



# ***Integration Guide***

## ***CRM4200***

### ***Cellular Radio Module***

Standard Communications Corp.  
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Torrance, CA 90502

800-767-2831

**Cellular Radio Module****CRM4200****Document Changes:****Date****Document Revision****Details**

**Cellular Radio Module****CRM4200****RF SAFETY WARNING**

***This device and associated antenna must be installed in a location at least 20cm from the body of the user or other nearby persons in order to comply with the FCC RF exposure guidelines.***

The above warning must be included in the user documentation of the final product that these modules are incorporated into. A warning label must also be included on the exterior of the device.

**WARNING**

While this device is in operation, a separation distance of at least 20 centimeters must be maintained between the radiating antenna and the body of all persons exposed to the transmitter in order to meet the FCC RF exposure guidelines.

**-IMPORTANT!!**

***Performance and compliance with FCC rules are heavily influenced by final packaging and antenna configuration of the end-product. Installations not complying with the 20cm minimum separation requirement, using substantially different antenna configurations from those described herein, or utilizing operating voltages outside of the normal specifications must be evaluated for compliance with FCC Rules and RF exposure requirements. Responsibility for compliance of the final product is the responsibility of the end-product manufacturer. For Co-location issue please refer to page 10.***

Refer to the following resources for additional information regarding FCC rules and RF Safety Guidelines for this type of devices:

47CFR Part 22 Subpart H

47CFR Part 1.1307 – 1.1310

47CFR Part 2.1091

Federal Communications Commission (FCC) Primary website:

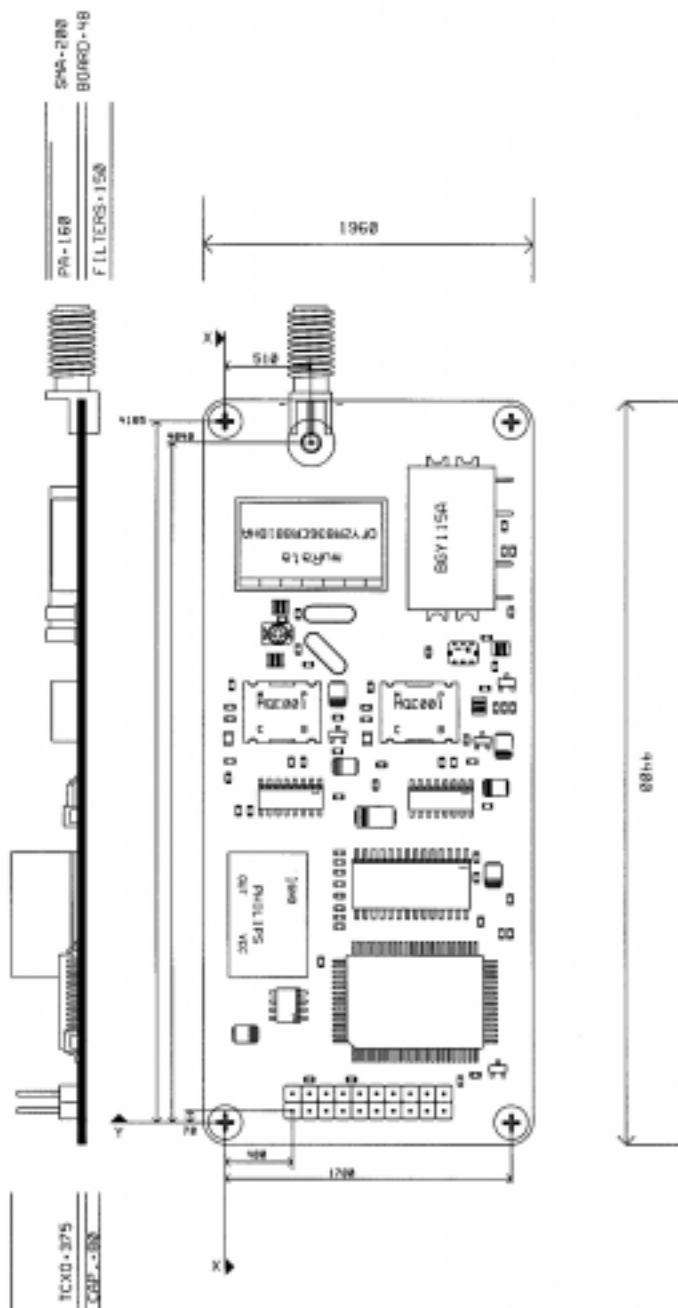
[www.fcc.gov](http://www.fcc.gov)

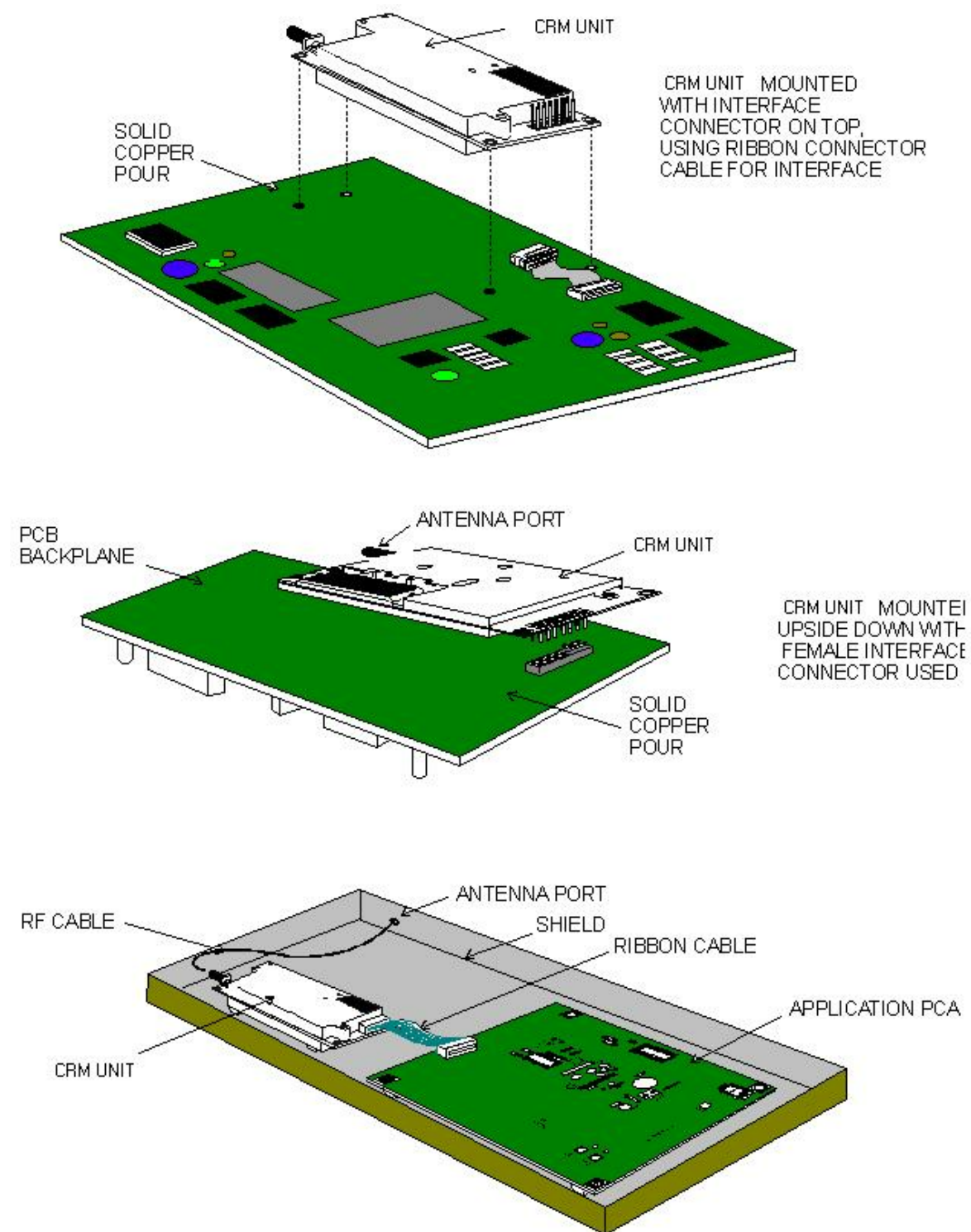
Federal Communications Commission Office of Engineering and Technology web site:

FCC Bulletin OET 65, [www.fcc.gov/oet/rfsafety](http://www.fcc.gov/oet/rfsafety)

# INTEGRATION

The following guide is designed to provide the developer / designer additional information regarding hardware considerations. The sections include detailed design ideas along with tips and tricks we have used in implementing various applications. Each section has a brief description and diagrams to assist you in your planning stages with the CRM4200.



**Cellular Radio Module****CRM4200****Mounting Considerations**

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**Cellular Radio Module**

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**ANTENNA CONSIDERATIONS AND SPECIFICATION**

The diagrams below illustrate the different antenna selections used for applications. Each example has implementation criteria due to its performance and operation.

A. The quarter wave antenna is small and lends itself well into tight applications where space is critical. A ground plane radius of greater than 100mm is required for proper operation. Failure to provide this grounding will result in erratic radiation patterns, signal loss and mismatched impedance to the CRM4200.

B. The half wave antenna is twice the length of the quarter wave. It's properties require less ground plane which make it more ideal for applications that have less metal mass. The antenna has a better radiation pattern.

C. The dipole antenna provides a ground-plane-free operation with optimum gain for its size. This antenna provides its own ground-radiating element and can be used with plastic enclosures.

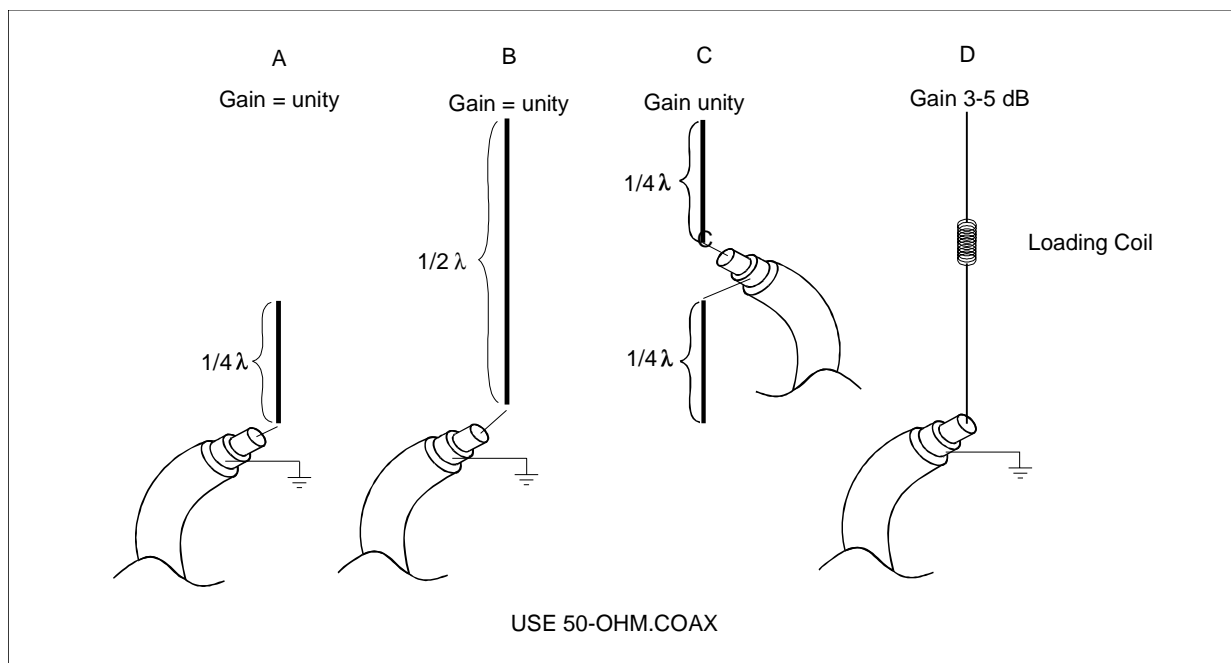
D. The loading coil antenna is the largest of the four mentioned but has a gain advantage over the dipole. The loading coil located in the center of the antenna provides electrically longer antenna to radiate the signal better.

Standard Communications has provided a 2.5 dBi gain center-fed half wave antenna\* with the developer kit. It is recommended that this antenna be used to insure compliance with the Equipment Authorization. (Please refer to statement below)

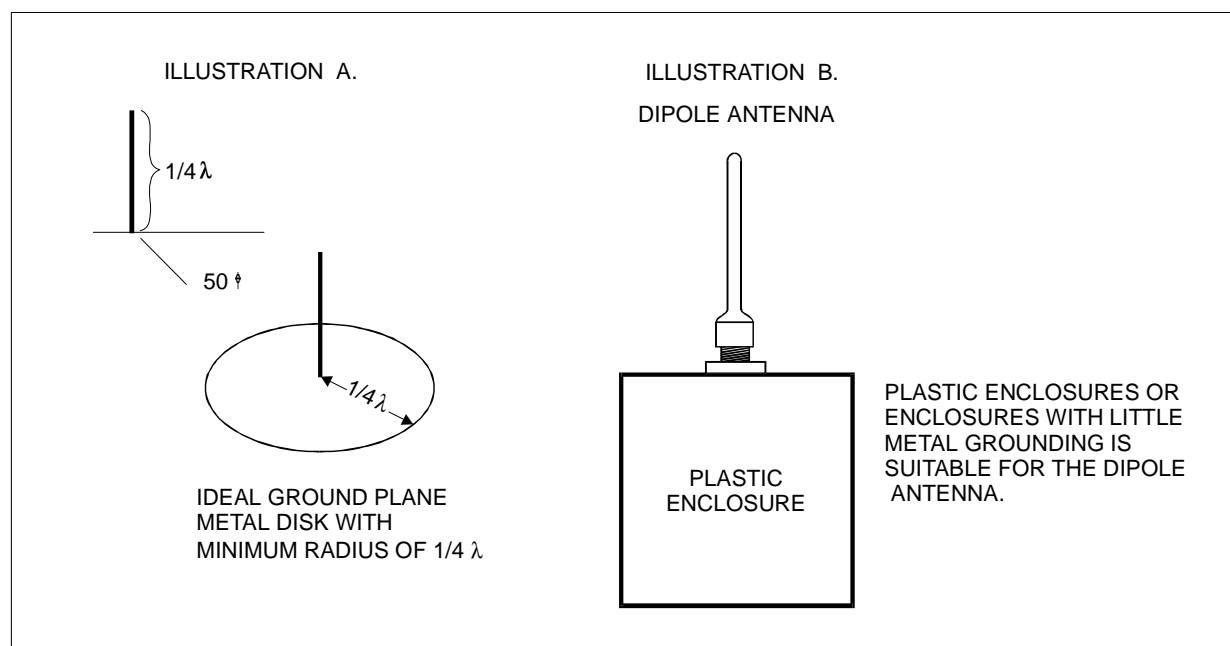
\* Centurion Antenna: Model: EXE-821-SM

**IMPORTANT!!**

**Performance and compliance with FCC rules are heavily influenced by final packaging and antenna configuration of the end-product. Installations not complying with the 20cm minimum separation requirement, using substantially different antenna configurations from those described above, or utilizing operating voltages outside of the normal specifications must be evaluated for compliance with FCC Rules and RF exposure requirements. Responsibility for compliance of the final product with a different antenna(s) is the responsibility of the OEM endproduct manufacturer and will required a new MPE measurement. For installations involving multiple antennas within the same physical area please refer to Co-location note on page 10.**

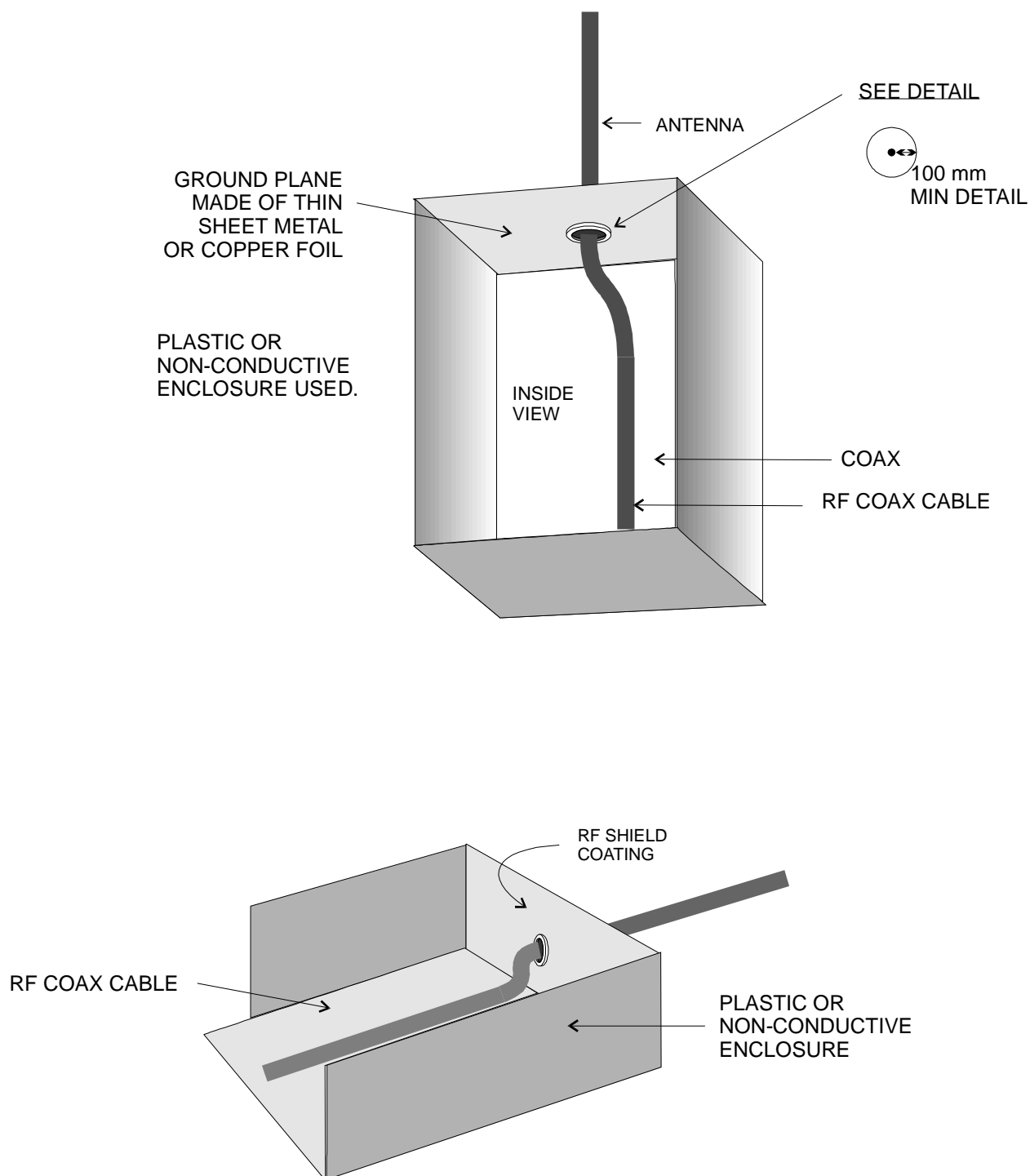
**Cellular Radio Module****CRM4200**

- A. QUARTER WAVE ANTENNA, WITH GROUND PLANE  
 B. HALF WAVE ANTENNA, LESS DEPENDENT UPON GROUND PLANE  
 C. DIPOLE ANTENNA, INDEPENDENT OF GROUND PLANE ( NO GROUND PLANE REQUIRED)  
 D. LOADING COIL ANTENNA, INDEPENDENT OF GROUND PLAN WITH GAIN 3 -5 db



## **SHIELDING CONSIDERATIONS**

When planning the PCB layout for an application some design rules and layout plans should be considered. The following diagrams show various mounting configurations with respect to shielding. Often the application PCB does not allow for separate ground plane implementation. In these cases a list of design rules should be used in order to prevent inter-circuit problems. The last section of this document deals with common design practices used with RF module implementations.

**Cellular Modem Module****CRM4200**

ANTENNA PLACEMENT AND GROUND PLANE EXAMPLES

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**Cellular Modem Module**

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**CRM4200**

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**ADDITIONAL RESPONSIBILITIES FOR CO-LOCATED ANTENNAS**

The CRM4200 antenna cannot be co-located with those of other transmitters without first addressing the effect of the combination of antennas upon compliance with rf safety hazard requirements at multiple-transmitter sites.

Co-location is where multiple-transmitter antennas are installed in the same location (Cellular, PCS, etc.) The FCC expects its licensees and applicants to cooperate in resolving problems involving compliance with rf safety hazard requirements at multiple-transmitter sites.

To assure that the location is still in compliance when adding the module's antenna, a new survey will have to be performed. The installers must ensure that the calculated or measured MPE levels are still within the limits found in Section 1.1310 of the FCC Rules. Further information and guidance is available in FCC Bulletin OET 65, [www.fcc.gov/oet/rfsafety](http://www.fcc.gov/oet/rfsafety).

# HARDWARE RESOURCES

The following are suggested hardware manufacturers providing various components of an application. The sources are kept as current as possible, but changes in the product line offered by the manufacturers occur often. Please contact them for their latest catalog to insure product availability.

## Antennas

Company	Products offered	Telephone #
Ace Antenna Company	Fixed and portable antennas	818-718-1534
Antenna Specialist / Allen Telecom Group <a href="http://www.allentele.com">www.allentele.com</a>	Mobile portable & base antennas	800-664-5274
Astron Antenna Co. <a href="http://www.astronantennas.com">www.astronantennas.com</a>	Fixed, "DISC", "Hemi" antennas	703-450-5517
Centurion International <a href="http://www.centurion.com">www.centurion.com</a>	Fixed and portable antennas and batteries.	800-228-4563
MAXRAD <a href="http://www.maxrad.com/wirelessdata">www.maxrad.com/wirelessdata</a>	Fixed and Mobile antennas	800-323-9122
TX/RX Systems Inc. <a href="http://www.txrx.com">www.txrx.com</a>	Base antennas / Fixed antennas	716-549-4700

## Batteries

Company	Products offered	Telephone #
Centurion International <a href="http://www.centurion.com">www.centurion.com</a>	Fixed and portable antennas and batteries.	800-228-4563
Digi-Key Corporation <a href="http://www.digikey.com">www.digikey.com</a>	Mounting hardware / connectors interface cables and components	800-344-4539

## Cables

Company	Products offered	Telephone #
Richardson Electronics <a href="http://www.rfpower.net">www.rfpower.net</a>	RF connectors and cable assy's	800-737-6937

**Cellular Modem Module****CRM4200****Coatings (RF shielding)**

Company	Products offered	Telephone #
Chomerics <a href="http://www.chomerics.com">www.chomerics.com</a>	EMI, RF Shielding gaskets, covers & spray	781-935-4850

**Connectors**

Company	Products offered	Telephone #
Digi-Key Corporation <a href="http://www.digikey.com">www.digikey.com</a>	Mounting hardware / connectors interface cables and components	800-344-4539
Dynawave Incorporated <a href="http://www.dynawave.com">www.dynawave.com</a>	RF connectors (PCB mount + cable)	800-886-7786
Johnson Components <a href="http://www.johnsoncomp.com">www.johnsoncomp.com</a>	RF connectors + hardware	800-247-8256
Richardson Electronics <a href="http://www.rfpower.net">www.rfpower.net</a>	RF connectors and cable assy's	800-737-6937
Samtec <a href="http://www.samtec.com">www.samtec.com</a>	Headers (0.100") PCB inter- connection solutions.	800-726-8329

**Cores (ferrite)**

Company	Products offered	Telephone #
Digi-Key Corporation <a href="http://www.digikey.com">www.digikey.com</a>	Ferrite core products	800-344-4539
Ferronics Incorporated <a href="http://www.ferronics.com">www.ferronics.com</a>	Ferrite beads	716-388-1020

**Enclosures (shielded)**

Company	Products offered	Telephone #
Compac Development Corp.	Shielded enclosures	516-585-3400
Leader Tech Inc.	Shielded enclosures	813-855-6921
Serpac Electronic Enclosures <a href="http://www.serpac.com">www.serpac.com</a>	Plastic enclosures w/EMI	626-331-0517

**Cellular Modem Module****CRM4200****Generators (see Service Monitors)****Power Converters (DC-DC)**

<b>Company</b>	<b>Products offered</b>	<b>Telephone #</b>
Allied Electronics, Inc. <a href="http://www.allied.avnet.com">www.allied.avnet.com</a>	Multi-source DC-DC converters	800-433-5700

**Power Supplies**

<b>Company</b>	<b>Products offered</b>	<b>Telephone #</b>
AstroDyne	Power Supplies	508-823-8080
Astron	Power Supplies	949-458-7277
Maxim Integrated Products <a href="http://www.maxin-ic.com">www.maxin-ic.com</a>	Power Supplies IC's	800-998-8800
Watkins-Johnson Co. <a href="http://www.wj.com">www.wj.com</a>	Power Supplies & Assy's	800-951-4401

**Service Monitors (Cellular test sets)**

<b>Company</b>	<b>Products offered</b>	<b>Telephone #</b>
Hewlett Packard <a href="http://www.hp.com">www.hp.com</a>	HP8920A, 8920B	800-452-4844
Grayson Wireless / Allen Telecom <a href="http://www.allentele.com">www.allentele.com</a>	Cellscope (over the air monitoring)	216-349-8400

**Solar Panels**

<b>Company</b>	<b>Products offered</b>	<b>Telephone #</b>
Sunwize Technologies, Inc. <a href="http://www.sunwize.com">www.sunwize.com</a>	Solar panels, system components	800-817-6527

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**CRM4200****Miscellaneous**

<b>Company</b>	<b>Products offered</b>	<b>Telephone #</b>
Black Box Corporation	Misc. Adapters, converters	800-321-0746
Global Engineering	EIA/TIA/IS-41.1-B, EIA/TIA-553	303-792-2181
Documents	Industry standards documents	
RAF Electronic Hardware <a href="http://www.rafhdwe.com">http://www.rafhdwe.com</a>	Stand-offs, chassis fasteners	203-888-2133