1b = Auto, 0b = Manual)
 - bit 5: VBW Coupling (1b = Auto, 0b = Manual)
 - bit 6: Attenuation Coupling (1b = Auto, 0b = Manual)
 - bit 7: View B On/Off
- 244) Frequency Scale Factor⁴⁸⁷ (higher byte)
- 245) Frequency Scale Factor (lower byte)
- 246) Frequency Range Minimum⁴⁸⁸ (highest byte)
- 247) Frequency Range Minimum
- 248) Frequency Range Minimum
- 249) Frequency Range Minimum (lowest byte)
- 250) Frequency Range Maximum⁴⁸⁹ (highest byte)
- 251) Frequency Range Maximum
- 252) Frequency Range Maximum
- 253) Frequency Range Maximum (lowest byte)
- 254) Marker Type⁴⁹⁰
- 255) Trace B Trace Id⁴⁹¹
- 256) Status Byte 9
 - (LSB) bit 0: Reserved
 - bits 1-7: Not Used
- 257-400) Not Used

For Power Meter Mode (narrow band only):

- 21) Power Meter Start Freq⁴⁹² (highest byte)
- 22) Power Meter Start Freq
- 23) Power Meter Start Freq
- 24) Power Meter Start Freq⁴⁹³ (lowest byte)
- 25) Power Meter Stop Freq (highest byte)
- 26) Power Meter Stop Freq
- 27) Power Meter Stop Freq
- 28) Power Meter Stop Freq (lowest byte)
- 29) Power Meter Center Freq⁴⁹⁴ (highest byte)
- 30) Power Meter Center Freq
- 31) Power Meter Center Freq
- 32) Power Meter Center Freq (lowest byte)
- 33) Power Meter Span⁴⁹⁵ (highest byte)
- 34) Power Meter Span
- 35) Power Meter Span
- 36) Power Meter Span (lowest byte)
- 37) Signal Standard⁴⁹⁶ (higher byte)

⁴⁸⁷ In number of Hz

⁴⁸⁸ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁸⁹ Scaled by Frequency Scale Factor (bytes 244-245)

⁴⁹⁰ 00h = Regular Marker, 01h = Noise Marker

⁴⁹¹ FFh indicates no trace selected

⁴⁹² Scaled by Frequency Scale Factor (bytes 54-55)

⁴⁹³ Scaled by Frequency Scale Factor (bytes 54-55)

⁴⁹⁴ Scaled by Frequency Scale Factor (bytes 54-55)

⁴⁹⁵ Scaled by Frequency Scale Factor (bytes 54-55)

⁴⁹⁶ Index into Standard List (use control byte #89 to retrieve the ASCII string name). "No Standard" sent as FFFEh

- 38) Signal Standard (lower byte)
- 39) Channel Selection⁴⁹⁷ (higher byte)
- 40) Channel Selection (lower byte)
- 41) Power Meter Offset⁴⁹⁸ (highest byte)
- 42) Power Meter Offset
- 43) Power Meter Offset
- 44) Power Meter Offset (lowest byte)
- 45) Power Meter Relative (highest byte)⁴⁹⁹
- 46) Power Meter Relative
- 47) Power Meter Relative
- 48) Power Meter Relative (lowest byte)
- 49) Not Used
- 50) Power Meter Unit (00h = Watts, 01h = dBm)
- 51) Power Meter Relative Status (00h = Off, 01h = On)
- 52) Power Meter Offset Status (00h = Off, 01h = On)
- 53) Power Meter RMS Averaging Level (00h = Off, 01h = Low, 02h = Medium, 03h = High)
- 54) Frequency Scale Factor⁵⁰⁰ (higher byte)
- 55) Frequency Scale Factor (lower byte)
- 56) Frequency Range Minimum⁵⁰¹ (highest byte)
- 57) Frequency Range Minimum
- 58) Frequency Range Minimum
- 59) Frequency Range Minimum (lowest byte)
- 60) Frequency Range Maximum⁵⁰² (highest byte)
- 61) Frequency Range Maximum
- 62) Frequency Range Maximum
- 63) Frequency Range Maximum (lowest byte)
- 64) Zero Status (00h = Off, 01h = On)
- 65) Zero Value⁵⁰³ (highest byte)
- 66) Zero Value
- 67) Zero Value
- 68) Zero Value (lowest byte)
- 69-120) Not Used

For T1 Mode (Option 50):

- 21) T1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
- 22) T1 Framing Mode (01h = ESF, 02h = D4SF)
- 23) T1 Line Coding (01h = B8ZS, 02h = AMI)
- 24) T1 Clock Source (00h = External, 01h = Internal)
- 25) T1 Tx Level (01h = 0 dB, 02h = -7.5 dB, 03h = -15 dB)
- 26) T1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
- 27) T1 Loop Code (00h = CSU, 01h = NIU, 02h = User 1, 03h = User 2)
- 28) T1 CRC Method (00h = ANSI CRC, 01h = Japanese CRC)
- 29) T1 Loop Type (00h = In Band, 01h = Data Link)
- 30) T1 Pattern (higher byte)
- 31) T1 Pattern (lower byte) (01h = PRBS-9, 02h = PRBS-11, 03h = PRBS-15, 04h = PRBS-20(O.151), 05h = PRBS-20(O.153), 06h = PRBS-23, 07h = QRSS, 08h = 1 in 8, 09h = 2 in 8, 0Ah = 3 in 8, 0Bh = All Ones, 0Ch = All Zeros, 0Dh = T1-DALY, 0Eh = User Defined)
- 32) T1 Pattern Invert Status (00h = Non-Inverted, 01h = Inverted)

⁴⁹⁷ “No Channel” is sent as FFFEh

⁴⁹⁸ Value sent as (value in dB * 1000)

⁴⁹⁹ Value sent as ((value in dBm * 1000) + 100)

⁵⁰⁰ In number of Hz

⁵⁰¹ Scaled by Frequency Scale Factor

⁵⁰² Scaled by Frequency Scale Factor

⁵⁰³ Value sent as ((value in dBm * 1000) + 100)

- 33) T1 Display Type (00h = Histogram, 01h = Raw Data)
- 34) T1 Impedance
- 35 - 50) First User Defined Loop Code Down (16 bytes)
- 51 - 66) Second User Defined Loop Code Down (16 bytes)
- 67 - 82) First User Defined Loop Code Up (16 bytes)
- 83 - 98) Second User Defined Loop Code Up (16 bytes)
- 99 - 130) User Defined Pattern (32 bytes)
- 131) T1 1st User Defined Loop Up (highest byte)
- 132) T1 1st User Defined Loop Up (lowest byte)
- 133) T1 2nd User Defined Loop Up (highest byte)
- 134) T1 2nd User Defined Loop Up (lowest byte)
- 135) T1 1st User Defined Loop Down (highest byte)
- 136) T1 1st User Defined Loop Down (lowest byte)
- 137) T1 2nd User Defined Loop Down (highest byte)
- 138) T1 2nd User Defined Loop Down (lowest byte)
- 139) T1 User Defined Pattern (highest byte)
- 140) T1 User Defined Pattern
- 141) T1 User Defined Pattern
- 142) T1 User Defined Pattern (lowest Byte)
- 143) T1 Bit Error Insert Value (1-1000) (highest byte)
- 144) T1 Bit Error Insert Value (lowest byte)
- 145) T1 Frame Error Insert Value (1-1000) (highest byte)
- 146) T1 Frame Error Insert Value (lowest byte)
- 147) T1 BPV Error Insert Value (1-1000) (highest byte)
- 148) T1 BPV Error Insert Value (lowest byte)
- 149) T1 Graph Resolution⁵⁰⁴
- 150) T1 Measurement Duration⁵⁰⁵
- 151) T1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
- 152) T1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
- 153) T1 Auto Pattern Sync Status (00h = Off, 01h = On)
- 154) Vpp Input Config (00h = Terminate, 01h = Bridged)
- 155) Data Logging Status (00h = Off, 01h = On)
- 156 – 250) Not Used

For E1 Mode (Option 50):

- 21) E1 Receive Input (00h = Terminate, 01h = Bridged, 02h = Monitor)
- 22) E1 Framing Mode (03h = PCM30, 04h = PCM30CRC, 05h = PCM31, 06h = PCM31CRC)
- 23) E1 Line Coding (02h = AMI, 03h = HDB3)
- 24) E1 Clock Source (00h = External, 01h = Internal)
- 25) E1 Tx Level
- 26) E1 Error Insert Type (00h = Frame Error, 01h = BPV, 02h = Bit Errors, 04h = RAI, 05h = AIS)
- 27) E1 Loop Code
- 28) E1 CRC Method
- 29) E1 Loop Type
- 30) E1 Pattern (higher byte)
- 31) E1 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)
- 32) E1 Pattern Invert (00h = Non-Inverted, 01h = Inverted)
- 33) E1 Display Type (00h = Histogram, 01h = Raw Data)
- 34) E1 Impedance (01h = 75 Ω, 02h = 120 Ω)

⁵⁰⁴ Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁵⁰⁵ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

- 35 - 50) First User Defined Loop Code Down (16 bytes)
- 51 - 66) Second User Defined Loop Code Down (16 bytes)
- 67 - 82) First User Defined Loop Code Up (16 bytes)
- 83 - 98) Second User Defined Loop Code Up (16 bytes)
- 99 - 130) User Defined Pattern (32 bytes)
- 131) E1 1st User Defined Loop Up (higher byte)
- 132) E1 1st User Defined Loop Up (lower byte)
- 133) E1 2nd User Defined Loop Up (higher byte)
- 134) E1 2nd User Defined Loop Up (lower byte)
- 135) E1 1st User Defined Loop Down (higher byte)
- 136) E1 1st User Defined Loop Down (lower byte)
- 137) E1 2nd User Defined Loop Down (higher byte)
- 138) E1 2nd User Defined Loop Down (lower byte)
- 139) E1 User Defined Pattern (highest byte)
- 140) E1 User Defined Pattern
- 141) E1 User Defined Pattern
- 142) E1 User Defined Pattern (lowest byte)
- 143) E1 Bit Error Insert Value (1-1000) (higher byte)
- 144) E1 Bit Error Insert Value (lower byte)
- 145) E1 Frame Error Insert Value (1-1000) (higher byte)
- 146) E1 Frame Error Insert Value (lower byte)
- 147) E1 BPV Error Insert Value (1-1000) (higher byte)
- 148) E1 BPV Error Insert Value (lower byte)
- 149) E1 Graph Resolution⁵⁰⁶
- 150) E1 Measurement Duration⁵⁰⁷
- 151) E1 Voltage Measurement Scale (00h = Vpp, 01h = dBdsx)
- 152) E1 Auto Framing Mode (00h = fixed framing, >00h = auto framing mode)
- 153) E1 Auto Pattern Sync Status (00h = Off, 01h = On)
- 154) Vpp Input Config (00h = Terminate, 01h = Bridged)
- 155) Data Logging Status (00h = Off, 01h = On)
- 156) E1 Vpp Input Impedance (01h = 75 Ω, 02h = 120 Ω)
- 157-250) Not Used

For CDMA Mode

- 21) Scale Division (Highest Byte)
- 22) Scale Division (Lowest Byte)
- 23) Center Frequency (Highest Byte)
- 24) Center Frequency
- 25) Center Frequency
- 26) Center Frequency (Lowest Byte)
- 27) External Reference Frequency
- 28) Marker 1
- 29) Marker 2
- 30) Marker 3
- 31) Marker 4
- 32) Marker 5
- 33) Marker 6
- 34) PN Search length
- 35) Measurement Speed
- 36) PN Offset (Highest Byte)
- 37) PN Offset (Lowest Byte)
- 38) Power Offset (Highest Byte)

⁵⁰⁶ Graph Resolution: 00h: Auto, 01h: 1 sec, 02h: 15 sec, 03h: 30 sec, 04h 45 sec, 05h 1 min, 06h: 15 min, 07h: 30 min, 08h: 45 min, 09h: 60 min

⁵⁰⁷ Measurement Duration: 00h: Manual, 01h: 3 min, 02h: 15 min, 03h: 30 min, 04h: 1 hr, 05h: 3 hrs, 06h: 6 hrs, 07h: 12 hrs, 08h: 1 day, 09h: 2 days

- 39) Power Offset
- 40) Power Offset
- 41) Power Offset (Lowest Byte)
- 42) External Reference Frequency Status
- 43) Marker 1 Status
- 44) Marker 2 Status
- 45) Marker 3 Status
- 46) Marker 4 Status
- 47) Marker 5 Status
- 48) Marker 6 Status
- 49) Radio Configuration
- 50) Trigger Polarity
- 51) Display Type
- 52) Units
- 53) PN Search Mode
- 54) Bit Reverse Status
- 55) Signal Standard (Highest Byte)
- 56) Signal Standard (Lowest Byte)
- 57) PN Increment
- 58 – 125)Reserved

For EVDO Mode

- 21) Scale Division (Highest Byte)
- 22) Scale Division (Lowest Byte)
- 23) Center Frequency (Highest Byte)
- 24) Center Frequency
- 25) Center Frequency
- 26) Center Frequency (Lowest Byte)
- 27) External Reference Frequency
- 28) Marker 1
- 29) Marker 2
- 30) Marker 3
- 31) Marker 4
- 32) Marker 5
- 33) Marker 6
- 34) PN Search length
- 35) Measurement Speed
- 36) PN Offset (Highest Byte)
- 37) PN Offset (Lowest Byte)
- 38) Power Offset (Highest Byte)
- 39) Power Offset
- 40) Power Offset
- 41) Power Offset (Lowest Byte)
- 42) External Reference Frequency Status
- 43) Marker 1 Status
- 44) Marker 2 Status
- 45) Marker 3 Status
- 46) Marker 4 Status
- 47) Marker 5 Status
- 48) Marker 6 Status
- 49) Data Modulation Type
- 50) Trigger Polarity
- 51) Display Type
- 52) Units
- 53) PN Search Mode
- 54) CDP Display Type

- 55) RF Display Type
- 56) Signal Standard (Highest Byte)
- 57) Signal Standard (Lowest Byte)
- 58) PN Increment
- 59 – 125)Reserved

Site Master Returns: 1 byte

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

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

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

“Frequency Parameters (for SPA, TM and PM)” are start, stop, and center frequencies, multiple limit “x” parameters and AM/FM demod frequency parameters.

“Frequency Parameters (for VNA modes)” are start and stop frequencies and multiple limit “x” parameters.

“Distance Parameters” are start and stop distances, multiple limit “x” parameters and cable loss.

Bytes to Follow: 2 bytes

- 1) Measurement Mode⁵⁰⁸
- 2) Limits to Read (00h = Frequency Parameter Limits (Spectrum Analyzer, Transmission Mode, Power Meter), 01h = Available RBWs, 02h = Available VBWs, 03h = Distance Parameter Limits (Metric Units, VNA DTF Modes) 04h = Distance Parameter Limits (English Units, VNA DTF Modes), FFh = All Other Parameter Limits)

Site Master Returns:

For All Modes:

- 1) Number of Following Bytes (higher byte)
- 2) Number of Following Bytes (lower byte)
- 3) Measurement Mode⁵⁰⁹
- 14-28) Not Used

For Spectrum Analyzer, Transmission (Option 21) and Power Meter Modes, Frequency Parameter Limits:

- 21) Number of Valid Frequency Ranges

For each range:

- 1) Range Scale Factor⁵¹⁰ (higher byte)
- 2) Range Scale Factor (lower byte)
- 3) Range Start Frequency⁵¹¹ (highest byte)
- 4) Range Start Frequency
- 5) Range Start Frequency
- 6) Range Start Frequency (lowest byte)
- 7) Range Stop Frequency⁵¹² (highest byte)
- 8) Range Stop Frequency
- 9) Range Stop Frequency

⁵⁰⁸ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁰⁹ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵¹⁰ Scale Factor in number of Hz

⁵¹¹ Scaled by Span Scale Factor

⁵¹² Scaled by Span Scale Factor

10) Range Stop Frequency (lowest byte)

For Spectrum Analyzer, Transmission (Option 21) Modes, Available RBWS:

21) Number of Valid RBWs

For each RBW:

- 1) RBW Frequency (in Hz) (highest byte)
- 2) RBW Frequency (in Hz)
- 3) RBW Frequency (in Hz)
- 4) RBW Frequency (in Hz) (lowest byte)

For Spectrum Analyzer, Transmission (Option 21) Modes, Available VBWS:

21) Number of Valid VBWs

For each VBW:

- 1) VBW Frequency (in Hz) (highest byte)
- 2) VBW Frequency (in Hz)
- 3) VBW Frequency (in Hz)
- 4) VBW Frequency (in Hz) (lowest byte)

For VNA Modes, Distance Parameter Limits, in Metric Units:

- 21) Distance Minimum⁵¹³ (highest byte)
- 22) Distance Minimum
- 23) Distance Minimum
- 24) Distance Minimum (lowest byte)
- 25) Distance Maximum⁵¹⁴ (highest byte)
- 26) Distance Maximum
- 27) Distance Maximum
- 28) Distance Maximum (lowest byte)
- 29) Cable Loss Minimum⁵¹⁵ (highest byte)
- 30) Cable Loss Minimum
- 31) Cable Loss Minimum
- 32) Cable Loss Minimum (lowest byte)
- 33) Cable Loss Maximum⁵¹⁶ (highest byte)
- 34) Cable Loss Maximum
- 35) Cable Loss Maximum
- 36) Cable Loss Maximum (lowest byte)

For VNA Modes, Distance Parameter Limits, in English Units:

- 21) Distance Minimum⁵¹⁷ (highest byte)
- 22) Distance Minimum
- 23) Distance Minimum
- 24) Distance Minimum (lowest byte)
- 25) Distance Maximum⁵¹⁸ (highest byte)
- 26) Distance Maximum
- 27) Distance Maximum
- 28) Distance Maximum (lowest byte)
- 29) Cable Loss Minimum⁵¹⁹ (highest byte)

⁵¹³ Distance sent as (distance in meters * 100,000)

⁵¹⁴ Distance sent as (distance in meters * 100,000)

⁵¹⁵ Cable loss sent as (loss in dB/m * 100,000)

⁵¹⁶ Cable loss sent as (loss in dB/m * 100,000)

⁵¹⁷ Distance sent as (distance in feet * 100,000)

⁵¹⁸ Distance sent as (distance in feet * 100,000)

⁵¹⁹ Cable loss sent as (loss in dB/ft * 100,000)

- 30) Cable Loss Minimum
- 31) Cable Loss Minimum
- 32) Cable Loss Minimum (lowest byte)
- 33) Cable Loss Maximum⁵²⁰ (highest byte)
- 34) Cable Loss Maximum
- 35) Cable Loss Maximum
- 36) Cable Loss Maximum (lowest byte)

For VNA Modes, All Other Parameter Limits:

- 21) Frequency Minimum⁵²¹ (highest byte)
- 22) Frequency Minimum
- 23) Frequency Minimum
- 24) Frequency Minimum (lowest byte)
- 25) Frequency Maximum⁵²² (highest byte)
- 26) Frequency Maximum
- 27) Frequency Maximum
- 28) Frequency Maximum (lowest byte)
- 29) Return Loss Scale/Limit Y Minimum⁵²³ (highest byte)
- 30) Return Loss Scale/Limit Y Minimum
- 31) Return Loss Scale/Limit Y Minimum
- 32) Return Loss Scale/Limit Y Minimum (lowest byte)
- 33) Return Loss Scale/Limit Y Maximum⁵²⁴ (highest byte)
- 34) Return Loss Scale/Limit Y Maximum
- 35) Return Loss Scale/Limit Y Maximum
- 36) Return Loss Scale/Limit Y Maximum (lowest byte)
- 37) Cable Loss Scale/Limit Y Minimum⁵²⁵ (highest byte)
- 38) Cable Loss Scale/Limit Y Minimum
- 39) Cable Loss Scale/Limit Y Minimum
- 40) Cable Loss Scale/Limit Y Minimum (lowest byte)
- 41) Cable Loss Scale/Limit Y Maximum⁵²⁶ (highest byte)
- 42) Cable Loss Scale/Limit Y Maximum
- 43) Cable Loss Scale/Limit Y Maximum
- 44) Cable Loss Scale/Limit Y Maximum (lowest byte)
- 45) SWR Scale/Limit Y Minimum⁵²⁷ (highest byte)
- 46) SWR Scale/Limit Y Minimum
- 47) SWR Scale/Limit Y Minimum
- 48) SWR Scale/Limit Y Minimum (lowest byte)
- 49) SWR Scale/Limit Y Maximum⁵²⁸ (highest byte)
- 50) SWR Scale/Limit Y Maximum
- 51) SWR Scale/Limit Y Maximum
- 52) SWR Scale/Limit Y Maximum (lowest byte)
- 53) Marker Minimum⁵²⁹ (higher byte)
- 54) Marker Minimum (lower byte)
- 55) Marker Maximum⁵³⁰ (higher byte)

⁵²⁰ Cable loss sent as (loss in dB/ft * 100,000)

⁵²¹ Frequencies sent in Hz

⁵²² Frequencies sent in Hz

⁵²³ Scale sent in (dB * 1000)

⁵²⁴ Scale sent in (dB * 1000)

⁵²⁵ Scale sent in (dB * 1000)

⁵²⁶ Scale sent in (dB * 1000)

⁵²⁷ Scale sent in (ratio * 1000)

⁵²⁸ Scale sent in (ratio * 1000)

⁵²⁹ Value sent as data point on the display. Equivalent frequency (or distance) = (# data points - 1) * (marker X - start X) / (stop X - start X)

- 56) Marker Minimum (lower byte)
- 57) Propagation Velocity Minimum (highest byte)
- 58) Propagation Velocity Minimum
- 59) Propagation Velocity Minimum
- 60) Propagation Velocity Minimum (lowest byte)
- 61) Propagation Velocity Maximum⁵³¹ (highest byte)
- 62) Propagation Velocity Maximum
- 63) Propagation Velocity Maximum
- 64) Propagation Velocity Maximum (lowest byte)
- 65) Cable Folder Minimum
- 66) Cable Folder Maximum
- 67) Trace Overlay Index Minimum
- 68) Trace Overlay Index Maximum
- 69-200) Not Used

For T1 Mode (Option 50), All Other Parameter Limits:

- 21) Receive Input Minimum
- 22) Receive Input Maximum
- 23) Framing Mode Minimum
- 24) Framing Mode Maximum
- 25) Line Coding Minimum
- 26) Line Coding Maximum
- 27) Clock Source Minimum
- 28) Clock Source Maximum
- 29) Tx Level Minimum
- 30) Tx Level Maximum
- 31) Error Insert Type Minimum
- 32) Error Insert Type Maximum
- 33) Loop Code Minimum
- 34) Loop Code Maximum
- 35) CRC Method Minimum
- 36) CRC Method Maximum
- 37) Loop Type Minimum
- 38) Loop Type Maximum
- 39) Pattern Minimum
- 40) Pattern Maximum
- 41) Display Type Minimum
- 42) Display Type Maximum
- 43) Bit Error Insert Value Minimum (higher byte)
- 44) Bit Error Insert Value Minimum (lower byte)
- 45) Bit Error Insert Value Maximum (higher byte)
- 46) Bit Error Insert Value Maximum (lower byte)
- 47) Frame Error Insert Value Minimum (higher byte)
- 48) Frame Error Insert Value Minimum (lower byte)
- 49) Frame Error Insert Value Maximum (higher byte)
- 50) Frame Error Insert Value Maximum (lower byte)
- 51) BPV Error Insert Value Minimum (higher byte)
- 52) BPV Error Insert Value Minimum (lower byte)
- 53) BPV Error Insert Value Maximum (higher byte)
- 54) BPV Error Insert Value Maximum (lower byte)
- 55) Graph Resolution Minimum
- 56) Graph Resolution Maximum

⁵³⁰ Value sent as data point on the display. Equivalent frequency (or distance) = (# data points – 1) * (marker X – start X) / (stop X – start X)

⁵³¹ Propagation velocity sent as (velocity * 100,000)

- 57) Measurement Duration Minimum
- 58) Measurement Duration Maximum
- 59) Voltage Scale Minimum
- 60) Voltage Scale Maximum
- 61) Vpp Input Config Minimum
- 62) Vpp Input Config Maximum
- 63-150) Not Used

For E1 Mode (Option 50), All Other Parameter Limits:

- 21) Receive Input Minimum
- 22) Receive Input Maximum
- 23) Framing Mode Minimum
- 24) Framing Mode Maximum
- 25) Line Coding Minimum
- 26) Line Coding Maximum
- 27) Clock Source Minimum
- 28) Clock Source Maximum
- 29) Tx Level Minimum
- 30) Tx Level Maximum
- 31) Error Insert Type Minimum
- 32) Error Insert Type Maximum
- 33) Loop Code Minimum
- 34) Loop Code Maximum
- 35) CRC Method Minimum
- 36) CRC Method Maximum
- 37) Loop Type Minimum
- 38) Loop Type Maximum
- 39) Pattern Minimum
- 40) Pattern Maximum
- 41) Display Type Minimum
- 42) Display Type Maximum
- 43) Bit Error Insert Value Minimum (higher byte)
- 44) Bit Error Insert Value Minimum (lower byte)
- 45) Bit Error Insert Value Maximum (higher byte)
- 46) Bit Error Insert Value Maximum (lower byte)
- 47) Frame Error Insert Value Minimum (higher byte)
- 48) Frame Error Insert Value Minimum (lower byte)
- 49) Frame Error Insert Value Maximum (higher byte)
- 50) Frame Error Insert Value Maximum (lower byte)
- 51) BPV Error Insert Value Minimum (higher byte)
- 52) BPV Error Insert Value Minimum (lower byte)
- 53) BPV Error Insert Value Maximum (higher byte)
- 54) BPV Error Insert Value Maximum (lower byte)
- 55) Graph Resolution Minimum
- 56) Graph Resolution Maximum
- 57) Measurement Duration Minimum
- 58) Measurement Duration Maximum
- 59) Voltage Scale Minimum
- 60) Voltage Scale Maximum
- 61) Vpp Input Config Minimum
- 62) Vpp Input Config Maximum
- 63) Impedance Minimum
- 64) Impedance Maximum
- 65-150) Not Used

For Spectrum Analyzer Mode, All Other Parameter Limits:

- 21) Frequency Scale Factor Minimum⁵³² (higher byte)
- 22) Frequency Scale Factor Minimum (lower byte)
- 23) Frequency Scale Factor Maximum⁵³³ (higher byte)
- 24) Frequency Scale Factor Maximum (lower byte)
- 25) Span Minimum⁵³⁴ (highest byte)
- 26) Span Minimum
- 27) Span Minimum
- 28) Span Minimum (lowest byte)
- 29) Span Maximum⁵³⁵ (highest byte)
- 30) Span Maximum
- 31) Span Maximum
- 32) Span Maximum (lowest byte)
- 33) Reference Level Minimum⁵³⁶ (highest byte)
- 34) Reference Level Minimum
- 35) Reference Level Minimum
- 36) Reference Level Minimum (lowest byte)
- 37) Reference Level Maximum⁵³⁷ (highest byte)
- 38) Reference Level Maximum
- 39) Reference Level Maximum
- 40) Reference Level Maximum (lowest byte)
- 41) Scale Minimum⁵³⁸ (highest byte)
- 42) Scale Minimum
- 43) Scale Minimum
- 44) Scale Minimum (lowest byte)
- 45) Scale Maximum⁵³⁹ (highest byte)
- 46) Scale Maximum
- 47) Scale Maximum
- 48) Scale Maximum (lowest byte)
- 49) Marker Minimum⁵⁴⁰ (higher byte)
- 50) Marker Minimum (lower byte)
- 51) Marker Maximum⁵⁴¹ (higher byte)
- 52) Marker Maximum (lower byte)
- 53) Limit Y Minimum⁵⁴² (highest byte)
- 54) Limit Y Minimum
- 55) Limit Y Minimum
- 56) Limit Y Minimum (lowest byte)
- 57) Limit Y Maximum⁵⁴³ (highest byte)
- 58) Limit Y Maximum
- 59) Limit Y Maximum
- 60) Limit Y Maximum (lowest byte)
- 61) OBW Method Minimum

⁵³² Scale Factor in number of Hz

⁵³³ Scale Factor in number of Hz

⁵³⁴ Scaled by Span Scale Factor

⁵³⁵ Scaled by Span Scale Factor

⁵³⁶ Value sent as (value * 1000) + 270,000

⁵³⁷ Value sent as (value * 1000) + 270,000

⁵³⁸ Value sent as (value * 1000)

⁵³⁹ Value sent as (value * 1000)

⁵⁴⁰ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

⁵⁴¹ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

⁵⁴² Value sent as (value * 1000) + 270,000

⁵⁴³ Value sent as (value * 1000) + 270,000

- 62) OBW Method Maximum
- 63) OBW % of Power Minimum
- 64) OBW % of Power Maximum
- 65) OBW dBc Minimum
- 66) OBW dBc Maximum
- 67) Attenuation Minimum
- 68) Attenuation Maximum
- 69) Amplitude Units Minimum
- 70) Amplitude Units Maximum
- 71) Detection Algorithm Minimum
- 72) Detection Algorithm Maximum
- 73) RL Offset Minimum⁵⁴⁴ (highest byte)
- 74) RL Offset Minimum
- 75) RL Offset Minimum
- 76) RL Offset Minimum (lowest byte)
- 77) RL Offset Maximum⁵⁴⁵ (highest byte)
- 78) RL Offset Maximum
- 79) RL Offset Maximum
- 80) RL Offset Maximum (lowest byte)
- 81) External Reference Frequency Minimum⁵⁴⁶ (highest byte)
- 82) External Reference Frequency Minimum
- 83) External Reference Frequency Minimum
- 84) External Reference Frequency Minimum (lowest byte)
- 85) External Reference Frequency Maximum⁵⁴⁷ (highest byte)
- 86) External Reference Frequency Maximum
- 87) External Reference Frequency Maximum
- 88) External Reference Frequency Maximum (lowest byte)
- 89) Trigger Type Minimum
- 90) Trigger Type Maximum
- 91) Minimum Sweep Type (in μ s) Minimum (highest byte)
- 92) Minimum Sweep Type (in μ s) Minimum
- 93) Minimum Sweep Type (in μ s) Minimum
- 94) Minimum Sweep Type (in μ s) Minimum (lowest byte)
- 95) Minimum Sweep Type (in μ s) Maximum (highest byte)
- 96) Minimum Sweep Type (in μ s) Maximum
- 97) Minimum Sweep Type (in μ s) Maximum
- 98) Minimum Sweep Type (in μ s) Maximum (lowest byte)
- 99) Video Trigger Level Minimum⁵⁴⁸ (highest byte)
- 100) Video Trigger Level Minimum
- 101) Video Trigger Level Minimum
- 102) Video Trigger Level Minimum (lowest byte)
- 103) Video Trigger Level Maximum⁵⁴⁹ (highest byte)
- 104) Video Trigger Level Maximum
- 105) Video Trigger Level Maximum
- 106) Video Trigger Level Maximum (lowest byte)
- 107) Sweep Average Minimum
- 108) Sweep Average Maximum
- 109) Trace Math Minimum
- 110) Trace Math Maximum

⁵⁴⁴ Value sent as (value * 1000) + 270,000

⁵⁴⁵ Value sent as (value * 1000) + 270,000

⁵⁴⁶ Reference frequency in Hz

⁵⁴⁷ Reference frequency in Hz

⁵⁴⁸ Value sent as (value * 1000) + 270,000

⁵⁴⁹ Value sent as (value * 1000) + 270,000

- 111) Impedance Loss Minimum⁵⁵⁰ (highest byte)
- 112) Impedance Loss Minimum
- 113) Impedance Loss Minimum
- 114) Impedance Loss Minimum (lowest byte)
- 115) Impedance Loss Maximum⁵⁵¹ (highest byte)
- 116) Impedance Loss Maximum
- 117) Impedance Loss Maximum
- 118) Impedance Loss Maximum (lowest byte)
- 119) Demod Type Minimum
- 120) Demod Type Maximum
- 121) Demod Volume Minimum
- 122) Demod Volume Maximum
- 123) Demod Time Minimum (in ms) (highest byte)
- 124) Demod Time Minimum (in ms)
- 125) Demod Time Minimum (in ms)
- 126) Demod Time Minimum (in ms) (lowest byte)
- 127) Demod Time Maximum (in ms) (highest byte)
- 128) Demod Time Maximum (in ms)
- 129) Demod Time Maximum (in ms)
- 130) Demod Time Maximum (in ms) (lowest byte)
- 131) SSB BFO Offset Minimum⁵⁵² (highest byte)
- 132) SSB BFO Offset Minimum
- 133) SSB BFO Offset Minimum
- 134) SSB BFO Offset Minimum (lowest byte)
- 135) SSB BFO Offset Maximum⁵⁵³ (highest byte)
- 136) SSB BFO Offset Maximum
- 137) SSB BFO Offset Maximum
- 138) SSB BFO Offset Maximum (lowest byte)
- 139) ACPR Main Channel BW Minimum (in Hz) (highest byte)
- 140) ACPR Main Channel BW Minimum (in Hz)
- 141) ACPR Main Channel BW Minimum (in Hz)
- 142) ACPR Main Channel BW Minimum (in Hz) (lowest byte)
- 143) ACPR Main Channel BW Maximum (in Hz) (highest byte)
- 144) ACPR Main Channel BW Maximum (in Hz)
- 145) ACPR Main Channel BW Maximum (in Hz)
- 146) ACPR Main Channel BW Maximum (in Hz) (lowest byte)
- 147) ACPR Adjacent Channel BW Minimum (in Hz) (highest byte)
- 148) ACPR Adjacent Channel BW Minimum (in Hz)
- 149) ACPR Adjacent Channel BW Minimum (in Hz)
- 150) ACPR Adjacent Channel BW Minimum (in Hz) (lowest byte)
- 151) ACPR Adjacent Channel BW Maximum (in Hz) (highest byte)
- 152) ACPR Adjacent Channel BW Maximum (in Hz)
- 153) ACPR Adjacent Channel BW Maximum (in Hz)
- 154) ACPR Adjacent Channel BW Maximum (in Hz) (lowest byte)
- 155) ACPR Channel Spacing Minimum (in Hz) (highest byte)
- 156) ACPR Channel Spacing Minimum (in Hz)
- 157) ACPR Channel Spacing Minimum (in Hz)
- 158) ACPR Channel Spacing Minimum (in Hz) (lowest byte)
- 159) ACPR Channel Spacing Maximum (in Hz) (highest byte)
- 160) ACPR Channel Spacing Maximum (in Hz)
- 161) ACPR Channel Spacing Maximum (in Hz)

⁵⁵⁰ Value sent as (value in dB * 1000)

⁵⁵¹ Value sent as (value in dB * 1000)

⁵⁵² Value sent as ((value in Hz) – 10,000)

⁵⁵³ Value sent as ((value in Hz) – 10,000)

- 162) ACPR Channel Spacing Maximum (in Hz) (lowest byte)
- 163) Channel Power Integration BW Minimum (in Hz) (highest byte)
- 164) Channel Power Integration BW Minimum (in Hz)
- 165) Channel Power Integration BW Minimum (in Hz)
- 166) Channel Power Integration BW Minimum (in Hz) (lowest byte)
- 167) Channel Power Integration BW Maximum (in Hz) (highest byte)
- 168) Channel Power Integration BW Maximum (in Hz)
- 169) Channel Power Integration BW Maximum (in Hz)
- 170) Channel Power Integration BW Maximum (in Hz) (lowest byte)
- 171-300) Not Used

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

- 21) Span Scale Factor Minimum⁵⁵⁴ (higher byte)
- 22) Span Scale Factor Minimum (lower byte)
- 23) Span Scale Factor Maximum⁵⁵⁵ (higher byte)
- 24) Span Scale Factor Maximum (lower byte)
- 25) Span Minimum⁵⁵⁶ (highest byte)
- 26) Span Minimum
- 27) Span Minimum
- 28) Span Minimum (lowest byte)
- 29) Span Maximum⁵⁵⁷ (highest byte)
- 30) Span Maximum
- 31) Span Maximum
- 32) Span Maximum (lowest byte)
- 33) Reference Level Minimum⁵⁵⁸ (highest byte)
- 34) Reference Level Minimum
- 35) Reference Level Minimum
- 36) Reference Level Minimum (lowest byte)
- 37) Reference Level Maximum⁵⁵⁹ (highest byte)
- 38) Reference Level Maximum
- 39) Reference Level Maximum
- 40) Reference Level Maximum (lowest byte)
- 41) Scale Minimum⁵⁶⁰ (highest byte)
- 42) Scale Minimum
- 43) Scale Minimum
- 44) Scale Minimum (lowest byte)
- 45) Scale Maximum⁵⁶¹ (highest byte)
- 46) Scale Maximum
- 47) Scale Maximum
- 48) Scale Maximum (lowest byte)
- 49) Marker Minimum⁵⁶² (higher byte)
- 50) Marker Minimum (lower byte)
- 51) Marker Maximum⁵⁶³ (higher byte)

⁵⁵⁴ Scale Factor in number of Hz

⁵⁵⁵ Scale Factor in number of Hz

⁵⁵⁶ Scaled by Span Scale Factor

⁵⁵⁷ Scaled by Span Scale Factor

⁵⁵⁸ Value sent as (value * 1000) + 270,000

⁵⁵⁹ Value sent as (value * 1000) + 270,000

⁵⁶⁰ Value sent as (value * 1000)

⁵⁶¹ Value sent as (value * 1000)

⁵⁶² Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

⁵⁶³ Value sent as data point on the display. Equivalent frequency = (point * span / (# data points - 1)) + start frequency.

- 52) Marker Maximum (lower byte)
- 53) Limit Y Minimum⁵⁶⁴ (highest byte)
- 54) Limit Y Minimum
- 55) Limit Y Minimum
- 56) Limit Y Minimum (lowest byte)
- 57) Limit Y Maximum⁵⁶⁵ (highest byte)
- 58) Limit Y Maximum
- 59) Limit Y Maximum
- 60) Limit Y Maximum (lowest byte)
- 61) Attenuation Minimum
- 62) Attenuation Maximum
- 63) Amplitude Units Minimum
- 64) Amplitude Units Maximum
- 65) Detection Algorithm Minimum
- 66) Detection Algorithm Maximum
- 67) External Reference Frequency Minimum⁵⁶⁶ (highest byte)
- 68) External Reference Frequency Minimum
- 69) External Reference Frequency Minimum
- 70) External Reference Frequency Minimum (lowest byte)
- 71) External Reference Frequency Maximum⁵⁶⁷ (highest byte)
- 72) External Reference Frequency Maximum
- 73) External Reference Frequency Maximum
- 74) External Reference Frequency Maximum (lowest byte)
- 75) Trigger Type Minimum
- 76) Trigger Type Maximum
- 77) Sweep Average Minimum
- 78) Sweep Average Maximum
- 79) Trace Math Minimum
- 80) Trace Math Maximum
- 81-200) Not Used

For Power Meter Mode (narrow band only), All Other Parameter Limits:

- 21) Span Scale Factor Minimum⁵⁶⁸ (higher byte)
- 22) Span Scale Factor Minimum (lower byte)
- 23) Span Scale Factor Maximum⁵⁶⁹ (higher byte)
- 24) Span Scale Factor Maximum (lower byte)
- 25) Span Minimum⁵⁷⁰ (highest byte)
- 26) Span Minimum
- 27) Span Minimum
- 28) Span Minimum (lowest byte)
- 29) Span Maximum⁵⁷¹ (highest byte)
- 30) Span Maximum
- 31) Span Maximum
- 32) Span Maximum (lowest byte)
- 33) Power Meter Offset Minimum (highest byte)
- 34) Power Meter Offset Minimum
- 35) Power Meter Offset Minimum

⁵⁶⁴ Value sent as (value * 1000) + 270,000

⁵⁶⁵ Value sent as (value * 1000) + 270,000

⁵⁶⁶ Reference frequency in MHz

⁵⁶⁷ Reference frequency in MHz

⁵⁶⁸ Scale Factor in number of Hz

⁵⁶⁹ Scale Factor in number of Hz

⁵⁷⁰ Scaled by Span Scale Factor

⁵⁷¹ Scaled by Span Scale Factor

- 36) Power Meter Offset Minimum (lowest byte)
- 37) Power Meter Offset Maximum (highest byte)
- 38) Power Meter Offset Maximum
- 39) Power Meter Offset Maximum
- 40) Power Meter Offset Maximum (lowest byte)
- 41) Power Meter Relative Minimum⁵⁷² (highest byte)
- 42) Power Meter Relative Minimum
- 43) Power Meter Relative Minimum
- 44) Power Meter Relative Minimum (lowest byte)
- 45) Power Meter Relative Maximum⁵⁷³ (highest byte)
- 46) Power Meter Relative Maximum
- 47) Power Meter Relative Maximum
- 48) Power Meter Relative Maximum (lowest byte)
- 49-150) Not Used

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

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

Bytes to Follow: 1 byte

- 1) Measurement Mode⁵⁷⁴

Site Master Returns:

For All Modes:

- 1) Number of Following Bytes (higher byte)
- 2) Number of Following Bytes (lower byte)
- 3) Number of Setups

For Each Setup, VNA Modes – Frequency Domain:

- 1) Setup Number
- 2) Attributes
 - bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
 - bits 1-7: Not Used
- 3) Measurement Mode⁵⁷⁵
- 4) Cal Status⁵⁷⁶
- 5) Frequency Scale Factor⁵⁷⁷ (higher byte)
- 6) Frequency Scale Factor (lower byte)
- 7) Start Frequency⁵⁷⁸ (highest byte)
- 8) Start Frequency
- 9) Start Frequency
- 10) Start Frequency (lowest byte)
- 11) Stop Frequency⁵⁷⁹ (highest byte)
- 12) Stop Frequency
- 13) Stop Frequency

⁵⁷² Value sent as ((value in dBm + 100) * 1000)

⁵⁷³ Value sent as ((value in dBm + 100) * 1000)

⁵⁷⁴ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁷⁵ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁷⁶ 00h = Cal Off, 01h = OSL Cal On, 02h = OSL InstaCal On, 03h = FlexCal On, 04h = FlexCal InstaCal On

⁵⁷⁷ Frequency Scale Factor is in number of Hz

⁵⁷⁸ Frequency is scaled by the frequency scale factor specified in bytes 5-6.

⁵⁷⁹ Frequency is scaled by the frequency scale factor specified in bytes 5-6.

- 14) Stop Frequency (lowest byte)
- 15-20) Not Used

For Each Setup, VNA Modes – Time Domain (i.e. DTF):

- 1) Setup Number
- 2) Attributes
 - bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
 - bits 1-7: Not Used
- 3) Measurement Mode⁵⁸⁰
- 4) Cal Status⁵⁸¹
- 5) Not Used
- 6) Measurement Units (00h = Feet, 01h = Meters)
- 7) Start Distance⁵⁸² (highest byte)
- 8) Start Distance
- 9) Start Distance
- 10) Start Distance (lowest byte)
- 11) Stop Distance⁵⁸³ (highest byte)
- 12) Stop Distance
- 13) Stop Distance
- 14) Stop Distance (lowest byte)
- 15-20) Not Used

For Each Setup, Spectrum Analyzer, Transmission Mode, Power Meter Modes:

- 1) Setup Number
- 2) Attributes
 - bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
 - bits 1-7: Not Used
- 3) Measurement Mode⁵⁸⁴
- 4) Cal Status (Transmission Mode Setup Only, 00h = Off, 01h = On)
- 5) Frequency Scale Factor⁵⁸⁵ (higher byte)
- 6) Frequency Scale Factor (lower byte)
- 7) Start Frequency⁵⁸⁶ (highest byte)
- 8) Start Frequency
- 9) Start Frequency
- 10) Start Frequency (lowest byte)
- 11) Stop Frequency⁵⁸⁷ (highest byte)
- 12) Stop Frequency
- 13) Stop Frequency
- 14) Stop Frequency (lowest byte)
- 15-20) Not Used

For Each Setup, T1 and E1 Modes:

- 1) Setup Number
- 2) Attributes
 - bit 0: Read Only Status (00h = Write-able, 01h = Read Only)
 - bits 1-7: Not Used
- 3) Measurement Mode⁵⁸⁸

⁵⁸⁰ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁸¹ 00h = Cal Off, 01h = OSL Cal On, 02h = OSL InstaCal On, 03h = FlexCal On, 04h = FlexCal InstaCal On

⁵⁸² Distance sent as (distance * 100,000) where “distance” is in the units specified in byte 6.

⁵⁸³ Distance sent as (distance * 100,000) where “distance” is in the units specified in byte 6.

⁵⁸⁴ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁸⁵ Frequency Scale Factor is in number of Hz

⁵⁸⁶ Frequency is scaled by the frequency scale factor specified in bytes 5-6.

⁵⁸⁷ Frequency is scaled by the frequency scale factor specified in bytes 5-6.

- 4) Framing Mode⁵⁸⁹
- 5) Pattern⁵⁹⁰
- 6) Pattern Invert Status (00h = Not Inverted, 01h = Inverted)
- 7-20) Not Used

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 byte- (ASCII)

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

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

The computer sends Enter Remote Mode Immediately byte #70 (46h) to the 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)

⁵⁸⁸ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

⁵⁸⁹ 01h = ESF (T1), 02h = D4SF (T1),

03h = PCM30 (E1), 04h = PCM30CRC (E1), 05h = PCM31 (E1), 06h = PCM31CRC (E1)

⁵⁹⁰ 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

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

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

Setup numbers as follows:

- 255 = All Setups in the Specified Mode
- 1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
- 1 – 5 = Saved setups for most other modes

Bytes to Follow: 3 bytes

- 1) Measurement Mode⁵⁹¹
- 2) Setup Number
- 3) Write-Protect Status (00h = Allow Writes (default), 01h = Lock Setup (i.e. “read only”))

Spectrum Master Returns: 1 byte

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

⁵⁹¹ Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

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

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

Setup numbers as follows:

- 255 = All Setups in the Specified Mode
- 1 – 10 = Saved setups for Spectrum Analyzer/Transmission Measurement modes
- 1 – 5 = Saved setups for most other modes

Bytes to Follow: 2 bytes

- 1) Measurement Mode⁵⁹²
- 2) Setup Number

Spectrum Master Returns: 1 byte

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

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

Description: Commands a virtual press of the selected key.

Bytes to Follow: 1 byte

- 00h: Null
- 0Dh: Enter
- 1Bh: Escape
- 2Eh: Print
- 30h: Recall Display
- 31h: Backlight
- 32h: Contrast
- 33h: Start Cal
- 34h: Auto Scale
- 35h: Save Setup
- 36h: Recall Setup
- 37h: Limit
- 38h: Marker
- 39h: Save Display
- 61h: Run/Hold
- 62h: Up
- 63h: Down
- 64h: Menu Key 1
- 65h: Menu Key 2
- 66h: Menu Key 3
- 67h: Menu Key 4
- 68h: Menu Key 5
- 69h: Menu Key 6
- 70h: System
- 71h: Mode
- 72h: Freq/Dist
- 73h: Amplitude
- 74h: Meas/Disp

Cell Master Returns: 1 byte

⁵⁹² Refer to Control Byte #3 “Select Measurement Mode” for valid measurement modes.

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

Write Signal Standards – Control Byte #78 (4Eh)

Description: Write user-defined signal standards to the unit.

Bytes to Follow: Variable bytes

- 1-2) Version # (integer, e.g. 100 for 1.00)
- 3-4) Total number of records in this package (Maximum 200)
(1st record)
- 5) Type of record (bit7: selected in SPA mode; bit6: selected in VNA mode; bit1: CDMA std; bit2: GSM std; Others are reserved)
- 6) # of sub-band (When the standard includes multiple sub-bands)
- 7-30) Name of Standard (ASCII 24 bytes)
- 31-34) Uplink Frequency (integer)
- 35-38) Downlink Frequency (integer)
- 39-40) Start Ch# (integer)
- 41-42) Stop Ch# (integer)
- 43-46) Channel occupied band width (integer)
- 47-50) Channel spacing (integer)
- 51-52) Channel step (integer)
(2nd record)
- 53-100) Repeat from 5 to 52
-

Cell Master Returns: 1 byte

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

Recall Signal Standards – Control Byte #79 (4Fh)

Description: Download signal standards to PC.

Bytes to Follow: 0 byte

Cell Master Returns:

Command received correctly : Variable bytes

- 1-2) Version # (integer, e.g. 100 for 1.00)
- 3-4) Total number of records in this package (Maximum 200)
(1st record)
- 5-6) Type of record

- 7-30) Name of Standard (ASCII 24 bytes)
- 31-34) Start Frequency (integer)
- 35-38) Stop Frequency (integer)
- 39-40) Start Ch# (integer)
- 41-42) Stop Ch# (integer)
- 43-46) Channel occupied band width (integer)
- 47-50) Channel spacing (integer)
- 51-52) Channel step (integer)
- (2nd record)
- 53-100) Repeat from 5 to 52
-
- Last byte) FF (End of the return bytes)
- Command error : 1 byte
- 224 (E0h) Parameter Error
- 238 (EEh) Time Out Error

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

Description: Write user-defined cable list to the unit.

Bytes to Follow: variable bytes

- 1-2) Version #
- 3-4) Total number of records in this package (Maximum 200)
- (1st Record)
- 5) Type of record (bit7: selected in SPA mode; bit6: selected in VNA mode; bit1: CDMA std; bit2: GSM std; Others are reserved)
- 6) # of sub-band (When the standard includes multiple sub-bands)
- 7-27) Cable name (ASCII 21 bytes)
- 28-31) Propagation Velocity
- 32-35) Frequency 1
- 36-39) Insertion Loss 1
- 40-43) Frequency 2
- 44-47) Insertion Loss 2
- 48-51) Frequency 3
- 52-55) Insertion Loss 3
- (2nd Record)
- (56-106) Repeat from 5 to 55
-

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: 0 byte

Cell Master Returns:

- Command received correctly: variable bytes
- 1-2) Version #

3-4) Total number of records in this package (Maximum 200)
(1st Record)
5-6) Type of record
7-27) Cable name (ASCII 21 bytes)
28-31) Propagation Velocity
32-35) Frequency 1
36-39) Insertion Loss 1
40-43) Frequency 2
44-47) Insertion Loss 2
48-51) Frequency 3
52-55) Insertion Loss 3
(2nd Record)
(56-106) Repeat from 5 to 55
... ..
Last byte) FF (End of the return bytes)
Command error : 1 byte
224 (E0h) Parameter Error
238 (EEh) Time Out Error

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.

Frequencies are sent in Hz scaled by the Scale Factor.

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

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

- 1) Antenna List Index (1-10)
 - 2-17) Antenna Name (in ASCII)
 - 18) Number of Antenna Factors (max = 60)
 - 19-20) Frequency Scale Factor (in Hz)
- For each antenna factor:
- 1) Frequency (scaled by Scale Factor) (highest byte)
 - 2) Frequency (scaled by Scale Factor)
 - 3) Frequency (scaled by Scale Factor)
 - 4) Frequency (scaled by Scale Factor) (lowest byte)
 - 5) Antenna Factor (higher byte)
 - 6) Antenna Factor (lower byte)

Cell Master Returns: 1 byte

- 2) 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.

Frequencies are sent in Hz scaled by the Scale Factor.

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

Bytes to Follow: 1 byte

- 1) Antenna List index (1-10)

Cell Master Returns: (28-382 bytes, depending on the number of antenna factors)

- 1) Maximum Antenna Number (10)
- 2-17) Antenna Name (in ASCII)
- 18) Number of Antenna Factors (max = 60)
- 19-20) Frequency Scale Factor (in Hz)
- 21-22) Number of Following Bytes

For each antenna factor:

- 1) Frequency (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 the standard antennas. The standard antennas are as follows:

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

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 #36, Upload 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* * 100) + 270000)
 - 18-21) Channel Power Density (= (density in *dBm/Hz* * 100) + 270000)
-

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

Description: Sets the state of the measurement (ON or OFF), the center frequency, the main channel bandwidth, the adjacent channel bandwidth and the channel spacing (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 #36, 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* * 100) + 270000)
 - 22-25) Lower Adjacent Channel Power (= (power in *dBm* * 100) + 270000)
 - 26-29) Upper Adjacent Channel Power (= (power in *dBm* * 100) + 270000)
-

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

Description: Select signal standard and the link direction.

Bytes to Follow: 2 bytes

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

Cell Master Returns: 1 byte

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

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

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

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

Bytes to Follow: 2 bytes

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

Cell Master Returns: 1 byte

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

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

Description: Read the current settings of signal standard. This command can be used in any measurement mode.

Bytes to follow: none

Cell Master Returns: 44 bytes

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

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

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

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

Each record has the following data field.

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

65-128): 2nd record.
129-192): 3rd record.
Etc.

Cell Master Returns: 1 byte

- 2) 255 (FFh) Operation Complete Byte
- 224 (E0h) Parameter Error: Invalid signal standard
- 238 (EEh) Time Out Error

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

Description: Measure OCC BW with % of Power method.

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 (lowebyte)
- 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 (higher byte)
- 5) Marker Value (lower 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: $\text{Point} = (400 * (\text{marker freq} - \text{start} - \text{req})) / \text{span}$

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 Peak Hold – Control Byte #105 (69h)

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

Bytes to Follow: 1 byte

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

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

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

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 #29 (14h) response bytes 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)⁵⁹³
- 4) Starting X
- 5) Starting X
- 6) Starting X (lowest byte)
- 7) Starting Y (higher byte)
- 8) Starting Y (lower byte)
- 9) Ending X (highest byte)⁵⁹⁴
- 10) Ending X
- 11) Ending X
- 12) Ending X (lowest byte)
- 13) Ending Y (higher byte)
- 14) Ending Y (lower 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

⁵⁹³ Frequency in Hz or Distance in 1/100,000 ft (or meters)

⁵⁹⁴ Frequency in Hz or Distance in 1/100,000 ft (or meters)

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 X⁵⁹⁵ (highest byte)
- 6) Limit Value Start X
- 7) Limit Value Start X
- 8) Limit Value Start X (lowest byte)
- 9) Limit Value Start Y⁵⁹⁶ (highest byte)
- 10) Limit Value Start Y
- 11) Limit Value Start Y
- 12) Limit Value Start Y (lowest byte)
- 13) Limit Value End X⁵⁹⁷ (highest byte)
- 14) Limit Value End X
- 15) Limit Value End X
- 16) Limit Value End X (lowest byte)
- 17) Limit Value End Y⁵⁹⁸ (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

⁵⁹⁵ Frequency in Hz

⁵⁹⁶ (Value in dBm * 1000) + 270,000

⁵⁹⁷ Frequency in Hz

⁵⁹⁸ (Value in dBm * 1000) + 270,000

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

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

Bytes to Follow: 1 byte

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

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
-

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

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

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

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

Bytes to Follow: 5 bytes

- 1) Impedance Adapter⁵⁹⁹
- 2) Impedance Loss⁶⁰⁰ (highest byte)
- 3) Impedance Loss
- 4) Impedance Loss
- 5) Impedance Loss (lowest byte)

Cell Master Returns: 1 byte

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

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

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

Bytes to Follow: 1 byte

- 1) Marker number (1-6)

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

Note:

Marker value sent as (value in dBm * 1,000) +270,000

⁵⁹⁹ Impedance Adapter: 00h = 50 Ω 0Ah = 75Ω, adapter 12N50-75B 0Ch = 75Ω, other adapter offset

⁶⁰⁰ Send the loss value as value in dB* 1,000

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, 1 turns averaging OFF)

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)⁶⁰¹
- 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
-

⁶⁰¹ The marker position is sent as a data point on the display. Equivalent Frequency = (position * span / (# data points – 1)) + start frequency

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 O-F the frequency reference

OR

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

- 1) 01h - Turn O- 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:

- 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) \geq 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 Spectrum Analyzer Units – Control Byte #140 (8Ch)

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

Linear units can be:

- 01h = Volts
- 02h = Watts

Logarithmic units can be:

- 03h = dBm
- 04h = dBV
- 05h = dBmV
- 06h = dB μ V

Bytes to Follow: 2 bytes

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

Cell Master Returns: 1 byte

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

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

This command is new to the MT8212A. Use it instead of Control Byte #106 to access any new RBWs.

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

Bytes to Follow: 4 bytes

- 1) Resolution Bandwidth (frequency in Hz) (highest byte)
- 2) Resolution Bandwidth (frequency in Hz)
- 3) Resolution Bandwidth (frequency in Hz)
- 4) Resolution Bandwidth (frequency in Hz) (lowest byte)

Cell Master Returns: 1 byte

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

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

This command is new to the MT8212A. Use it instead of Control Byte #107 to access any new VBWs.

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

Bytes to Follow: 4 bytes

- 1) Video Bandwidth (frequency in Hz) (highest byte)
- 2) Video Bandwidth (frequency in Hz)
- 3) Video Bandwidth (frequency in Hz)
- 4) Video Bandwidth (frequency in Hz) (lowest byte)

Cell Master Returns: 1 byte

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

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

This command is new to the MT8212A. Use it instead of Control Byte #111 to access any new attenuations.

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

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

Bytes to Follow: 1 byte

- 1) Attenuation (0 – 51)

Cell Master Returns: 1 byte

- 1) 255 (FFh) Operation Complete Byte
 - 224 (E0h) Parameter Error: Invalid attenuation
 - 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 Main Serial Number – Control Byte #221 (DDh)

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

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

Bytes to Follow: 0 bytes

Cell Master Returns: 4 bytes

- 1) Main Serial Number (highest byte)
 - 2) Main Serial Number
 - 3) Main Serial Number
 - 4) Main Serial Number (lowest byte)
-

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

Description: Reads and returns the 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: BER
 - 02h: BPV
 - 03h: Framing
- 2) Number of Errors (highest byte)
- 3) Number of Errors
- 4) Number of Errors
- 5) Number of Errors (lowest byte) If Error Type is BER, the number of error is limited to 1 to 7 where the number corresponds to the BER. For example, 7 will yield a BER of 1E-7.

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. If the error type is BER, this command will toggle error insertion on and off.

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: 75 Ω
 - 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 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) Status Byte
 - 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
-

Read T1/E1 dBdsx – Control Word (A016h)

This control byte is available with Option 50 only.

Description: Initiates a voltage measurement on the T1 board and returns the result in dBdsx. The resolution is 0.1 dB and is offset by 350 so that only positive values are returned. For example, -5.0 dB will be reported as 300. Results less than -20 dB are not accurate to 0.1 dB and should be divided by 10.

Bytes to Follow: 2 bytes

- 1) dBdsx (higher byte)
- 2) dBdsx (lower byte)

Cell Master Returns: 1 byte

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

Read T1/E1 Frequency – Control Word (A017h)

This control byte is available with Option 50 only.

Description: Reports the last T1/E1 frequency measurement result in Hz if available. The DSP CPLD U80 must be version 7 or higher and the T1E1 board version number must be 1 or higher for this measurement. The Cell Master must be configured for a BER measurement and a BER measurement must be running before this command is executed. The firmware must version V1.88 or higher.

Bytes to Follow: 0 bytes

Cell Master Returns: 4 bytes

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

Read T1/E1 Frequency Cal – Control Word (A018h)

This control byte is available with Option 50 only.

Description: Reports the current T1/E1 frequency calibration setting. The value is in Hz offset from 0 by 100, with a range of 0 to 200 Hz (equivalent to +/- 100 Hz).

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

- 1) Frequency Calibration Setting in Hz

Set T1/E1 Frequency Cal – Control Word (A019h)

This control byte is available with Option 50 only.

Description: Sets the T1/E1 frequency calibration value. The value is in Hz offset from 0 by 100, with a range of 0 to 200 Hz (equivalent to +/- 100 Hz).

Bytes to Follow: 1 byte

- 1) Frequency Calibration Setting in Hz

Cell Master Returns: 1 byte

- 1) Status Byte
255 (FFh) Operation Complete Byte

Configure DS0/E0 Channel Tests – Control Word (A01Ah)

This control byte is available with Option 50 only.

Description: Configures DS0/E0 channel access

Bytes to Follow: 3 bytes

- 1) Channel insert ON/OFF. 1 for ON, 0 for OFF.
- 2) Channel number. 1 – 24 for DS1, 1- 32 for E1
- 3) Audio monitor volume in percent, 0 – 100%

Cell Master Returns: 1 byte

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

Read DS0/E0 Level and Frequency – Control Word (A01Bh)

This control byte is available with Option 50 only.

Description: Reports the level and frequency of the received signal on the selected DS0/E0 channel. The range of the level measurement is –40.0 to +3.0 dBm. The result is reported with 0.1 dB resolution, offset by 401. A report of 401 corresponds to 0.0 dBm, a report of 0 is under range and a report of 432 is over range. The frequency is reported in Hz.

Bytes to Follow: 0 bytes

Cell Master Returns: 4 bytes

- 1) Level high byte
- 2) Level low byte
- 3) Frequency high byte
- 4) Frequency low byte

Set DS0/E0 Level and Frequency Control Word (A01C)

This control byte is available with Option 50 only.

Description: Sets the level and frequency of the sinusoidal signal to transmit on the selected channel. The range of the level setting is 0 to –30 dBm. The level setting is offset by 30 where 30 corresponds to 0 dBm and 0 to –30 dBm. The frequency is in Hz with a range of 100 to 3000 Hz.

Bytes to Follow: 3 bytes

- 1) Level
- 2) Frequency high byte
- 3) Frequency low byte

Cell Master Returns: 1 byte

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

Perform Transmission Mode Calibration – Control Word (A301h)

This command is available only with option 21.

Description: Perform Transmission Mode Calibration.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

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

Turn OFF Transmission Mode Calibration – Control Word (A302h)

This command is available only with option 21.

Description: Turn OFF Transmission Mode Calibration

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

Get Signal Standard Name – Control Word (A501h)

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

Bytes to follow: 2

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

Cell Master Returns: 20 bytes

- 1 – 20) Standard Name in ASCII

Perform Noise Diode Cal – Control Word (A505h)

Description: Performs noise diode calibration on SPA board

Bytes to follow: 0

Cell Master Returns: 1 byte

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

Set Bias T Voltage – Control Word (A506h)

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

Bytes to follow: 1

- 1) Bias T Voltage

Cell Master Returns: 1 byte

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

Read External Module Name – Control Word (A201h)

This command is available only with option 6.

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

For example, module name “FCN4760” will be received as:

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

Bytes to Follow: 0 bytes

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

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

OR

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

Read External Module Serial Number – Control Word (A202h)

This command is available only with option 6.

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

For example, serial number 12345678 will be received as:

8,1,2,3,4,5,6,7,8,ff

Bytes to Follow: 0 bytes

Cell Master Returns: 10 bytes

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

OR

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

Read External Module Frequency Range – Control Word (A203h)

This command is available only with option 6.

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

For example, the frequency range of the FCN4760 is as follows:

Scale factor: 10

Input Start Frequency: 4700 MHz (scaled, this number is 470 MHz)

Input End Frequency: 6000 MHz (scaled, this number is 600 MHz)

Output Start Frequency: 450 MHz (scaled, this number is 45 MHz)

Output End Frequency: 1750 MHz (scaled, this number is 600 MHz)

So the response will look like:

12,0,a,1c,3,a1,80,23,c3,46,0,2,ae,a5,40,a,6e,49,c0,ff
Bytes to Follow: 0 bytes

Cell Master Returns: 20 bytes (success) OR 1 byte (failure)

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

OR

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

Read Module Fail Counter – Control Word (A204h)

This command is available only with option 6.

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

Bytes to Follow: 0 bytes

Cell Master Returns: 2 bytes (success) OR 1 byte (failure)

- 1) Fail Counter (higher byte)
- 2) Fail Counter (lower byte)

OR

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

Clear Module Fail Counter – Control Word (A205h)

This command is available only with option 6.

Description: Sets the module lock fail counter to 0.

Bytes to Follow: 0 bytes

Cell Master Returns: 1 byte

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

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

This command is available only with option 25.

Description: Selects measurement function in Interference Analysis mode.

Bytes to Follow: 1 bytes

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

Cell Master Returns: 1 byte

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

Spectrogram: Set Sweep Interval – Control Word (A721h)

This command is available only with option 25.

Description: Sets the sweep interval in spectrogram mode.

Bytes to Follow: 2 bytes

- 1) Sweep interval in seconds (MSB)
- 2) Sweep interval in seconds (LSB)

Cell Master Returns: 1 byte

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

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

This command is available only with option 25.

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

Bytes to Follow: 2 bytes

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

Cell Master Returns: 1 byte

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

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

This command is available only with option 25.

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

Bytes to Follow: 1 bytes

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

Cell Master Returns: 1 byte

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

Spectrogram: Get Trace Name – Control Word (A724h)

This command is available only with option 25.

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

Bytes to Follow: 0 bytes

Cell Master Returns:

- When control word is received correctly: 101 bytes
 - 1-2) Index of trace (from 0 to 4)
 - 3-12) Date of save in ASCII string, format: "--/--/----"
 - 13-20) Time of save in ASCII string, format: "--:--:--"
 - 21-100) Repeat the information of 1) to 20) four times
- 101) FFh
- When error occurs: 1 byte

- 1) 224 (E0h) Parameter Error: Module not attached
 - 238 (EEh) Time Out Error
-

Spectrogram: Recall Trace – Control Word (A725h)

This command is available only with option 25.

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

Bytes to Follow: 1 bytes

- 1) Index of memory slots (0-4)

Cell Master Returns:

When control word is received correctly: 32448 bytes

1-10) Date of save (ASCII, format: "--/--/----")

11-18) Time of save (ASCII, format: "--:--:--")

19-22) Center Frequency (Integer – MSB to LSB)

23-26) Span (Integer – MSB to LSB)

27-30) RBW (Integer – MSB to LSB)

31-34) VBW (Integer – MSB to LSB)

35-38) Reference level (Integer – MSB to LSB)

39-42) Scale (Integer – MSB to LSB)

43-46) Time Span (Integer – MSB to LSB)

47-48) Sweep Interval (Integer – MSB to LSB)

49-52) GPS Position – Latitude (long integer)⁶⁰²

53-56) GPS Position – Longitude (long integer)

57-58) GPS Position – Altitude (short integer)

59-32458) 80 records of spectrogram data. Each record has the following format:

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

$$\text{Color Index} = (\text{Ref Level} - \text{SaMeasData}) * 255 / (\text{Division} * 10)$$

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

Status byte: 1 byte

⁶⁰² Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

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

Remote Self Test – Control Word (AA15h)

Description: Trigger the equivalent of a “key press” selftest.

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

Bytes to Follow: 0 bytes

Cell Master Returns: 39 bytes

- 1) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 °C) (higher byte)
- 2) Temperature in 1/10th of degree Celsius (e.g. 362 = 36.2 °C) (lower byte)
- 3) Memory Check (01h: Pass, 00h: Fail)
- 4) RTC Voltage Check (01h: Pass, 00h: Fail)
- 5) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (higher byte)
- 6) Power Voltage in 1/10ths of a Volt (e.g. 124 = 12.4 Volts) (lower byte)
- 7) VNA Lock Failure Counter (higher byte)
- 8) VNA Lock Failure Counter (lower byte)
- 9) VNA Integrator Failure Counter (higher byte)
- 10) VNA Integrator Failure Counter (lower byte)
- 11) SPA LO Failure Counter (higher byte)
- 12) SPA LO Failure Counter (lower byte)
- 13) H/W Config – Mother Board ID
- 14) H/W Config - SPA Board ID
- 15) H/W Config - T1E1 Board ID
- 16) H/W Config - PLD1 ID
- 17) H/W Config - PLD2 ID
- 18) H/W Config – T1E1 COLD ID
- 19) VNA PLL Lock Failure Test - Status–(01h: Pass, 00h: Fail)
- 20) VNA PLL Lock Failure Test - Failed–data point # (Ignore this byte if the Lock Fail Test Status was Pass)
- 21) VNA PLL Lock Failure Test - Failed–PLL # (Ignore this byte if the Lock Fail Test Status was Pass)
- 22) VNA Integration Test – Status (01h: Pass, 00h: Fail)
- 23) VNA Integration Test – Failed data point # (Ignore this byte if the Integration Test Status was Pass)
- 24) VNA Integration Test - Reserved
- 25) SPA LO Test - Status–(01h: Pass, 00h: Fail, FFh: SPA board not installed)
- 26) SPA LO Test - Failed–data point #
- 27) SPA LO Test - Failed–LO #
- Option 6/Frequency Extension Module Selftest:
 - 27) Module PLD Version
 - 28) Module Attached
 - 29) Module Lock (sent only if Module Attached = 1) (01h = Locked, 00h = Not Locked)
 - 30) Module Lock Fail Counter (sent only if Module Attached = 1) (higher byte)
 - 31) Module Lock Fail Counter (sent only if Module Attached = 1) (lower byte)
 - 32) End of Data (FFh)
- T1/E1 Selftest:
 - 28) Status (01h: Pass, 00h: Fail, FFh: T1/E1 board not installed)
 - 29) Carrier Status (01h: carrier present, 00h: No carrier)
 - 30) Frame Sync Status (01h: in frame sync, 00h: Not in frame sync)
 - 31) QRSS pattern sync status (01h: Pattern sync, 00h: Not in sync)

- 32) QRSS bit error count (01h: Bit error found, 00h: No bit error)
 - 33) T1 – Daly pattern sync status (01h: Pattern sync, 00h: Not in pattern sync)
 - 34) 0 dB CSU Tx Level Check (00h: Pass (> - 2.5 dB), XXh: Value reported by DS2155)
 - 35) -7.5 dB CSU Tx Level Check (00h: Pass (-5.0 to -12.5 dB), XXh: Value reported by DS2155)
 - 36) -15 dB CSU Tx Level Check (00h: Pass (-12.5 to -20.0 dB), XXh: Value reported by DS2155)
 - 37) -22.5 dB CSU Tx Level Check (00h: Pass (-20.0 to -30.0 dB), XXh: Value reported by DS2155)
 - 38) Vpp measurement of 0 dB signal in 1/10ths of a Volt (e.g. 124 = 12.4 Volts)
 - 39) End of Data (FFh)
-

Set GSM Display Type – Control Byte # (A101h)

Description: Sets the display Type for GSM Measurements (Spectrum/Frame /Slot Views)

Bytes to Follow: 1 bytes

- 1) Display Type⁶⁰³

Cell Master Returns: 1 byte

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

Set GSM Center Frequency – Control Byte # (A102h)

Description: Sets the Frequency for GSM Mode

Bytes to Follow: 4 bytes

- 1) Center Frequency (Highest Byte)⁶⁰⁴
- 2) Center Frequency
- 3) Center Frequency
- 4) Center Frequency (Lowest Byte)

Cell Master Returns: 1 byte

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

⁶⁰³ 0 – Spectrum View, 1 – Frame View, 2 – Slot View

⁶⁰⁴ Frequency in Hz

Set GSM Power Units – Control Byte # (A105h)

Description: Sets the Units for GSM Mode dBm or Watts

Bytes to Follow: 1 bytes

- 1) Units⁶⁰⁵

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

Set CDMA / EVDO Frequency– Control Byte # (A401h)

Description: Sets Frequency in Hz for CDMA / EVDO Modes

Bytes to Follow: 4 bytes

- 1) Frequency (Highest Byte)
- 2) Frequency
- 3) Frequency
- 4) Frequency (Lowest Byte)

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

Set CDMA/EVDO Scale– Control Byte # (A402h)

Description: Sets Scale for CDMA CDP or the EVDO CDP and Spectrum (Valid Values between 1 & 15)

Bytes to Follow: 1 byte

- 1) Scale

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

⁶⁰⁵ 0 – dBm, 1 - Watts

Set CDMA/EVDO Units– Control Byte # (A407h)

Description: Sets Units for power measurement displays

Bytes to Follow: 1 byte

- 1) Units⁶⁰⁶

Cell Master Returns: 1 byte

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

Set CDMA /EVDO Power Offset – Control Byte # (A408h)

Description: Sets the power offset

Bytes to Follow: 4 bytes

- 1) Power Offset (Highest Byte)⁶⁰⁷
- 2) Power Offset
- 3) Power Offset
- 4) Power Offset (lowest byte)

Cell Master Returns: 1 byte

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

Set CDMA/EVDO Display Type– Control Byte # (A409h)

Description: Sets the power offset

Bytes to Follow: 1 byte

- 1) Display Type⁶⁰⁸

Cell Master Returns: 1 byte

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

⁶⁰⁶ 0 – dBm, 1 - Watts

⁶⁰⁷ Offset in dB * 1000 + 270,000

⁶⁰⁸ CDMA Modes - 1 – Text Only, 2 – CDP, 3 – Over the Air Measurements, 4 – RF Spectrum
EVDO Mode – 0 – CDP MAC, 1 – CDP Data, 2 – Text Only, 3 – OTA, 4 – RF Idle, 5 – RF Active

Set CDMA /EVDO PN Offset– Control Byte # (A40Ah)

Description: Sets the PN Offset

Bytes to Follow: 4 bytes

- 1) PN Offset (Highest Byte)⁶⁰⁹
- 2) PN Offset
- 3) PN Offset
- 4) PN Offset (Lowest Byte)

Cell Master Returns: 1 byte

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

Set CDMA Walsh Codes– Control Byte # (A40Bh)

Description: Sets the Radio Config

Bytes to Follow: 1 byte

- 1) Walsh Codes⁶¹⁰

Cell Master Returns: 1 byte

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

Set CDMA PN Search Length– Control Byte # (A40Dh)

Description: Sets the PN Search length

Bytes to Follow: 4 bytes

- 1) PN Search length (Highest Byte)⁶¹¹
- 2) PN Search length
- 3) PN Search length
- 4) PN Search length (Lowest Byte)

Cell Master Returns: 1 byte

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

⁶⁰⁹ Untriggered if Bit 7 of Byte 2 is 1, External Trigger if Bit 3 of Byte 2 is 1, otherwise GPS triggered. External Auto / GPS Auto if Bit 1 of Byte 3 is 1. PN Offset for Manual modes is sent in Byte 1 and bit 0 of Byte 2

⁶¹⁰ 1 – 64 , 2 – 128

⁶¹¹ Valid Values between 1 & 12

Set CDMA /EVDO Measurement Speed– Control Byte # (A40Eh)

Description: Sets the Measurement Speed

Bytes to Follow: 1 bytes

- 1) Measurement Speed⁶¹²

Cell Master Returns: 1 byte

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

Set CDMA/EVDO Trigger Polarity– Control Byte # (A40Fh)

Description: Sets the Trigger Polarity

Bytes to Follow: 1 byte

- 1) Trigger Polarity⁶¹³

Cell Master Returns: 1 byte

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

Set CDMA PN Increment– Control Byte # (A411h)

Description: Sets the PN Increment

Bytes to Follow: 1 byte

- 1) PN Increment

Cell Master Returns: 1 byte

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

⁶¹² Valid Values 1 – Fast, 2 – Normal, 3 - Slow

⁶¹³ 1 – Rising Edge, 0 – Falling Edge

Set EVDO Data Modulation Type– Control Byte # (A412h)

Description: Sets the Data modulation Type to either Auto Measure, QPSK, 8-PSK or 16-QAM

Bytes to Follow: 1 byte

- 1) Data Modulation Type⁶¹⁴

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

GPS Power – Control Byte #237 (EDh)

Description: Turn On/Off power of GPS module.

Bytes to Follow: 1 bytes

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

Cell Master Returns: 1 byte

255 (FFh) Operation Complete Byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

Read GPS Position – Control Byte #238 (EEh)

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

Bytes to Follow: nothing

Cell Master Returns: 13 byte (if Ok)

1-2) Number of satellites in use (< 3 if not locked)

3-6) GPS Position – Latitude (long integer)⁶¹⁵ (= -1 if not valid)

7-10) GPS Position – Longitude (long integer) (= -1 if not valid)

11-12) GPS Position – Altitude (short integer) (= -30000 if not valid)

13) 255 (FFh) Operation Complete Byte

Error code : 1 byte

224 (E0h) Parameter Error

238 (EEh) Time Out Error

⁶¹⁴ 0 – Auto, 1 – QPSK, 2 – 8-PSK, 4 – 16-QAM

⁶¹⁵ Signed long integer is used to represent latitude and longitude. Positive latitude means North hemisphere, negative latitude means South hemisphere; Positive longitude means East hemisphere, negative longitude means West hemisphere. Degree = $\text{int}(\text{abs}(\text{value})/1,000,000)$; Minute = $(\text{float})(\text{abs}(\text{value})\%1,000,000)/10,000$

Automatic Cal Disable – Control Byte #240 (F1h)

Description: Disable automatic calibration.

Bytes to Follow: 1 byte

- 1: to disable automatic calibration
- 0: to enable automatic calibration

Cell Master Returns: 1 byte

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

Set Frequency in CW GENERATOR MODE - CODE WORD(A801H0)

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

Bytes to Follow: 4 bytes

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

Cell Master Returns: 1 byte

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

Retrieve Power in CW GENERATOR MODE - CODE WORD(A802H0)

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

Bytes to Follow: 0 bytes

Cell Master Returns: 5 bytes

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

Parameter Definitions

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

Programming Examples

This section contains several sample functions written in C, (and one in Visual Basic) that can be used as references when programming the Anritsu Handheld Products. These include functions to set up the comm Port, enter and exit remote mode and set the reference level of the spectrum analyzer.

Examples in C:

```

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

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

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

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

/*****
/*   unsigned char SetSPAScale(unsigned long ReferenceLevel,   */
/*                               unsigned long dBScale, BYTE *ResponseBytes) */
/*   Description: This function implements control byte #101, Set */
/*               Spectrum Analyzer Scale.  It sets the spectrum */
/*               analyzer reference level and scale (dB/div).     */
/*   Inputs  :   RefLevel = reference level value               */
/*               dBScale = scale value                          */
*****/

```

```

/*          NOTE: This function assumes the values have          */
/*          already been checked to fall in the valid range      */
/*          and scaled according to the formulas in the          */
/*          Programming Manual.                                   */
/*          ResponseBytes = pointer to an array of bytes at      */
/*          least 1 element long (1 byte is expected in         */
/*          response to the Set Spectrum Analyzer Scale          */
/*          command).                                           */
/* Returns:  SUCCESS if the values are set                       */
/*          FAILURE if the command fails                         */
/*          Response bytes are returned in the variable         */
/*          ResponseBytes.                                       */
/*****/
unsigned char SetSPAScale(unsigned long RefLevel,
                          unsigned long dBScale, BYTE *ResponseBytes)
{
    BYTE *SendScalePointer;          // Data to send
    BYTE SendBytes[9];
    BYTE SerialCommand;

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

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

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

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

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

    // Expecting 1 byte back (give the unit 5 seconds to respond):
    // 0xFF = success
    // 0xE0 = parameter failure (invalid value)
    // 0xEE = time-out (insufficient # of bytes received by SPA)
    if(!ReadFromPort(1, ResponseBytes, 5))
    {
        return FAILURE;
    }
    else
    {
        if ( *ResponseBytes != 0xFF )
        {
            return FAILURE;
        }
        else
        {
            return SUCCESS;
        }
    }
}

```

```

    }
} /* SetSPAScale */

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

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

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

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

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

```

```

/*          parm2 - 4 byte unsigned long integer          */
/* Returns:  SUCCESS if the unit is in remote mode      */
/*          FAILURE if the command fails                */
/*          The resulting bytes are returned in the     */
/*          memory location pointed to by ByteData. This */
/*          location must have at least 8 empty bytes.  */
/*****/
void Get8Bytes(unsigned long parm1, unsigned long parm2,
               BYTE* ByteData)
{
    // MSB of 1st parameter
    *ByteData = (BYTE)((parm1 & 0xFF000000)>>24);
    *(ByteData+1) = (BYTE)((parm1 & 0x00FF0000)>>16);
    *(ByteData+2) = (BYTE)((parm1 & 0x0000FF00)>>8);
    // LSB of 1st parameter
    *(ByteData+3) = (BYTE)(parm1 & 0x000000FF);

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

/*****//**
    BOOL OpenCommunications(int ComPort, int ComBaud)    */
/* Description : This function is to Open the communication port */
/* and set the port settings                                */
/* Inputs :      int - ComPort- entered as a command line argument */
/*              int - ComBaud- The Baud rate for Communication      */
/* Returns:     SUCCESS - If the-Communication link was established*/
/*             FAIL - IF the-e was an error opening the COM Port  */
/*****//**
BOOL OpenCommunications(int ComPort, int ComBaud)
{
    DCB      CommSettings; // Structure with COM Port settings
    LPCTSTR ComPortNumber; // Pointer to the COM port number
    BOOL PortReady;        // Return val after setting the COM Port
    COMMTIMEOUTS timeout;  // Structure with Time out values

    switch (ComPort)
    {
    case '1':
        C`m'ortNumber = "COM1";
    " bre"k;
    case '2':
        C`m'ortNumber = "COM2";
    " bre"k;
    case '3':
        C`m'ortNumber = "COM3";
    " bre"k;
    case '4':
        C`m'ortNumber = "COM4";
    " bre"k;

```

```

default:
    CloseHandle(ComHandle);
    fclose(fp);
    exit(0);
    break;
}

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

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

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

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

/* This is Used to Update the CommSettings Structure Variables*/
// Setting the Baud Rate
switch (ComBaud)
{
    case '1':
        \o'mSettings.BaudRate = CBR_9600; // rate - 9600
        -break;
    case '2':
        \o'mSettings.BaudRate = CBR_19200; // rate - 19200
        - break;
    case '3':
        \o'mSettings.BaudRate = CBR_38400; // rate - 38400
        - break;
}

```

```

        case '4':
            \o'mSettings.BaudRate = CBR_56000; // rate - 56000
-       break;
        case '5':
            \o'mSettings.BaudRate = CBR_115200; // rate - 115200-
break;
        default:
            CommSettings.BaudRate = CBR_9600; //Default - 9600
-       break;
    }

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

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

    PortReady = SetCommState (ComHandle, &CommSettings);

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

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

    /* Sets the communication timeouts
    Syntax -
        BOO- SetCommTimeouts(
            HANDLE hFile, // handle to comm dev omm.
    LPCOMMTIMEOUTS lpCommTimeouts /* pointer to comm tim omm.t structure */
        );
    */
    SetCommTimeouts(ComHandle, &timeout);

    if(PortReady)

```

```

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

```

Example in Visual Basic

```

Private Sub cmdSetBaudRateSM_Click()
    Dim ChangeBaudSerialCmd As Integer
    Dim BaudRate As Integer
    Dim strInputBuf As Variant
    Dim PreviousSettings As String

    PreviousSettings = commCtrl.Settings

    'Check t`at we`re in remote and have selected a baud rate
    If CheckInitialConditions(True, False, True) = False Then
        GoTo SetSMBaud_err_handler
    End If

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

    Delay (300)

    'Change `he Baud setting for the application also
    If BaudRate = 0 Then
        commCtrl.Settings = "9600,n`,`1"
    El`eIf BaudRate = 1 Then
        commCtrl.Settings = "19200,n`8,1"
    El`eIf BaudRate = 2 Then
        commCtrl.Settings = "38400,n`8,1"
    El`eIf BaudRate = 3 Then
        commCtrl.Settings = "56000,n`8,1"
    El`eIf BaudRate = 4 Then
        commCtrl.Settings = "115200`,`8,1"
    El`e
        'Box wil` fail, set back to 9600.
        commCtrl.Settings = "9600,n`,`1"
    En` If

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

```



```

""      MsgBox "Invalid" Baud Rate - NO STR-NG"
      " GoTo SetSMBaud_err_handler
End If

If Asc(strInputBuf) = 255 Then
  MsgBox "Set Bau" Rate Successfully"
El"eIf Asc(strInputBuf) = 238 Then
  MsgBox "SiteMas"er Timed out"
  " GoTo SetSMBaud_err_handler

ElseIf Asc(strInputBuf) = 224 Then
  MsgBox "Invalid" Baud Rate - ERR 22-"
  " GoTo SetSMBaud_err_handler
Else
  MsgBox "Invalid Baud Rate - ERR " + CStr(Asc(strInputBuf))
  GoTo SetSMBaud_err_handler

End If

Exit Sub
SetSMBaud_err_handler:
  commCtrl.Settings = PreviousSettings
End Sub

```

Revision History

| Date | Manual Section Name /Command Name | Change Description |
|-------------|--|---------------------------|
| 4/15/05 | Manual Revision A (10580-00106A.pdf) | Initial release |
| 2/6/06 | Manual Revision B (10580-00106B.pdf) | Revision |
| 6/29/06 | Manual Revision C (10580-00106C.pdf) | Revision |
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