Integration Guide

CMM9900/CMM9920

AMPS Retrofit Converter

(GSM/GPRS Modem Module)

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Document Changes:

Date	Document Revision	Details
12/27/2006	0.01	Initial version
01/03/2007	0.02	Revised per engineering inputs

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RF SAFETY WARNING

- WARNING -

This device and associated antenna must be installed in a location at least 30cm from the body of the user or other nearby persons in order to comply with the FCC RF exposure guidelines.

- NOTICE -

To comply with RF Exposure and FCC Regulations (CFR 47 Parts 22H & 24E) these devices must be used with an approved antenna system. The total antenna system gain must not exceed that of the original approved configuration. This transmitter module is restricted to mobile or fixed installations. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 30 cm from all persons and must not be co-located or operating in conjunction with any other transmitter. Portable operation within 30 cm of a person's body is not allowed."

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 30cm 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.

The CMM9900/9920 may only be used with antennas specifically approved for use with this product and included in the FCC and PTCRB approvals for this product.

- WARNING -

Use of antenna types other than those included on the CMM9900/9920 FCC Equipment Authorizations may invalidate the FCC and PTCRB approvals for this product. See the appendix in the back of this document for a current list of approved antennas.

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

47CFR Part 22H

47CFR Part 24E

47CFR Part 1.1307 – 1.1310

47CFR Part 2.1091, 2.1093

Federal Communications Commission (FCC) Primary website:

www.fcc.gov

Federal Communications Commission Office of Engineering and Technology web site:

www.fcc.gov/oet/rfsafety

PART 15 NOTICE

- NOTICE -

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver s connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

INTEGRATION GUIDELINES

The following guide is designed to provide the developer/integrator 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 CMM9900/CMM9920.

MOUNTING

The CMM9900/CMM9920 has four mounting holes arranged in the pattern shown in figure 1. If stand-offs are to be used, metal type is the recommended due to added ground potential. In figure 1, the stand-offs set the CMM9900/CMM9920 unit slightly higher than the host PCB. An air gap is not necessary but will allow for PCB to PCB isolation and noise immunity. The standoff used on the evaluation PCB is exaggerated to display the CMM9900/CMM9920. The height of these stand-offs are not necessarily ideal and space can be greatly conserved by using shorter ones.

Figure 2. Shows an example of a plate shield already used on an application with the modification of bent tabs to allow for mounting of the CMM9900/CMM9920. This is a relatively inexpensive method of mounting and can be implemented easily when the plate is initially punched. Care should be taken so that the tabs do not extend past the flash area of the mounting holes.

Figures 3 and 4. Shows the mechanical drawing of the CMM9900/CMM9920 units. These dimensions should be used for mounting and placement purposes. The drawing is illustrated from the bottom side perspective. The antenna and interface connectors are located on the topside of the PCB.

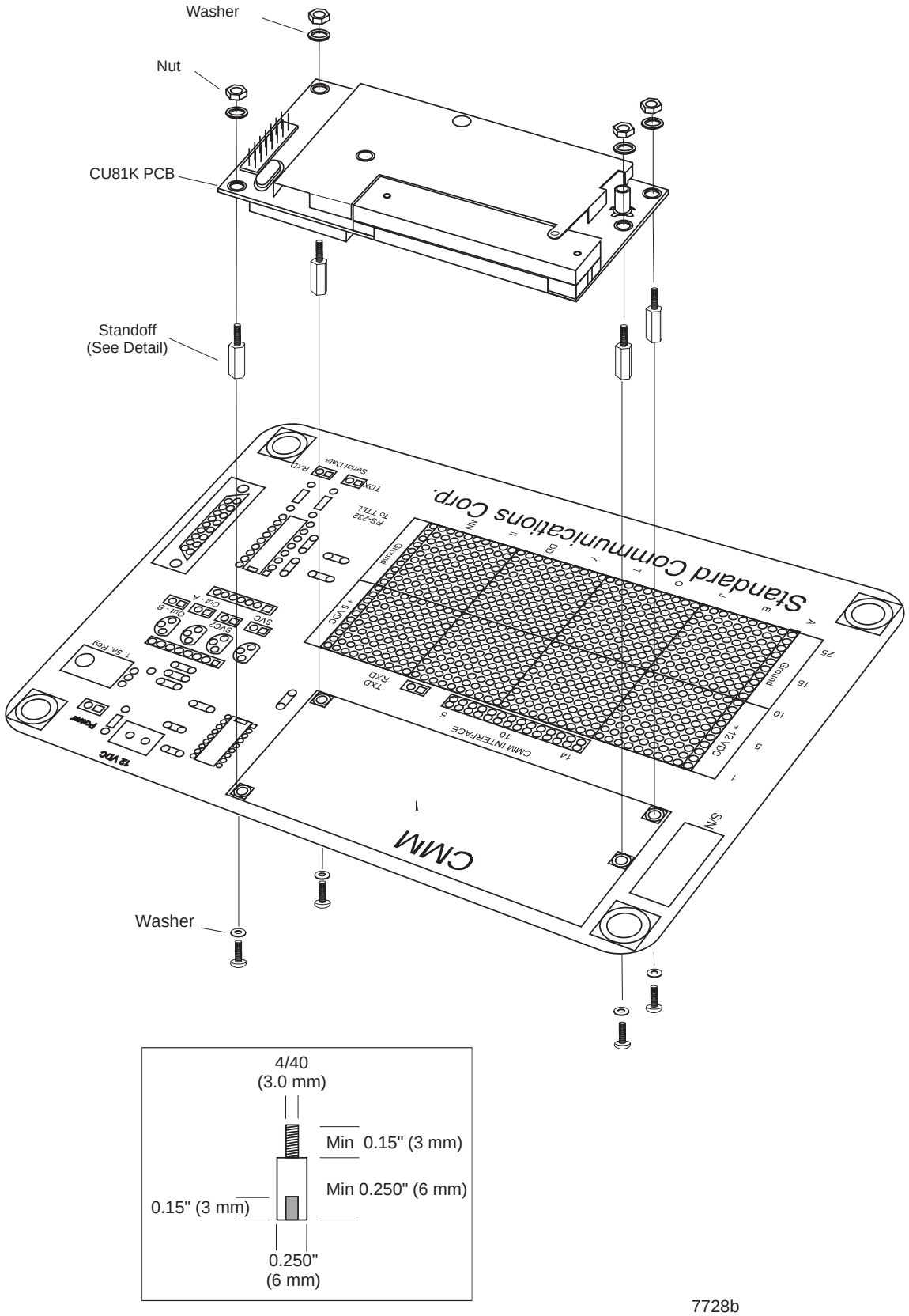


Figure 1. Mounting Details

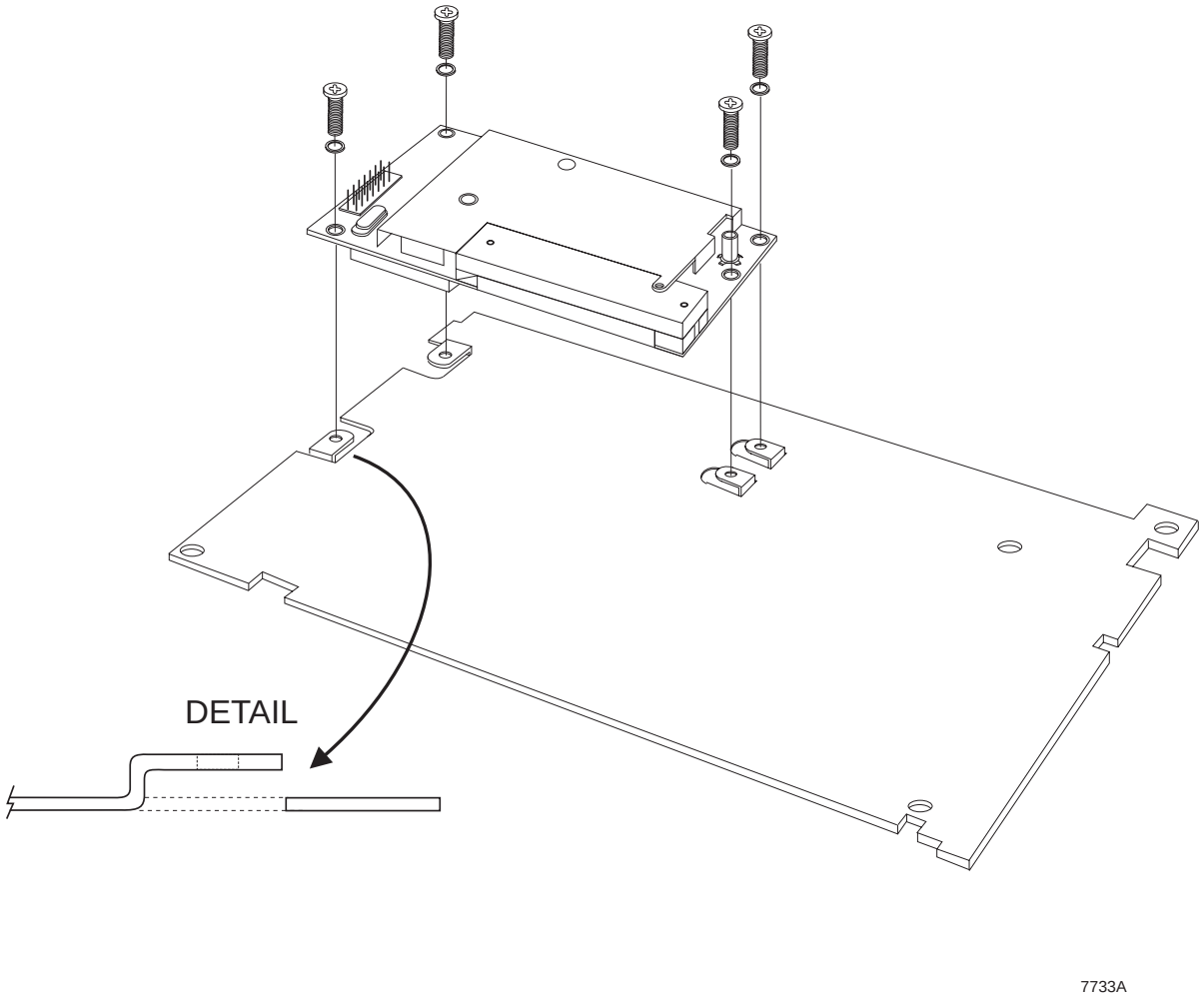


Figure 2. Sheet Metal Tab Detail

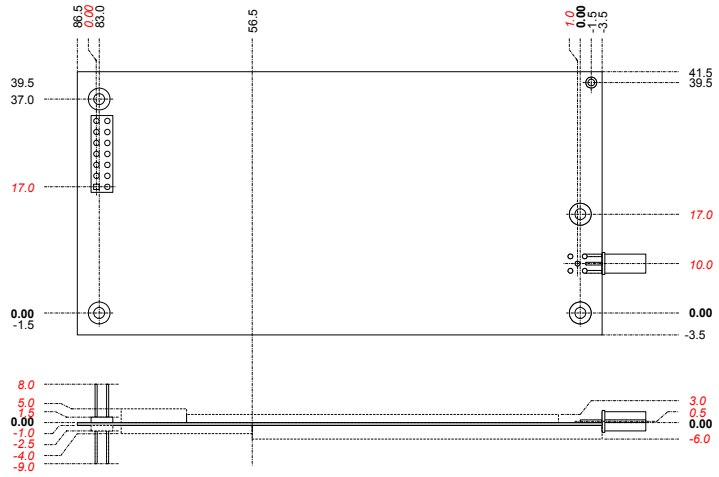


Figure 3. CMM9900 Dimensions

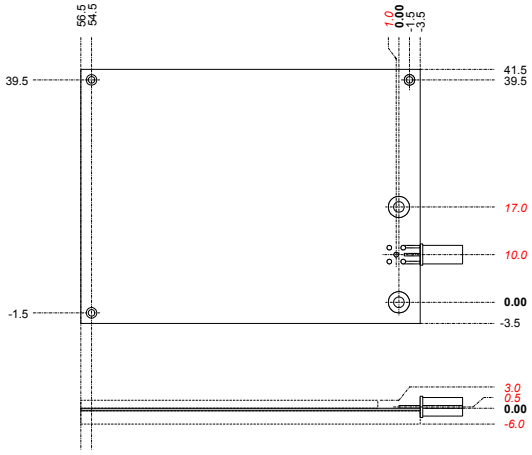


Figure 4. CMM9920 Dimensions

ANTENNA CONSIDERATIONS

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

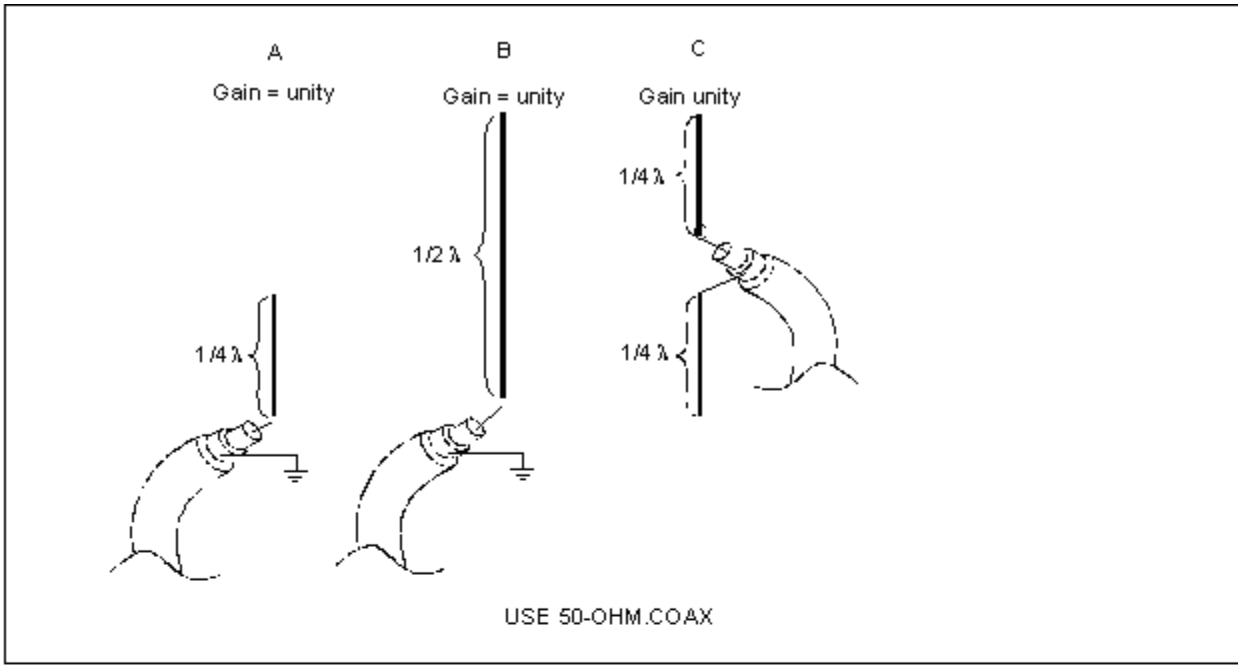
A. The quarter wave antenna is small and lends itself well into tight applications where space is critical. A ground plane radius of greater than 100mm is required for proper operation. Failure to provide this grounding will result in erratic radiation patterns, signal loss and mismatched impedance to the CMM9900/CMM9920.

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.

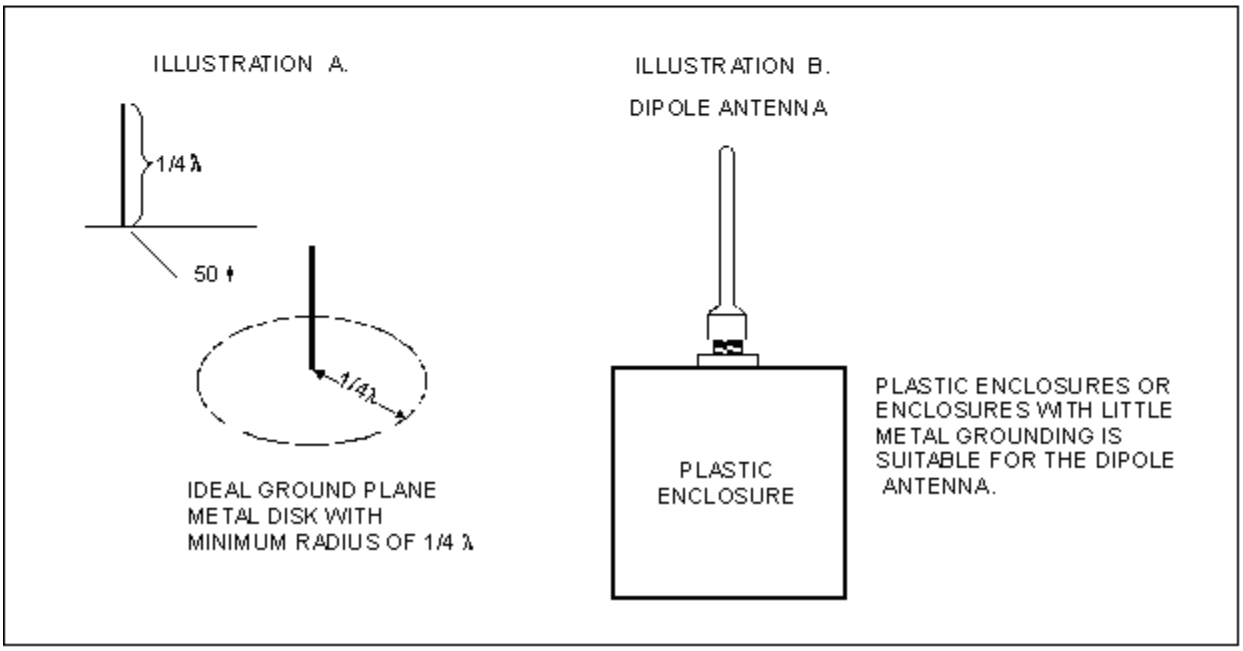
C. The dipole antenna provides a ground-plane-free operation with optimum gain for its size. This antenna provides its own ground-radiating element and can be used with plastic enclosures.

WARNING

Use of antenna types other than those included on the CMM9900/9920 FCC Equipment Authorizations may invalidate the FCC and PTCRB approvals for this product. See the appendix in the back of this document for a current list of approved antennas.

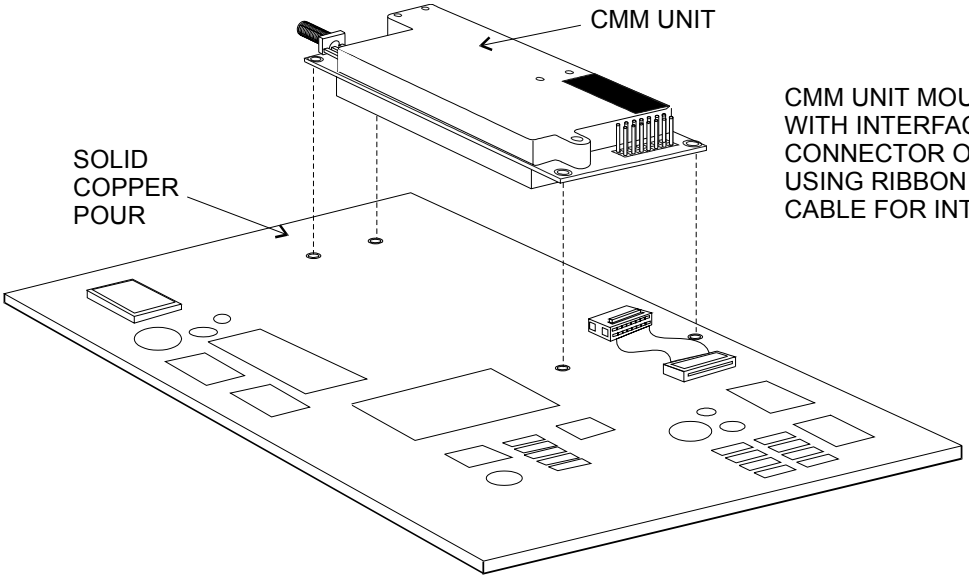


A. QUAITER WAVE ANTENNA, WITH GROUND PLANE
B. HALF WAVE ANTENNA, LESS DEPENDENT UPON GROUND PLANE
C. DIPOLE ANTENNA, INDEPENDENT OF GROUND PLANE (NO GROUND PLANE REQUIRED)

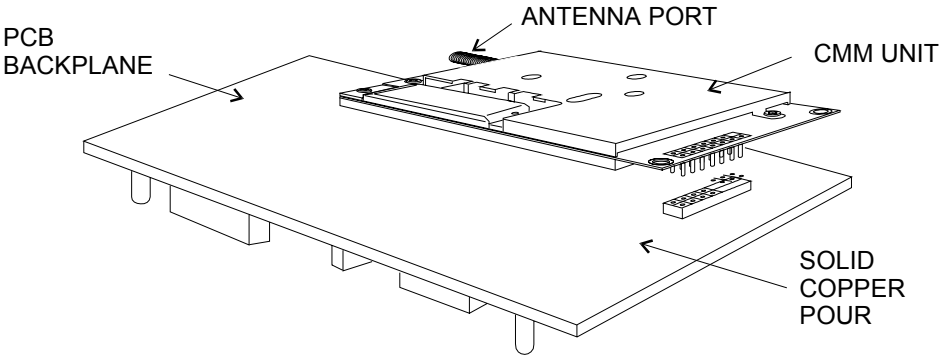


SHIELDING CONSIDERATIONS

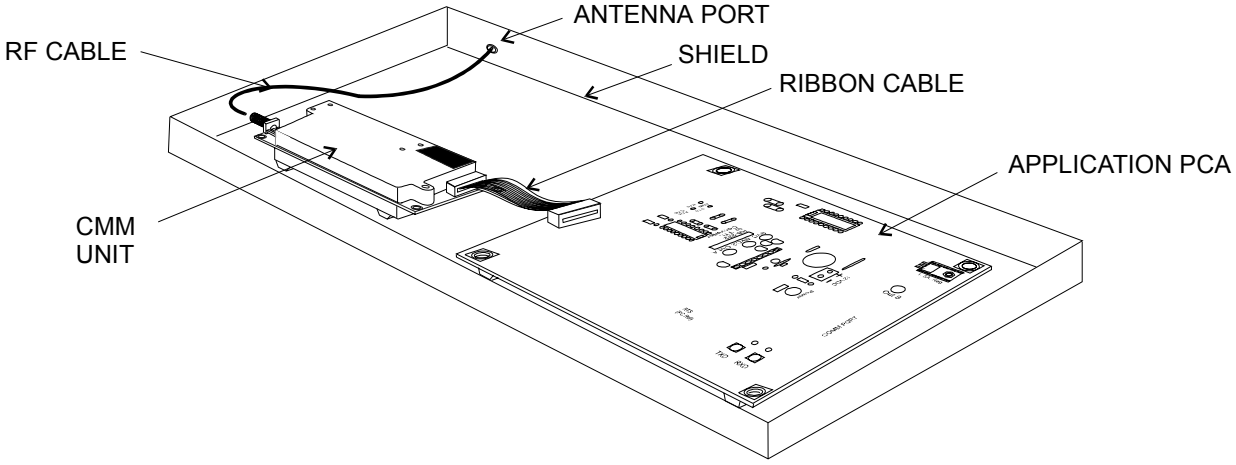
When planning the PCB layout for an application some design rules and layout plans should be considered. The following diagrams show various mounting configurations with respect to shielding. Often the application PCB does not allow for separate ground plane implementation. In these cases a list of design 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.

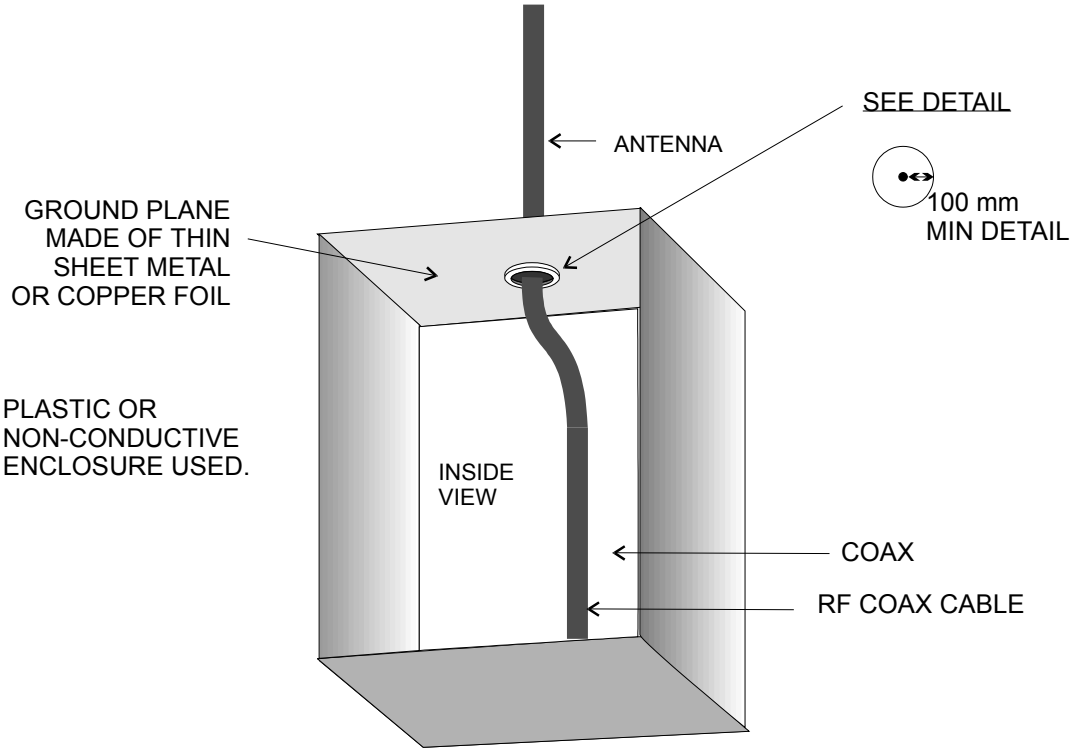


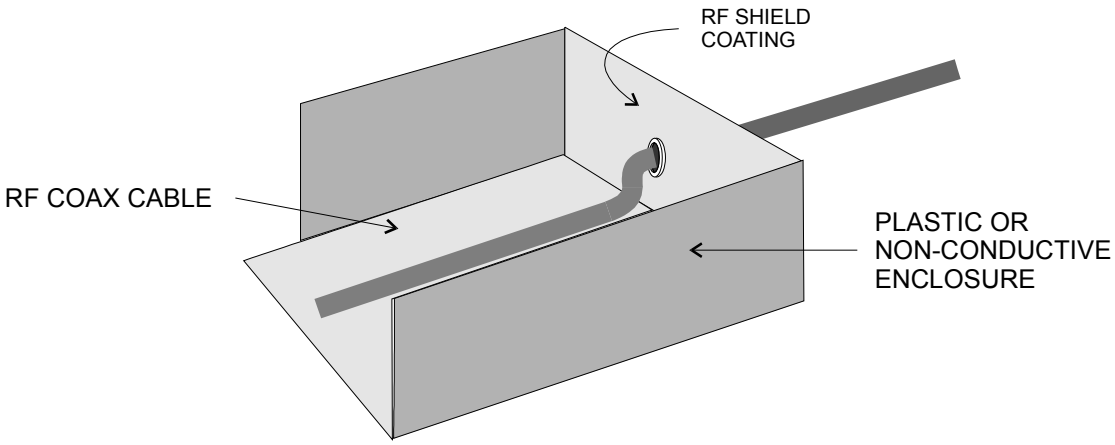
CMM UNIT MOUNTED
WITH INTERFACE
CONNECTOR ON TOP,
USING RIBBON CONNECTOR
CABLE FOR INTERFACE



CMM UNIT MOUNTED
UPSIDE DOWN WITH
FEMALE INTERFACE
CONNECTOR USED







ANTENNA PLACEMENT AND GROUND PLANE EXAMPLES

RETROFIT INSTALLATION GUIDELINES

The CMM9900 and CMM9920 are designed to be 'drop-in' replacements for the legacy CMM products. This means that no modification to the hardware or software of the application device is necessary in order to install and operate the CMM99xx in place of the legacy CMM device. (With the exception of the replacement of the CMM device, and possibly the antenna.)

There are however, some specific steps necessary in order to successfully complete the process of installation into an existing application device. The following guidelines will describe the process of installing the CMM9900 or CMM9920 into existing CMM-based applications:

NETWORK PROVISIONING OF THE CMM9900/CMM9920

The CMM9900 and CMM9920 must be provisioned for operation on the GSM network before they access the network to send and receive data. The CMM99xx devices receive the majority of their network provisioning information through the installation of a GSM SIM card onto the module. *The installation of the SIM card onto the CMM99xx module must be completed prior to installation of the module into the application device.*

There is also additional information that must be provided to the module in order to finalize the provisioning process and allow communication of data through the Control Channel Network Server via SMS and/or GPRS. This information may include some or all of the following:

- Original Primary MIN number
- Any secondary MIN number(s) used
- Electronic Serial Number(ESN) of original CMM module
- SMS address for Control Channel Network Server
- Control Channel Network Server IP address for GPRS data
- APN for GPRS data

Default values for SMS address, Control Channel Network Server IP address, and APN are pre-loaded into the device based upon the type of Control Channel Network at time of installation configuration. *These values may updated manually via the serial interface or over-the-air if they require changes in the future.*

COPYING THE CONFIGURATION INFORMATION FROM THE ORIGINAL DEVICE

The configuration information from the original CMM device is necessary for the CMM99xx to properly communicate the data back to the network server and function transparently.

Refer to the Sections following for specific information regarding removal, installation and validation.

REMOVING THE ORIGINAL CMM DEVICE

The original CMM device should be removed using procedures appropriate for the specific application device. Power should always be removed from both the application device and the CMM device prior to conducting any installation, or removal of the CMM device.

Special care should be taken not to damage the application unit or the original CMM device. *(Further operation of the original CMM module may be required in order to copy the configuration data for loading onto the new CMM99xx module.)*

WARNING

Precautions must be taken whenever handling the CMM to protect the electronic circuitry of both the CMM module and the application device from damage due to static discharge (ESD).

INSTALLING THE CMM99xx RETROFIT ADAPTER

The CMM99xx device should be installed using procedures appropriate for the specific application device. This will normally be the same, or very similar, procedure to that used for installation of the original CMM device.

If the existing antenna connected to the application device is not an approved antenna, it should be removed and replaced with an approved antenna prior to re-applying power to the unit.

VALIDATING THE INSTALLATION

Validation of the CMM99xx installation should be conducted to confirm successful installation of the device and that the application device is still functioning properly. Validation testing should also confirm that all necessary configuration and identity information has been programmed into the CMM99xx device.

APPROVALS

The CMM9900 and CMM9920 have been approved as complete GSM Modem type devices. The FCC, Industry Canada, PTCRB and carrier approvals have all been completed with the CMM99xx as a final finished product. With the exception of Part 15, no further testing or certifications should be necessary for the final application, provided that an approved antenna configuration is used in that application.

The following approvals have been secured (or are in-process) for the CMM99xx products:

- FCC Equipment Authorization (type approval)
- FCC Part 15 Class B
- Industry Canada Equipment Authorization
- PTCRB Approval
- Cingular Approval
- Aeris.net Approval
- Numerex Approval

- WARNING -

The CMM99xx device must be used with an antenna system that is included in the CMM99xx approval files. Use of an unapproved antenna system in the end application will make these approvals invalid in that application. Applications requiring the use of an antenna system not currently on the approved list will require either (1) Re-testing and updated approvals to add that antenna to the CMM9900 list of approved antenna systems; or (2) New approvals under the customer name.

PART 15 CERTIFICATION

The CMM9900 and CMM9920 have been certified to meet the requirements of Part 15 of the FCC Rules as a Class B device. This certification only applies to the CMM99xx unit itself. Once installed into an application device, responsibility for Part 15 compliance becomes the responsibility of the manufacturer/provider of the end-product (application).

The environment within the application device includes other potential sources of radio frequency (RF) interference in addition to the CMM99xx. These potential sources include such items as crystal oscillator(s), digital address/data lines, switching power supplies, and other circuitry.

All application devices subject to Part 15 of the FCC rules must be retested and certified to be in compliance with the rules. This retesting and certification is the responsibility of the customer.

PRODUCT LABELING

EQUIPMENT AUTHORIZATION

The labeling of the CMM99xx devices includes certain identifying information that must be visible in the final end-product (application). If the label of the CMM99xx device is not clearly visible from the exterior of the end product, then the exterior labeling of the end product must include information referring to the enclosed transmitter module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: APVCMM9900, IC: 363A-CMM9900” or “Contains FCC ID: APVCMM9900, IC: 363A-CMM9900”

- WARNING -

Proper labeling of the device is a mandatory requirement for approval of these devices. Failure to properly label the application device will invalidate all device approvals and may subject the end-product manufacturer to sanctions and/or fines.

PRODUCT SAFETY WARNING

The following safety warning must be included in the product documentation for the installer and end-user:

> “To comply with RF Exposure and FCC Regulations (CFR 47 Parts 22H & 24E) this device must only be used with antenna systems approved for use with this device. The total antenna system gain must not exceed that of the original approved configuration. This transmitter module is restricted to mobile or fixed installations. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 30 cm from all persons and must not be co-located or operating in conjunction with any other transmitter. Portable operation within 30 cm of a person’s body is not allowed.”

It is also recommended that a caution label or tag be attached to the application device.

- WARNING -

This device and associated antenna must be installed in a location at least 30cm from the body of the user or other nearby persons in order to comply with the FCC RF exposure guidelines.

OTHER PRODUCT LABELING REQUIREMENTS

Other labeling and/or documentation requirements may also apply to end-product applications of the CMM9900 and CMM9920. These requirements may include statements related to FCC Part 15 compliance as well as other regulatory requirements.

APPENDIX A - APPROVED ANTENNA LIST FOR USE WITH CMM9900/CMM9920

The following is a list of antennas approved for use with the CMM9900 and CMM9920. Customers are strongly encouraged to use antennas already included on this list in order to expedite their time to market.

Manufacturer	*Mfg Model / Part Number*	*Type*	*Gain (dBi)*
Jinchang Electron	GSM-JC000	SMA Flex	3
Jinchang Electron	GSM-JC001	Mag w/SMA cable	3.5
JEMA; Japan Electronic Manufacturers, Inc.	JA-800-CSMA	Sleeve Dipole SMA	2
Hustler	CMT-800SMA	5/8 Mag w/SMA cable	3.2

The use of antennas other than those specifically approved for use with these devices may invalidate the FCC and PTCRB approvals for these devices. Contact CalAmp M2M Application Engineering for assistance with antenna selection and further information on approvals and use of other antennas.

APPENDIX B - HARDWARE RESOURCES

The following is a partial list of hardware manufacturers providing various components which may be utilized in various applications of the CMM99xx. The sources are kept as current as possible, but changes in the product line offered by the manufacturers occur often. Please contact these companies directly for their latest product information and specs.

Antennas

Company	Products offered	Telephone #
Ace Technology http://www.aceteq.com	Fixed and portable antennas	818-718-1534
Antenna Specialist / Allen Telecom Group www.allentele.com	Mobile portable & base antennas	800-664-5274
Astron Wireless Technologies www.astronwireless.com	Fixed, “DISC”, “Hemi” antennas	703-450-5517
Centurion International www.centurion.com	Fixed and portable antennas and batteries.	800-228-4563
MAXRAD www.maxrad.com	Fixed and Mobile antennas	800-323-9122

Cables

Company	Products offered	Telephone #
Richardson Electronics www.rfpowernet.com	RF connectors and cable assy’s	800-737-6937
RF Industries www.rfcables.com	RF cable assemblies	800-233-1728
Emerson Network Power (formerly Johnson) http://www.emersonnetworkpower.com/connectivity	RF connectors + hardware	800-247-8256
Samtec www.samtec.com	Headers, PCB interconnect solutions. RF Connectors and assemblies.	800-726-8329

Connectors

Company	Products offered	Telephone #
Digi-Key Corporation www.digikey.com	Mounting hardware / connectors interface cables and components	800-344-4539
Emerson Network Power (formerly Johnson) http://www.emersonnetworkpower.com/connectivity	RF connectors + hardware	800-247-8256
Hirose Electronics http://www.hirose.com	PCB interconnect and RF connectors and cable assy's *(60-pin connector for CMM9920)*	805-522-7958
Richardson Electronics www.rfpowernet.com	RF connectors and cable assy's	800-737-6937
Samtec www.samtec.com	Headers, PCB interconnect solutions. RF Connectors and assemblies.	800-726-8329

Miscellaneous

Company	Products offered	Telephone #
IHS/Global Engineering Documents http://global.ihs.com	EIA/TIA/IS-41.1-B, EIA/TIA-553 Industry standards documents	303-792-2181
RAF Electronic Hardware http://www.rafhdwe.com	Stand-offs, chassis fasteners	203-888-2133