

Interface Specification

CRM4250/4200

Cellular Radio Module

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Cellular Radio Module

CRM4250/4200

1.0. SYSTEM OVERVIEW

The Standard Communications CRM4250/4200 Cellular Radio Module is part of a two-piece solution for wireless data communications. The CRM4250/4200 unit is used in conjunction with a separate modem unit to provide a complete solution. This architecture allows use of multiple radio and other media interface modules with a common multi-standard modem unit.

2.0 GENERAL DESCRIPTION

The CRM4250/4200 contains all of the functional elements of a complete cellular telephone with the exception of the user interface and the battery. The unit includes a complete receiver and transmitter; plus, a micro controller and other circuitry to allow the unit to efficiently interface to an external modem unit.

3.0. INTERFACE SPECIFICATION

3.1 General

The CRM4250/4200 interface is designed to allow simple interfacing between various modems and radio modules. It is designed to be hardware and standard independent on both the radio and the modem sides of the interface. This interface has been submitted to the PCMCIA committee for adoption as an extension to the PCMCIA modem card auxiliary connector standard.

The interface command set includes operating modes to support many different radio system standards. At present, the standards defined for the interface include AMPS cellular telephone. Products utilizing this interface may support one or more of these operating modes and will have the ability to query the personality of a given module and to set the operating mode of a multiple mode module.

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3.2 Physical

The host interface to the CRM4250/4200 is implemented using a 20 pin (2x10) header connector. It provides all connections between the CRM4250/4200 and the base band controller and/or data modem.

<u>PIN</u>	<u>SMBOL</u>	<u>I/O</u>	<u>DESCRIPTION</u>
1,2	GND	GND	Ground.
3	SPKR OUT	O	High Power Audio (Ear/Speaker)
4	LINE A	O	RX demodulated signal (+) +/-8.0kHz deviation input will produce 1 volt p-p output signal (variable level with 99h command) for modem use.
5	SPKR OUT	O	High Power Audio (Ringer).
6	LINE IN	I	TX modulation (+) 1 volt p-p signal, will produce +/-8.0kHz deviation. Single-ended input (600 ohm)
7	LINE B	O	Fixed -18dBm modem audio output.
8	MIC	I	Microphone audio input. Can be directly connected to 600 ohm impedance microphone or Electric type microphone.
9,10	VCC	PWR	(CRM4200 ONLY) +5 VDC supply input. Requires a minimum available current of 750mA. (DO NOT CONNECT IF CRM4250)
11	reserved	-	Do not connect.
12	RSSI	O	Receive signal strength indication. Varying DC voltage output based on received signal strength.
13,14	VCC	PWR	(CRM4250 ONLY) +12VDC supply input Requires a minimum available current of 1.2 amps. (DO NOT CONNECT IF CRM4200)

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PIN	SMBOL	I/O	DESCRIPTION continued.
15	RXD	I	Control serial data RX. TTL/CMOS compatible levels.
16	TXD	O	Control serial data TX. TTL/CMOS compatible levels.
17	PROGRAM	I	Do not connect. Reserved for production.
18	AUXA	I/O	Reserved for customer applications.
19	AUXB	I/O	Reserved for customer applications.
20	GND	GND	Ground.

Note: Portions of this physical interface specification are in the process of being redefined. Contact the factory for latest status or for special requirements.

3.3 Electrical

3.3.1 Serial Control Link

Tx Data: TTL / CMOS logic level signal output for data from radio to host
 Rx Data: TTL / CMOS logic level signal input for data from host to radio
 Handshake: none, handshakes implemented in s/w only

3.4. Serial Data Format

type: asynchronous, full duplex
 word format: 1 start, 8 data, 1 parity and 1 stop bit
 parity: even
 bit rate: 9600 baud

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4.0 SERIAL CONTROL PROTOCOL

4.1. Packet Structure

```

/      control field      /      data field      /
| SOF | byte count | command | data 1 | ... | data n | FCS |

```

Where:	SOF	Start Of Frame, hex value 02 (STX)
	byte count	One byte value indicating the total number of bytes in the packet, except the SOF.
	command	One byte value representing the command/message type being transmitted
	data	argument or data for the command or message
	FCS	checksum; the two's complement of the lower 8-bits of the sum of the binary values of all of the bytes in the packet except the SOF and FCS.

4.2. Data Transparency

Byte stuffing is used to reduce the probability of errors in frame synchronization. An STX (02 hex) byte in the control or data fields of the packet, without byte stuffing, could cause loss of frame synchronization. Byte stuffing applies only to the data and control fields.

Prior to transmission of a packet, a DLE (10 hex) byte will be inserted prior to every STX (02 hex) or DLE byte. The stuffed DLE byte is counted as a valid byte in determining both in the LEN byte count and the FCS.

Once all the byte stuffing has been completed, the LEN byte needs to be compared against the DLE. For the special case when the LEN byte is equal to a DLE 10h, the LEN byte is incremented by one and a DLE inserted between the SOF and LEN.

Example of a LEN of 10h:

```

SOF  DLE  LEN  CMD  ....  FCS
02h  10h  11h  76h

```

Note: Do Not DLE the FCS byte.

4.3. Message Flow

step 1 - Command / message transmitted (either direction)

step 2 - Destination processor immediately sends ACK/NAK to acknowledge receipt of packet. (If required for command received.)

note: If necessary, destination processor initiates response message when requested command is complete and/or requested data is available.

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COMMAND NAME	CMD	Data Len HTR / RTH	Radio Mode	ACK REQ	Page
ACK	00	0	ALL	NO	9
Initialize Radio Mode	01*(56)	1	ALL	YES	9
Set MIN	07	5	TEST	YES	10
Set SID	09	2	TEST	YES	10
Set Baud / Parity	0B	2	TEST	YES	10
Dial	21	16	AMPS	YES	11
Answer	22	0	AMPS	YES	12
Disconnect	23	0	AMPS	YES	12
Key Flash	24	16	AMPS	YES	12
System Info Query/Response	25	0/5	ALL	YES	13
Reset Radio	41	0	ALL	YES	13
Radio power on/Response	45	/0	ALL	NO	14
RSSI Query/Response	52	0/1	ALL	YES	14
Self Test (CAL) / Response	55	0/1	TEST	YES	15
Initialize Radio Mode	56 (01)	1	ALL	YES	15
Request Firmware Revision	57	0/2	ALL	YES	16
Test mode	58	1	ALL	YES	16
Battery Level Query	59	0/1	ALL	YES	17
Battery level update	5A	/1	ALL	YES	17
ID Info Query/Response	73	0/11	TEST	YES	18
System A/B Select	74	1	ALL	YES	19
Service Status Query	89	0/7	ALL	YES	19
Service Unavailable	90	/0	AMPS	YES	20
Service Available	91	/0	AMPS	YES	21
Ring	92	/0	AMPS	YES	21
Call connected	93	/0	AMPS	YES	21
Call Failure	94	/0	AMPS	YES	22
Call Terminated (remote)	95	/0	AMPS	YES	22
Handoff started	96	/0	AMPS	YES	22
Handoff completed	97	/0	AMPS	YES	22
Call Terminated (signal loss)	98	/0	ALL	YES	23
Volume Control	99	1	ALL	YES	23
Load Authentication A-key	B0	26/1	TEST	YES	23
Enable / Disable Authentication	B2	1	ALL	YES	24
Set Negative SID	C8	3	TEST	YES	23
Req Negative SID	C9	1/3	ALL	YES	24
Not supported	FE	0	ALL	NO	25
NAK	FF	0	ALL	NO	25

* This command is subject to future removal
 Commands Are Not Supported, but will be in future revisions

Data Length

(HTR) Direction Host to Radio
 (RTH) Direction Radio to Host

Radio Mode

(AMPS) AMPS Data / AMPS Voice

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6.0. DETAILED COMMAND DESCRIPTIONS**6.1. Labeling conventions for syntax:**

SOF = "start of frame" flag. Sent as 02 hex.

LEN = length of packet, in bytes.

FCS = "checksum" calculated as described in section 4.1

6.2. General Commands

Commands/messages listed in this section can be used under any operating mode. They include commands/messages for general flow control, selection and control of operating mode and general radio control.

00H Command ACK

This message is sent to acknowledge receipt of a command or message. Transmission of an ACK only indicates successful reception of a supported command, if data or other response is required, it will be sent in a separate message. An ACK must be received within 100ms of reception of a packet, otherwise the packet will be assumed lost and a retry will be attempted. While waiting for reception of an ACK message, any new messages must be held until the current message has been successfully acknowledged. After three unsuccessful retry attempts, an error condition should be declared and appropriate error recovery procedures initiated.

Direction: either
 Syntax: | SOF | LEN | 00H | FCS |
 ACK required: NO

01H Command Initialize Radio Mode.

This command is used to select the operating mode of the radio. The appropriate value/bit is set in the data word to identify the selected mode.

Direction: Host to radio
 Radio Mode: ALL
 Syntax: | SOF | LEN | 01H | aa | FCS |

Where: aa = 01H AMPS voice (MIC Input PIN 8)
 aa = 02H Amps Data mode (LINE IN Input PIN 6)
 See Command 58H for Entering Test Mode
 ACK required: YES

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CRM4250/4200**07H Command Set MIN.**

This command is used to set the cellular phone number (MIN) of the radio. This parameter is normally set at the time of cellular service activation by the equipment or service provider.

Direction: Host to radio
Radio Mode: TEST
Syntax: | SOF | LEN | 07H | aa aa aa aa aa | FCS |

Where: aa aa aa aa aa = 5 bytes containing MIN nibble packed BCD
example: (800) 555-1212 = '80 05 55 12 12'

ACK required: YES

09H Command Set SID.

This command is used to set the home system ID (SID) corresponding to the cellular phone number. This parameter is normally set at the same time of the cellular phone number (MIN) is programmed into the radio.

Direction: Host to radio
Radio Mode: TEST
Syntax: | SOF | LEN | 09H | aa aa | FCS |

Where: aa aa = SID hex value (sent MS byte first)

ACK required: YES

Note: The SID as provided from the cellular carrier is usually in decimal format. Converting this to hex is required.

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Cellular Radio Module**CRM4250/4200****0BH Command Set Serial Communication Baud Rate**

This command is used to set the baud rate and serial format on the serial control interface of the radio.

Direction: Host to radio
 Mode: TEST
 Syntax: | SOF | LEN | 0BH | aa bb | FCS |

Where: aa: 0 = 9600
 1 = 4800
 2 = 2400
 3 = 1200
 4 = 300
 bb: 0 = 8 bits, no parity
 1 = 8 bits, even parity

Warning: After this command is issued, the ACK message will be sent, and then the new data rate and serial format will take effect immediately.

Usage: By sending this command to the radio, the signaling between the host and the radio data rate can be changed.

Storage: Non-volatile.
 Factory default: 9600, 8 bits, even parity

21H Command Dial - send.

This command is used to place a cellular call. It is the equivalent of dialing the number and pressing SEND on a cellular telephone.

Direction: Host to radio
 Radio Mode: AMPS
 Syntax: | SOF | LEN | 21H | <number> | FCS |

Where: <number> = 16 byte string containing phone number to be dialed (in 4 bit binary format), padded to end with NUL characters

NUL = 0 hex * = B hex
 Number 0 = A hex # = C hex

ACK required: YES

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22H Command Answer.

This command is used to answer an incoming call.

Direction: Host to radio
 Radio Mode: AMPS
 Syntax: | SOF | LEN | 22H | FCS |
 ACK required: YES

23H Command Disconnect

This command will terminate a call in process. It is equivalent to pressing the END key on a cellular telephone.

Direction: Host to radio
 Radio Mode: AMPS
 Syntax: | SOF | LEN | 23H | FCS |
 ACK required: YES

24H Command Key flash

This command is used to send the equivalent of a hook or key flash to the telephone network. This is used in some systems to access call waiting or other custom features.

A simple flash message is sent with either a null string or the last number dialed in the number field. A second call (for 3-way dialing) is initiated by sending a flash message with the new number to be dialed in the number field.

Direction: Host to radio
 Radio Mode: AMPS
 Syntax: | SOF | LEN | 24H | <number> | FCS |

Where: <number> =16 byte string containing phone number to be dialed (in 4 bit binary format), padded to end with NUL characters

NUL = 0 hex * = B hex
 Number 0 = A hex # = C hex

ACK required: YES

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25H Command Current Information Query

Direction: Host to radio
 Radio Mode: ALL
 Syntax: | SOF | LEN | 25H | FCS |
 ACK required: YES

25H Command Current Information Response

Direction: Radio to host
 Radio Mode: ALL
 Syntax: | SOF | LEN | 25H | aa bb bb cc cc | FCS |

Where: aa = radio mode (04=Data Mode, 10=Voice Mode)
 bb bb = current channel (MS byte first)
 cc cc = current RSSI reading (MS byte first)

ACK required: YES

41H Command Reset Radio

Initiates a 'reboot' of processor on radio. Result of a proper reset will be transmission of a 'ready' (45h) message.

Direction: Host to radio
 Radio Mode: ALL
 Syntax: | SOF | LEN | 41H | FCS |
 ACK required: NO

45H Command Radio Power ON Response

This command is sent instructing the radio's controller to turn power on to the radio portion of the board.

Direction: Radio to host
 Syntax: | SOF | LEN | 45H | FCS |
 ACK required: NO

Some Applications have been not waiting long enough to receive this command and mistakenly detecting a boot up sequence error. Ensure future revision compatibility the application should wait up to 5 Seconds before giving up on the Power On Response command.

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CRM4250/4200**52H Command RX signal level (RSSI) Query**

This command is used to get the current strength of the base station signal seen by the receiver.

Direction: Host to radio
Radio Mode: All
Syntax: | SOF | LEN | 52H | FCS |
ACK required: YES

52H Command RX Signal Level (RSSI) Response

This message is sent in response to a RSSI Query command. It provides the signal strength measurement as an unsigned integer value.

Direction: Radio to host
Syntax: | SOF | LEN | 52H | aa | FCS |

Where: aa = RSSI value
RSSI value equals 0 when signal is -114 dBm. Value increases by one for each dB increase in signal strength.

ACK required: YES

55H Command Run Self Test. (CAL)

This command is used to initiate a self test of the radio. The resulting Self Test Result message will provide a pass-fail indication of the test result.

Direction: Host to radio
Radio Mode: TEST
Syntax: | SOF | LEN | 55H | FCS |
ACK required: YES

Self-Test 55h will no longer verify the non-volatile memory by writing and reading to all address locations. This was done to reduce the risk of corrupting the Non-Volatile (EEPROM) memory when power is removed during the Self-Test. Self-Test typically took 1.5 seconds now is completed in under 10 ms. The Non-volatile memory can still be verified using the Hardware Test Command DEh and Hardware Failure DFh.

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CRM4250/4200**55H Command Self test result.**

This message is sent in response to the Run Self Test command. The data provided is a simple pass-fail indication of the test result.

Direction: Radio to host
Syntax: | SOF | LEN | 55H | aa | FCS |

Where: aa = 1 byte of result data.. 0 = pass, 1 = fail

ACK required: YES

56H Command Initialize Radio Mode.

This command is used to select the operating mode of the radio. The appropriate value/bit is set in the data word to identify the selected mode.

Direction: Host to radio
Radio Mode: All
Syntax: | SOF | LEN | 56H | aa | FCS |

Where: aa = 02H CDPD mode
= 04H AMPS data mode
= 10H AMPS voice mode

ACK required: YES

57H Command Software Revision Query (ENQ)

Direction: Host to radio
Mode: All
Syntax: | SOF | LEN | 57H | FCS |

Usage: The polling message is used to determine the firmware revision of the radio.

ACK required: YES

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CRM4250/4200**57H Command Software Revision Query (ENQ) Response**

Direction: Radio to host
Syntax: SOF | LEN | 57H | aa aa | FCS |

Where: aa = XX.XX version in hex format

Usage: The SW revision response message is sent in response to a query message from the host.

58H Command Test Mode

This command is used to place the radio into test mode.

Direction: Host to radio
Mode: All
Syntax: | SOF | LEN | 58H | aa | FCS |

Where: aa = test mode byte
bit 0 Disable Tx timeout
bit 1 reserved
bit 2 reserved
bit 3 reserved
bit 4 reserved
bit 5 reserved
bit 6 reserved
bit 7 reserved

ACK required: YES

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CRM4250/4200**59H Command Battery Level Query**

This command is used to get the current reading of the battery level.

Direction: Host to radio
Mode: All
Syntax: | SOF | LEN | 59H | FCS |
ACK required: YES

59H Command Battery Level Response

This message is sent in response to a Battery Level Query command. It provides the battery level measurement as a percentage value.

Direction: Radio to host
Syntax: | SOF | LEN | 59H | aa | FCS |

Where: aa = Battery level (00-64H corresponding to 0-100%)

ACK required: YES

Note: Command Removed in Revision V00.37

5AH Command Battery level update

This message is sent automatically when the battery level drops below 5%.

Direction: Radio to host
Syntax: | SOF | LEN | 5A | aa | FCS |

Where: aa = Battery level value (00-64H corresponding to 0-100%)

ACK required: NO

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73H Command ID Information Request.

This command is used to read the current configuration and identity information from the radio. The result will be an ID Information Response message.

Direction: Host to radio
 Mode: All
 ACK required: YES
 Syntax: | SOF | LEN | 73H | FCS |
 ACK required: YES

73H Command ID Information Response.

This message is sent in response to an ID Information Request command.

Direction: Radio to host
 Syntax: | SOF | LEN | 73H | aa aa aa aa bb bb bb bb bb cc cc dd ee ff | FCS |

Where: aa .. aa = ESN (Set by Manufacture)
 bb .. bb = MIN (See Command 07h)
 cc cc = SID in hex format (See Command 09h)
 dd = System preference
 (See Command 74h System A/B Select)
 ee = Reserved
 ff = Reserved

ACK required: YES

74H Command System A/B select.

This command is used to set the criteria for accessing the two sides of the cellular network.

Direction: Host to radio
 Mode: All
 Syntax: | SOF | LEN | 74H | aa | FCS |

Where: aa = 00H - for system B only
 = 01H - for system A only
 = 02H - for normal mode
 (preferred system determined by SID)
 = 03H - for Home only

ACK required: YES

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Cellular Radio Module**CRM4250/4200****89H Command Service Status Query**

This message is originated by the host in order to confirm the availability of cellular service.

Direction: Host to radio
 Mode: All
 Syntax: | SOF | LEN | 89H | FCS |

Usage: This command is used by the host to determine if service is available before initiating a 'send' command. It can also be used for monitoring the integrity of the cellular service.

89H Command Service Status Response

This message is sent to the host in response to a Service Status Query.

Direction: Radio to host
 Mode: All
 Syntax: | SOF | LEN | 89H | aa aa bb bb cc dd ee FCS |

Where: aa aa = current received system SID in hex format
 (or 0 = no service available)
 bb bb = current channel (MS byte first)
 cc = current RSSI reading
 dd = Reserved
 ee = Radio Service Status

- bit 0 Reserved Value could be 0 or 1
- bit 1 Authentication Enabled
- bit 2 Carrier is capable of handling Authentication
- bit 3 Reserved
- bit 4 Reserved
- bit 5 Reserved
- bit 6 Reserved
- bit 7 Reserved
-

Usage: This message is an automatic response to the Service Status Query command.

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90H Command Service unavailable.

This message is originated by the radio whenever there is a loss of available service. When service becomes available, or if alternate service is determined to be available, a new service available message will be sent.

Direction: Radio to host
 Syntax: SOF | LEN | 90H | FCS |
 ACK required: YES

91H Command Service available / service status.

This message is originated by the radio whenever there is a change in the service available status (except no service). The status bit(s) are set to indicate the new service status.

Direction: Radio to host
 Syntax: | SOF | LEN | 91H | aa bb bb cc | FCS |

Where: aa = service status
 bit 0 - Roam
 bit 1 - System A/*B (0 = B, 1 = A)
 bit 2-7 - reserved
 bb bb = current received SID (MS byte first)
 cc = Authentication Status
 bit 0 - Network Supports Extended Protocol
 bit 1 - Radio is using Authentication
 bit 2 - Network Supports Authentication
 bit 3-7 - reserved

ACK required: YES

92H Command Ring.

This message is originated by the radio upon notification from the base station of an incoming call. It is automatically re-sent every five (5) seconds until the call is either: 1) answered; 2) terminated by the caller; or 3) 65 seconds has passed since notification of the incoming call.

Direction: Radio to host
 Syntax: | SOF | LEN | 92H | FCS |
 ACK required: YES

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93H Command Call established.

This message is originated by the radio when an attempt to place a call has been successful. This message only indicates successful connection to the cellular system, not to the final calling destination.

Direction: Radio to host
Syntax: | SOF | LEN | 93H | FCS |
ACK required: YES

94H Command Call failure indication (CFI).

This message is originated by the radio when an attempt to place a call is unsuccessful.

Direction: Radio to host
Syntax: | SOF | LEN | 94H | FCS |
ACK required: YES

95H Command Call terminated (remote)

This message is originated by the radio whenever an established call is terminated by the base station without a hang up command. This message is also sent when a ringing incoming call is terminated at the origin before the 65 second timeout.

Direction: Radio to host
Syntax: | SOF | LEN | 95H | FCS |
ACK required: YES

96H Command Handoff pending.

This message is originated by the radio whenever it receives a handoff or frequency change order from the base station. This is to notify the modem that the data carrier and data flow will be temporarily interrupted during the change.

Direction: Radio to host
Syntax: | SOF | LEN | 96H | FCS |
ACK required: YES

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CRM4250/4200**97H Command Handoff complete**

This message is originated by the radio after a frequency change when communication with the base station has been successfully established.

Direction: Radio to host
Syntax: | SOF | LEN | 97H | FCS |
ACK required: YES

98H Command Call terminated (loss of signal).

This message is originated by the radio whenever an established call is terminated by the radio due to loss of signal from the base station for more than 5 seconds.

Direction: Radio to host
Syntax: | SOF | LEN | 98H | FCS |
ACK required: YES

99H Command Volume Control

This command is used to adjust the Radio Volume (amplitude) on output pins of the JL01 Host Interface Connector. If CRM4250/4200 is in AMPS DATA mode, then this command will change the Amplitude of PIN 4 (LINE A). If the Radio mode is any other setting it will change the Amplitude of PIN 3 (SPKR OUT).

Direction: Radio to host
Mode: All
Syntax: | SOF | LEN | 99H | aa | FCS |

Where: aa = Range 00h - 0Fh (0Fh is Max. Value)

ACK required: YES

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CRM4250/4200**B0H Command: Load Authentication A-key**

Direction: Host to radio
Mode: Test
Syntax: | SOF | LEN | B0H | aa aa aa aa aa aa aa aa aa aa bb bb bb | FCS |

Where: aa = 20 Digit A-key
bb = 6 Digit A-key Checksum
Values are Nibble Packed Decimal

Usage: Sets Amps Mode Authentication A-key Value. A-Key is provided by the Amps Service provider.

B0H Command: Load Authentication A-key Response

Direction: Radio to host
Syntax: | SOF | LEN | 99H | aa | FCS |

Where: aa = Results,
00h Valid A-key Entered
FFh Invalid A-key Entered

B2H Command: Set Authentication

Direction: Host to radio
Mode: All
Syntax: | SOF | LEN | B2H | aa | FCS |

Where: aa = Zero Value Disables Authentication
Non-Zero Value Enables Authentication

Usage: Works with Amps Authentication Only

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Cellular Radio Module**CRM4250/4200****C8H Command Set Negative SID**

Direction: Host to radio
 Mode: Test
 Syntax: | SOF | LEN | 73H | aa | bb cc | FCS |

Where: aa = Negative SID slot number 00 or 01
 bb = SID data <byte 1>
 cc = SID data <byte 2>

SID data is sent as 2 consecutive bytes with Byte 1 being the most significant byte of SID, and Byte 2 being the least significant.

Usage: This message is used to identify cellular system IDs that the unit should ignore and not consider service available from.

This feature is intended to prevent units installed in locations near cellular market borders from locking to the wrong system.

There are currently two negative SID slots available (00 and 01).

Storage: Non-volatile.

C9H Command Request NSID

This command will query the radio for its programmed negative SIDs.

Direction: Host to radio
 Mode: AMPS
 Syntax: | SOF | LEN | C9H | aa | FCS |

Where: aa = 00 Negative SID slot 0
 01 Negative SID slot 1

Usage: By using this command the negative SID programmed can be read out to the host controller. The negative SID is a system ID that the unit will ignore so that it cannot lock to it erroneously. Typical usage is where there is a signal presence from two different carriers (A or B side) with different SIDs. The desired SID can be isolated by banning operation on the undesired SID. This example deals with different carriers on the same side (A and A or B and B).

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C9H Command Request NSID Response

This command will query the radio for it's programmed negative SIDs.

Direction: Radio to host
 Mode: AMPS
 Syntax: | SOF | LEN | C9H | aa bb bb | FCS |

Where: aa = 00 Negative SID slot 0
 01 Negative SID slot 1
 bb bb = SID number (i.e. 001Fh = 31d)

Usage: This command response is associated with the NSID query (C9h) FEH Command Unsupported Command Response This message is sent in response to a command or message which is not supported in the current operating mode or by the operating software version.

Direction: either
 Mode: All
 Syntax: | SOF | LEN | FEH | FCS |
 ACK required: NO

FFH Command NAK.

A NAK message is sent when a packet is received with a good checksum (FCS), but that has one or more of the following errors:

- length not acceptable for the given command
- unrecognized byte in the data field

Direction: either
 Mode: All
 Syntax: | SOF | LEN | FFH | FCS |
 ACK required: NO

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7.0 CONTROL MESSAGE FLOW DIAGRAMS

7.1 Initial Power-up Sequence

Upon initial power-up, the unit will execute a basic self-test / initialization routine and, upon successful completion, send out a 'Radio Power On' message. The normal sequence is then to initialize the radio mode (Data, Voice, Diagnostic).

If you select the Voice or Data mode the unit will then attempt to locate cellular service and, if available, will indicate such with a 'Service Available' message.

At this point the unit is ready for normal operation.

Note: You must select one of the three modes upon power up, radio reset or upon receiving the 45h command.

7.2 Power-down Sequence

Normal power-down sequence requires shutting down any call or other connection in process before removing power from the unit.

7.3 Change Operating Mode

The operating mode of the radio can be changed at any time using the set Initialize radio mode command (56h). Care should be taken to insure that any connection established in one mode is terminated (or properly monitored) when changing to an alternate mode.

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8.0 POWER MANAGEMENT

The CRM radio in AMPS mode draws approximately 30-50mA. This is in a state where the CRM is listening to the control channel for pages (incoming calls). If your application does not utilize incoming calls, then the CRM may be switched OFF (VCC remove from pins 9 & 10 (CRM4200) or pins 13 & 14 (CRM4250) to conserve power completely.

During a phone call / conversation, the CRM4250 can draw a nominal 1.0 Amps (3 watts), the CRM4200 can draw a nominal 700mA (600mW). Depending upon how long the call lasts will determine the length of time that the power supply must maintain at least 1.3 Amps for Class I operation (3 watts) or up to 740mA for Class III operation (600Mw). The CRM may be asked by the cellular system to reduce the output power due to the strong RSSI (received signal strength indication) by the cell site during the call. This depends upon the physical location of the CRM to the cell site. In mobile applications the CRM may change power levels several times during a conversation.

Fixed applications usually have consistent power consumption based on the locked location. You should consider worst case scenarios in the event that the CRM is placed in a spot that is located far from the nearest cell or located near the cell site.

When planning a power consumption model the efficiency of the DC regulator needs to be accounted for. For example if the power conversion of the regulator is 75% then the total power draw from the CRM including regulation is used for you calculations.

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