
# PCIDM™ V2.86
# Users Manual

ICI Document Number: PCIDM-V2-UM

2004.11.26



Innovative Concepts, Inc.
8200 Greensboro Drive, Suite 700
McLean, VA 22102
703.893.2007

www.innocon.com
www.pcidm.com

# Table Of Contents





Innovative Concepts

# Table Of Figures



# Table Of Tables

# 1 Overview

The Personal Computer Improved Data Modem (PCIDM) is a low cost, portable alternative to the Avionics Improved Data Modem (IDM). It is comprised of a single Type 2 Extended PC card, paired with application software for Windows 98/NT/ME/2000/XP. The protocol stack for the PCIDM is fully compatible with the protocol stack in the avionics version of the IDM and therefore fully interoperable.

With a PCIDM and computer, the user can send and receive Air Force Application Program Development (AFAPD), TACFIRE, Marine Tactical System (MTS), Intra-flight Data Link (IDL) and Variable Message Format (VMF) messages over the air using many common military radios communicating with most systems that support the same message sets. Figure 1 shows the PCIDM hardware.

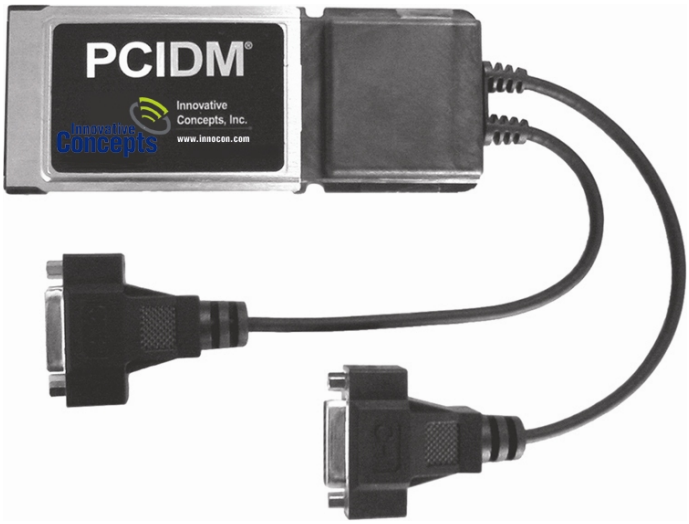



**Figure 1: PCIDM V2**

# 2 Related Documents

- AMGUI Users Manual
  Application Message Parser Graphical User Interface

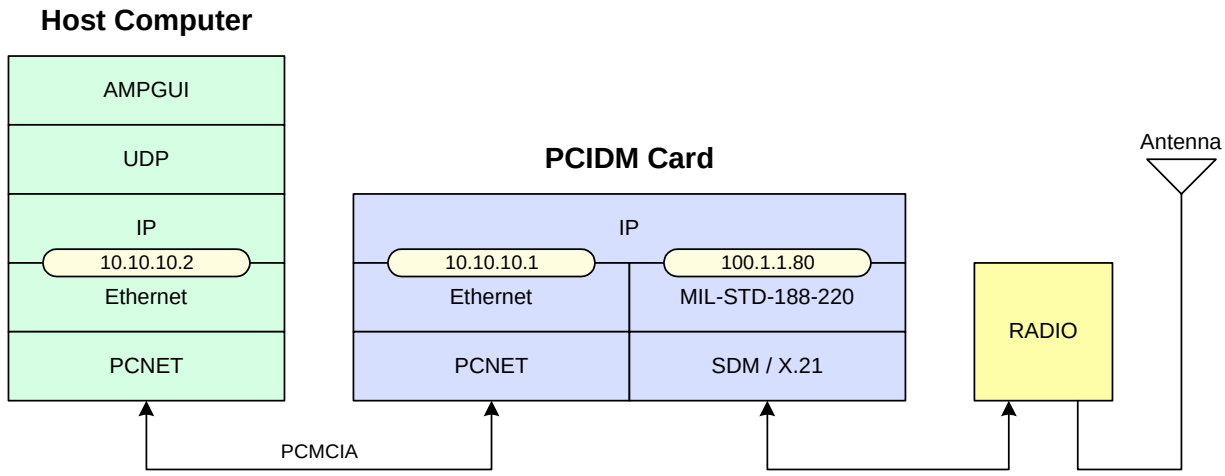
- PCIDM SDK Documentation
  The PCIDM Software Development Kit Documentation can be found on the PCIDM V2 installation CD under the SDK directory.

# 3 Installation

## 3.1 IP Address Assignment

The PCIDM is an Internet Protocol (IP) router, with its own TCP/IP protocol stack. PCIDM configuration, message transmission, and message reception are accomplished via TCP/IP. Installation of the PCIDM host software will add a network interface to your machine, which will require an IP address. In addition, the PCIDM card requires an IP address.

Figure 2 shows the host computer and PCIDM card using the default IP addresses.




10.10.10.2 is entered via Start > Settings > Control Panel > Network
10.10.10.1 is entered via the PCIDM Control Panel (see section 3.2).
100.1.1.80 is entered via the AMPGUI PCIDM V2 Configuration dialog.

**Figure 2: Host Computer and PCIDM IP Addresses**

## 3.2 PCIDM Control Panel

After installing the PCIDM software, as directed in Section 3.3, the PCIDM Control Panel Icon will appear in the Windows tool tray. The Windows tool tray, shown in Figure 3, is most often located in the lower right corner of the Windows desktop. Clicking the PCIDM Control Panel Icon will bring up cause the main window of PCIDM Control Panel to be displayed. The color of the PCIDM Control Panel Icon in the tool tray will be either Red or Green, giving the status of the PCIDM card.


**Figure 3: PCIDM Control Panel**

The PCIDM Control Panel includes three indicators in color which show the status of the PCIDM. The PCIDM Control Panel is shown in Figure 4.

Serial Number – Green (B AND P)

B – Green in the B column indicates that a BOOTP request from PCIDM has been received and was recognized. The PCIDM has booted properly.

P – Green in the P column indicates that a Ping to PCIDM TCP/IP stack was successful. The Application software on the PCIDM has started.

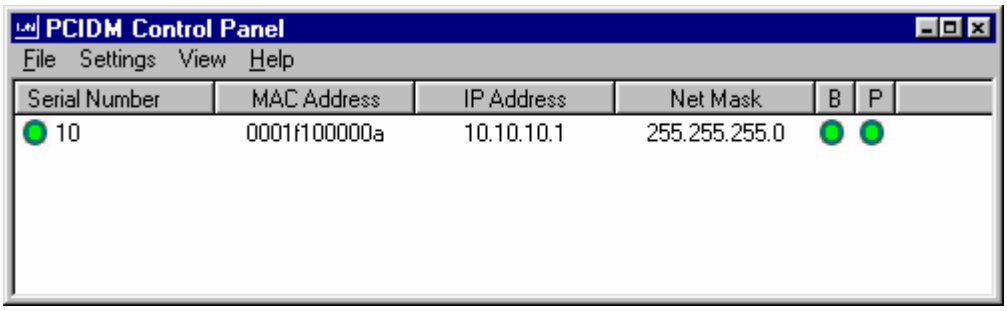



**Figure 4: PCIDM Control Panel**

## 3.3 PCIDM V2 Installation

### 3.3.1 PCIDM V2 Windows 98 Installation

Execute the following steps to install the PCIDM on a machine that is powered up and running Windows 98:

1. Insert the PCIDM CD-ROM into the CD-ROM drive. The setup program will automatically start. Follow the setup instructions. It is recommended to use the default values for all options, as they have been confirmed as safe to use.
2. Plug the PCIDM PC card into a PC card socket. Windows will recognize the new hardware and rebuild its driver database.
3. Click **Start** > **Settings** > **Control Panel** > **Network**.
4. Select "**TCPIP -> ICI PcidmV2 Network Interface Card**".
5. Click the **Properties** button.
6. Select the "**IP Address**" tab.
7. Select the "**Specify an IP Address**" button.
8. Enter an IP address and net mask for the windows network adapter. If you do not have a preference, use the following settings:
   - **IP address = 10.10.10.2**
   - **Net Mask = 255.255.255.0**
9. Select the "**Gateway**" tab.
10. Enter a default Gateway, and click **Add**. The default Gateway should be the address of the PCIDM card. If you do not have a preference, set the **Gateway IP address to 10.10.10.1**. Click **Add**.
11. Click **OK** twice to close the network control panel.
12. Reboot Windows.
13. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
14. Double click the first PCIDM in the list (see Figure 4).
15. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
16. Reboot the computer.
17. Check to make sure the PCIDM control panel indicators are all **GREEN**.

### 3.3.2 PCIDM V2 Windows NT Installation

Execute the following steps to install the PCIDM on a machine running Windows NT SP5+:

1. Plug the PCIDM PC card into a PC card socket.
2. Login as **Administrator**.
3. Insert the PCIDM CD-ROM into the CD-ROM drive. The setup program will automatically start. Follow the setup instructions. It is recommended to use the default values for all options, as they have been confirmed as safe to use.
4. Click **Start** > **Settings** > **Control Panel** > **Network**.
5. Select the **Adapter** tab.
6. Click **Add**.
7. Select "**ICI PCIDM V2 Adapter**" from the list.
8. Click **OK**.
9. Select **IRQ Level**, **Memory Base Address**, and **I/O Port Address** and click **OK**.
10. Point the path to **Windows NT disc on CDROM** and click **Continue**.
11. Click **Close**.
12. On TCP/IP Properties dialog, select "**ICI PCIDM V2 Adapter Driver**" from Adapter pulldown list.
13. Enter an IP address, Subnet Mask, and default Gateway for the Windows adapter. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.2**
    - **Subnet Mask = 255.255.255.0**
    - **default Gateway = 10.10.10.1**
14. Click **Yes** to restart computer.
15. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
16. Double click the first PCIDM in the list (see Figure 4).
17. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
18. Reboot the computer.
19. Check to make sure the PCIDM control panel indicators are all **GREEN**.

**NOTE:**

Windows NT 4.0 does not support plug-and-play operation or hot swapping of PC cards.

Table 1 indicates settings that have been known to work.

**Table 1: Recognized Modem Settings**

| Computer | Interrupt (IRQ) | I/O Port | Memory Address |
|---|---|---|---|
| Tadiran Tacter RHC-31A without internal modem | 7 | 0x300 | 0xD0000 |

### 3.3.3 PCIDM V2 Windows ME Installation

Execute the following steps to install the PCIDM on a machine running Windows ME:

1. Insert the PCIDM CD-ROM into the CD-ROM drive. The setup program will automatically start. Follow the setup instructions. It is recommended to use the default values for all options, as they have been confirmed as safe to use.
2. Plug the PCIDM PC card into a PC card socket. Windows will recognize the new hardware and rebuild its driver database.
3. Click **Start** > **Settings** > **Control Panel** > **Network**.
4. Select "**TCPIP -> ICI PcidmV2 Network Interface Card**".
5. Click the **Properties** button.
6. Select the "**IP Address**" tab.
7. Select the "**Specify an IP Address**" button.
8. Enter an IP address and net mask for the windows network adapter. If you do not have a preference, use the following settings:
   - **IP address = 10.10.10.2**
   - **Net Mask = 255.255.255.0**
9. Select the "**Gateway**" tab.
10. Enter a default Gateway, and click **Add**. The default Gateway should be the address of the PCIDM card. If you do not have a preference, set the **Gateway IP address to 10.10.10.1**. Click **Add**.
11. Click **OK** twice to close the network control panel.
12. Reboot Windows.
13. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
14. Double click the first PCIDM in the list (see Figure 4).
15. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
16. Reboot the computer.
17. Check to make sure the PCIDM control panel indicators are all **GREEN**.

### 3.3.4 PCIDM V2 Windows 2000 / Windows XP Installation

Execute the following steps to install the PCIDM on a machine running Windows 2000 SP2+ or Windows XP:

1. Ensure that the PCIDM is **NOT** plugged into the computer.
2. Login as **Administrator**.
3. Insert the PCIDM CD-ROM into the CD-ROM drive. The setup program will automatically start. Follow the setup instructions. It is recommended to use the default values for all options, as they have been confirmed as safe to use.

**NOTE:**

If the PCIDM has not been plugged in prior to this step, proceed to step 9. If it has, then Windows probably installed the PCIDM as an unknown device type. It will need to be uninstalled before continuing. If the PCIDM is in the PC card socket while Windows 2000 is installing, it will configure the PCIDM as an unknown device without informing the user.

4. Right click the **My Computer** icon, and select **Properties** from the menu.
5. Select the **Hardware** tab and click on the **Device Manager** button.
6. Plug the PCIDM PC card into a PC card socket. Windows will list the PCIDM device under the category Unknown.
7. Right click the **PCIDM device** and select **Uninstall** from the menu. Windows will warn that you are uninstalling the device.
8. When the device has been uninstalled, temporarily eject the PCIDM from the PC card socket.
9. Plug the PCIDM PC card into a PC card socket. Windows will recognize the new hardware and rebuild its driver database. You may get a dialog box informing that the driver you are installing is unsigned. Click the **Continue** button.
10. Click **Start** > **Settings** > **Control Panel** > **Network and Dialup Connections** > **Local Area Connection 2** > **Properties**.
11. Select **General** > **Internet Protocol (TCP/IP)** > **Properties**.
12. Select the "**Use the following IP address**" radio button.
13. Enter an IP address, net mask, and gateway for the windows network adapter. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.2**
    - **Net Mask = 255.255.255.0**
    - **Gateway IP address = 10.10.10.1**
14. Click **OK** twice to accept the settings and then close the status window for the network connection. Windows may take up to 1 minute to accept the settings.
15. Reboot Windows.
16. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
17. Double click the first PCIDM in the list (see Figure 4).
18. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
19. The PCIDM Control Panel indicators should change to **GREEN**.

## 3.4 Tacter PCIDM Installation

### 3.4.1 Tacter PCIDM Windows NT Installation

Execute the following steps to install the PCIDM software for a Tacter PCIDM on a Tacter RHC-31A running Windows NT 4.0 SP6:

1. Login as **Administrator**.
2. Insert the PCIDM CD-ROM into the CD-ROM drive. The setup program will automatically start. Follow the setup instructions. It is recommended to use the default values for all options, as they have been confirmed as safe to use.
3. Click **Start** > **Settings** > **Control Panel** > **Network**.
4. Select the **Adapter** tab.
5. Click **Add**.
6. Select "**ICI Tacter PCIDM Adapter**" from the list.
7. Click **OK**.
8. The Property Page for the Tacter PCIDM should appear.
9. Confirm that the defaults are set to **IRQ 7** and **I/O port 0x300** and click **OK**.

**NOTE:**

**Do not change the IRQ or I/O port values unless the Tacter PCIDM hardware has been modified to match.**

10. Point the path to Windows NT disc on CDROM and click **Continue**.
11. Click **Close**.
12. On TCP/IP Properties dialog, select "**ICI Tacter PCIDM Adapter Driver**" from Adapter pulldown list.
13. Enter an IP address, Subnet Mask, and default Gateway for the Windows adapter. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.2**
    - **Subnet Mask = 255.255.255.0**
    - **default Gateway = 10.10.10.1**.
14. Click on **Yes** to restart computer.
15. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
16. Double click the first PCIDM in the list (see Figure 4).
17. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
18. Reboot.
19. Check to make sure the PCIDM control panel indicators are all **GREEN**.

### 3.4.2 Tacter PCIDM Windows 2000 Installation

Execute the following steps to install the PCIDM software for a Tacter PCIDM on a Tacter RHC-31A running Windows 2000:

1. If you haven't already, install PCIDM_V2.x from the CD. When Installation is complete, reboot the Tacter.
2. Open the control panel by selecting "**Start** > **Settings** > **Control Panel**".
3. Select "**Add/Remove Hardware**" to start the hardware wizard.
4. Click **Next** at the first dialog to continue.
5. Select "**Add/Troubleshoot a device**" and click the "**Next>**" button to continue.
6. Windows will spend several seconds searching for new Plug 'n Play devices. In the next dialog box, select "**Add a new device**" from the top of the scroll list and click "**Next>**".
7. Windows will now ask if you would like it to search for new hardware. Select "**No, I want to select the hardware from a list**" and click the "**Next>**" button.
8. Next, you will be asked to select the device type. Scroll down to "**Network Adapters**" and select it. Then click the "**Next>**" button.
9. The "**Select Network Adapter**" dialog should now contain the entry "**Innovative Concepts Inc. Tacter PCIDM**". Select this entry and click the "**Next>**" button.
10. The "**Start Hardware Installation**" dialog will now appear along with a warning that Windows could not detect the settings of the device. This is normal. Dismiss the warning dialog by clicking the "**OK**" button.
11. The "**Add New Hardware Wizard Properties**" dialog will now appear to allow for the entry of hardware resources. Make sure that these are set to **Interrupt Request 07** and **Input/Output Range 0300 – 0307**, and click the **OK** button.
12. You should now see the "**Start Hardware Installation**" dialog again. Click the "**Next>**" button to continue.
13. A warning dialog will appear informing that the software is not digitally signed by Microsoft. Dismiss the warning by clicking the "**Yes**" button to continue.
14. This will bring up the final dialog of the Add/Remove Hardware Wizard. If you want to check the resources that you set, click the "**Resources…**" button. Otherwise, click the "**Finish**" button to complete driver installation.
15. At the next dialog, click "**Yes**" to reboot the computer.
16. When the Tacter reboots, click "**Start** > **Settings** > **Control Panel** > **Network and Dialup Connections** > **Local Area Connection 2** >**Properties**".
17. Select "**General** > **Internet Protocol (TCP/IP)** > **Properties**".
18. Select the "**Use the following IP address**" radio button. Enter an IP address, Net Mask, and Gateway for the windows network adapter. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.2**
    - **Net Mask = 255.255.255.0**
    - **Gateway IP address = 10.10.10.1**
19. Click **OK** twice to accept the settings, and then close the status window for the network connection. Windows may take up to 1 minute to accept the settings.
20. Reboot Windows.
21. Click the **PCIDM Control Panel** icon in the taskbar tray (see Figure 3).
22. Double click the first PCIDM in the list (see Figure 4).
23. Enter an IP address and Net Mask for the PCIDM card. If you do not have a preference, use the following settings:
    - **IP address = 10.10.10.1**
    - **Net Mask = 255.255.255.0**
24. The PCIDM Control Panel indicators should change to **GREEN**.

## 3.5 Updating PCIDM V2 Flash

Updating the Windows host software is separate from updating the PCIDM PCMCIA PC card firmware stored in flash. The Windows host software and PCIDM card firmware must be kept in sync. After updating the host software using the PCIDM V2 installation CD, follow the following steps to update the PCIDM V2 flash.

1. Click **Start** > **PCIDM V2** > **Update Flash**.
2. Click **Flash** > **Update**.
3. Click **Update**.
4. The update process will take approximately 3 minutes to complete.
5. Click **Flash > Exit**.
6. Reboot your machine.

# 4 Operation Checklist

- ☐ Install PCIDM software from CD.
- ☐ Install PCIDM PC card into your computer.
- ☐ Verify the PCIDM and Windows IP configuration.
- ☐ Verify the PCIDM status indicators in the PCIDM Control Panel are **GREEN**.
- ☐ Connect the PCIDM to your radio with the proper cable (see Section 7 Cables).
- ☐ Start AMPGUI and configure the PCIDM for operation (see AMPGUI User's Manual).
- ☐ Verify that your radio settings are compatible with the PCIDM configuration.
- ☐ You should now be able to transmit or receive messages using AMPGUI.

# 5 Specifications

## 5.1 System

Table 2 lists various system specifications for PCIDM versions 2.70 and 2.80.

**Table 2: System Specifications**

| Attribute | PCIDM V2.70 | PCIDM V2.80 |
|---|---|---|
| **# of Channels** | 2 | 2 |
| **Protocols** | AFAPD | AFAPD |
| | TACFIRE | TACFIRE |
| | MIL-STD-188-220B | MIL-STD-188-220B |
| | MTS | MTS |
| | IDL | IDL |
| | MIL-STD-188-184 | MIL-STD-188-184 |
| **Message Sets** | AFAPD F-16 | AFAPD F-16 |
| | AFAPD Apache (full) | AFAPD Apache (full) |
| | TACFIRE (partial) | TACFIRE (partial) |
| | VMF R2 (F/A-18 Message Set) | VMF R2 (F/A-18 Message Set) |
| | VMF R3 (Full Message Set) | VMF R3 (Full Message Set) |
| | | **VMF R5** (Compatible with SWB1 and MIL-STD-2045-47001C) |
| | MTS (partial) | MTS (partial) |
| | IDL (full) | IDL (full) |
| | MIL-STD-188-184 Notes | MIL-STD-188-184 Notes |
| | | **MIL-STD-188-184 Email** |
| **Radio Interfaces** | | |
| **NRZ (SDM)** | 2 Channels | 2 Channels |
| **Packet (X.21)** | 2 Channels | 2 Channels |
| **ASK** | 1 Channel | 1 Channel |
| **FSK** | 1 Channel | 1 Channel |
| **Hardware** | | |
| **Processors** | 1 PowerPC (40MHz)<br>1 DSP | 1 PowerPC (40MHz)<br>1 DSP |
| **Memory** | 32 MB SDRAM<br>16 MB FLASH<br>2 KB SEPROM | 32 MB SDRAM<br>16 MB FLASH<br>2 KB SEPROM |
| **Size** | PCMCIA Type II Ext.<br>PC Card<br>54mm W<br>135mm D<br>5mm – 10 mm H | PCMCIA Type II Ext.<br>PC Card<br>54mm W<br>135mm D<br>5mm – 10 mm H |
| **Power** | Est. +5 V, 0.4 A, 2 W | Est. +5 V, 0.4 A, 2 W |
| **Weight** | 5 ounces (w/ pigtail) | 5 ounces (w/ pigtail) |
| **Temperature** | Commercial | Commercial |
| **Functional Distribution** | | |
| **Physical Layer** | Card | Card |
| **Link Layer** | Card | Card |
| **Network Layer** | Card | Card |
| **Application Layer** | Host | Host |

## 5.2 Hardware Support

The PCIDM software supports several hardware platforms. Table 3 indicates the hardware platforms supported by the various versions of PCIDM software.

**Table 3: Hardware Support**

| | Software Version | | |
|---|---|---|---|
| **Hardware** | **PCIDM V2.60** | **PCIDM V2.70** | **PCIDM V2.80** |
| **PCIDM V2 R1** | Yes | Yes | Yes |
| **PCIDM V2 R2** | Yes | Yes | Yes |
| **SCIDM** | Yes | Yes | Yes |
| **LW-PCIDM** | Yes | Yes | Yes |
| **Tacter PCIDM** | | Yes | Yes |
| **IDM PMC** | | Yes | Yes |
| **UIDM Prototype** | | | Yes |
| **MIDM Prototype** | | | Yes |

# 6 Radio Interface

## 6.1 Overview

The PCIDM V2 includes two Combat Net Radio (CNR) half-duplex channels. Channel 1 supports NRZ (non-return-to-zero synchronous data mode (SDM)), and Packet (X.21) operation. Channel 2 supports NRZ (non-return-to-zero synchronous data mode (SDM), Packet (X.21), Amplitude Shift Key (ASK), and Continuous Phase Frequency Shift Key (CPFSK) operation. Figure 5 shows a PCIDM V2 hardware block diagram.

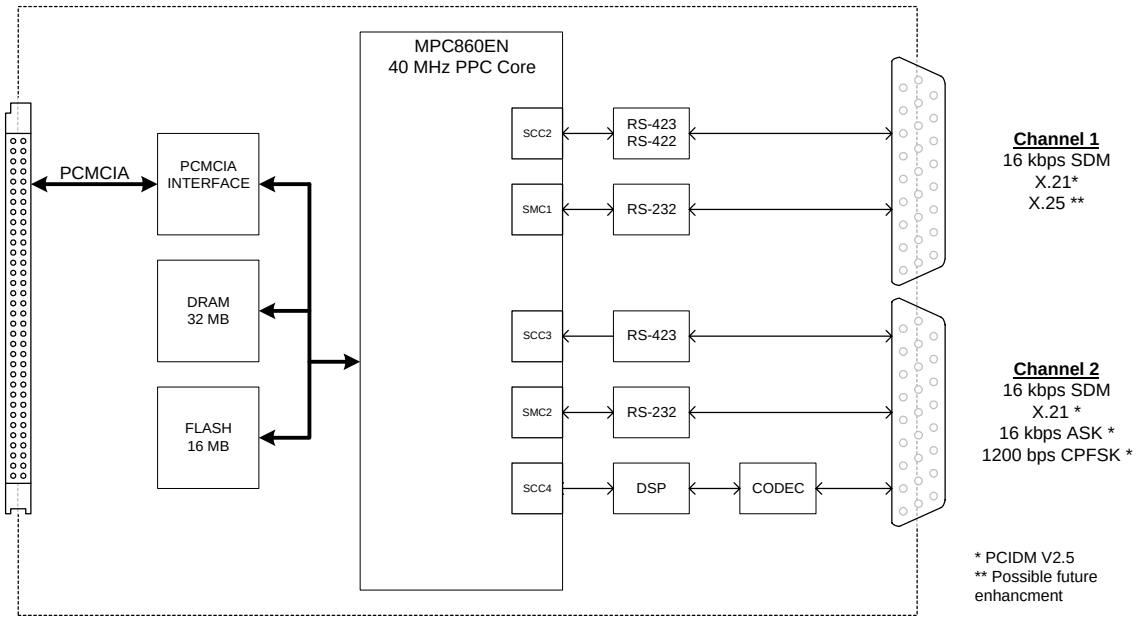



**Figure 5 : PCIDM V2 Hardware Block Diagram**

## 6.2 Radio Connector

The PCIDM V2 has two 26-pin connectors. Table 4 shows the connector pin-out.

**Table 4 : PCIDM V2 26-Pin Connector Pin-out**

| PIN | CHANNEL 1 | CHANNEL 2 | |
|---|---|---|---|
| 1 | GND | ANLG_TX | Analog (ASK or FSK) transmit data |
| 2 | RX-RS232 | RX-RS232 | Asynchronous RS-232 used for radio control, console, or PPP |
| 3 | TX-RS232 | TX-RS232 | |
| 4 | NC | NC | |
| 5 | NC | NC | |
| 6 | NC | NC | |
| 7 | GND | GND | Ground |
| 8 | NC | HOP_IND | Radio Hop Indication (input) |
| 9 | X.21_C/RTS[1] | X.21_C/RTS[1] | Request to Send (output) |
| 10 | BUSY | BUSY | Busy Indication (input) |
| 11 | PTT | PTT | Push To Talk (output) |
| 12 | CPTT | CPTT | Crew Push To Talk (input) |
| 13 | MUTE | MUTE | |
| 14 | TXD[2] | TXD | NRZ or X.21 transmit data |
| 15 | TXD-RS422-B[2] | ANLG_REF | Analog Reference (signal ground) |
| 16 | RXD[2] | RXD | NRZ or X.21 receive data |
| 17 | RXD-RS422-B[2] | ANLG_RX | Analog (ASK or FSK) receive data |
| 18 | RXC | RXC | Receive Clock Input (+) |
| 19 | RXC-B | GND | |
| 20 | NC | NC | |
| 21 | X.21_I/CTS | X.21_I/CTS | Clear To Send (+)(input) |
| 22 | CTS- | NC | |
| 23 | DDMC | DDMC | Digital Data Mode Control |
| 24 | GND/SHIELD | GND/SHIELD | |
| 25 | ADMC | ADMC | Analog Data Mode Console |
| 26 | NC | NC | |

[1] Presence of RTS signal depends on the PCIDM V2 hardware revision, as identified in Table 5.

**Table 5: PCIDM V2 RTS Signaling**

| Serial Number | Hardware Revision | RTS Present |
|---|---|---|
| 100-349 | PCIDM V2 Revision 1 | NO |
| 350 and up | PCIDM V2 Revision 2 | YES |

[2] For RS-422 balanced signaling, pin 14 TXD is TXD-RS422-A and pin 16 RXD is RXD-RS422-B. Signals labeled A are (-); those labeled B are (+).

## 6.3 Radio Interface Modes

The PCIDM supports the following radio interface modes:

### 6.3.1 NRZ

NRZ (non-return-to-zero) mode has the following characteristics:

- Supported on PCIDM channel 1 and PCIDM channel 2.
- Sometimes referred to as SDM, EDM, synchronous mode, DRA, or clock and data mode.
- NRZ is Synchronous interface that uses the clock provided by the radio (DCE).

Table 6 identifies characteristics of NRZ mode.

**Table 6: NRZ Mode Characteristics**

| | |
|---|---|
| **Signal Type** | NRZ-L |
| **Data Rate** | Up to 16000 bps |
| **Signal Level** | As per MIL-STD-188-114A |
| **Input Clock Frequency** | 75, 150, 300, 600, 1.2k, 2.4k, 4.8k, 8k, 9.6k, 16k Hz, corresponding to the clock rate, provide by the DCE |
| **Clocking Edge** | Negative edge clocks data into PCIDM<br>Positive edge clocks data out of PCIDM |
| **Clock to Data Skew** | <1 µs |
| **Input Impedance** | >6000 Ω (RS-422/RS-423 modes)<br>>2000 Ω (RS-232 mode) |
| **Output Impedance** | ≤55 Ω |

### 6.3.2 Packet

Packet mode has the following characteristics:

- Supported on PCIDM channel 1 and channel 2.
- Sometimes referred to as SINCGARS packet mode or X.21 packet mode.
- Supported by the RT-1523E and ARC-201D radios.

Table 7 identifies characteristics of Packet mode.

**Table 7: Packet Mode Characteristics**

| | |
|---|---|
| **Signal Type** | NRZ-L |
| **Data Rate** | 16000 bps |
| **Signal Level** | As per MIL-STD-188-114A |
| **Input Clock Frequency** | 16000 Hz, corresponding to the clock rate, provide by the DCE |
| **Clocking Edge** | Negative edge clocks data into PCIDM<br>Positive edge clocks data out of PCIDM |
| **Clock to Data Skew** | <1 µs |
| **Input Impedance** | >6000 Ω (RS-422/RS-423 modes)<br>>2000 Ω (RS-232 mode) |

| | |
|---|---|
| **Output Impedance** | ≤55 Ω |

### 6.3.3 ASK

Amplitude Shift Key (ASK) modulation/demodulation mode has the following characteristics:

- **Only supported on PCIDM channel 2.**
- Sometimes referred to as Digital.
- Asynchronous in nature. The bit timing is derived from the signal itself, since a separate clock is not present.

Table 8 identifies characteristics of ASK mode, and Figure 6 shows characteristics of the ASK signal.

**Table 8: ASK Mode Characteristics**

| | |
|---|---|
| **Signal Type** | ASK |
| **Data Rate** | 16k bps |
| **Data Rate Deviation** | 0.1% |
| **Input Signal Level** | 0.1-16 Vp-p (assuming 0V DC offset) |
| **Type of Channel** | Linear |
| **Input Frequency Range** | dc to 16 kHz |
| **Required Channel Bandwidth (3 Db) for ASK Data** | ≥17 kHz linear channel |
| **Input Impedance** | >5.32KΩ ± 10% |
| **Output Signal Level** | Programmable 1 to 8 Vp-p |
| **Output Current** | 11 mA |
| **Output Impedance** | 150 Ω ± 10% |
| **Signal-to-Noise Ratio** | Bit Error Rate is within 2dB of theoretical |

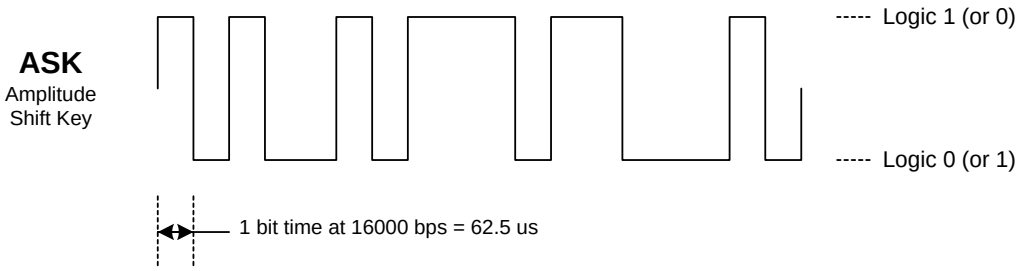



**Figure 6: ASK Mode Signal Characteristics**

Figure 7 shows the PCIDM performance curve comparing system specification requirements versus the theoretical ideal condition. Actual performance lies somewhere between spec. and ideal.

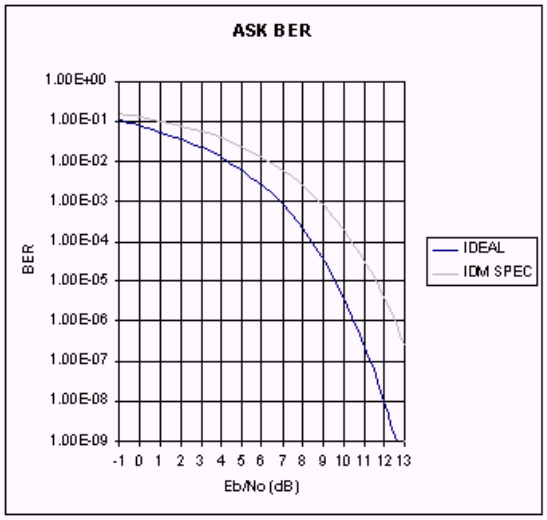



**Figure 7: ASK Modem Performance**

### 6.3.4 CPFSK

Continuous Phase Frequency Shift Key (CPFSK) operation has the following characteristics:

- **Only supported on PCIDM channel 2.**
- Sometimes referred to as FSK or Analog.

**Table 9: CPFSK Mode Characteristics**

| | |
|---|---|
| **Signal Type** | CPFSK |
| **Data Rate** | 1200 bps (CPFSK) |
| **Data Rate Deviation** | 0.1% |
| **Tone Pairs** | 1200/2400 (‘0’ high frequency, ‘1’ low frequency) |
| **Tone Frequency Deviation** | 0.1% |
| **Input Signal Level** | 0.1 to 6.0 Vrms |
| **Input Impedance** | >5.32KΩ ± 10% |
| **Output Signal Level** | Programmable 10 mV to 1.5 Vrms |
| **Output Load Impedance** | 150 Ω ± 10%, balanced load |
| **Signal-to-Noise Ratio** | Is within 2 dB of theoretical |

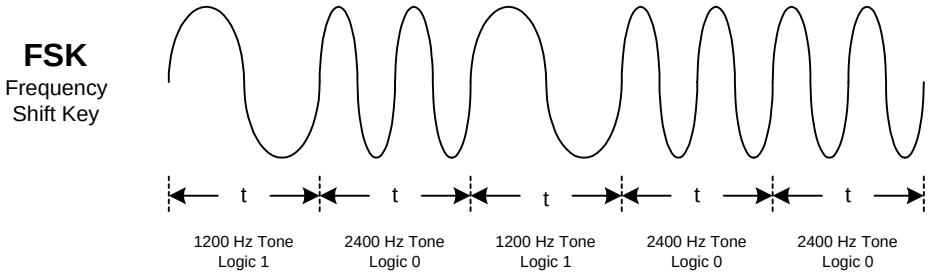



**Figure 8: FSK Mode Signal Characteristics**

## 6.4 Discrete I/O

### 6.4.1 Crew Push To Talk Input (CPTT)

The crew push to talk input is used to monitor the activity of the aircraft audio system to determine the availability of the PCIDM to transmit. The crew push to talk input signal has the characteristics identified in Table 10.

**Table 10: Crew Key Monitor Characteristics**

| | |
|---|---|
| **Low Signal Levels** | ±0.5 V, or grounded with <1000 Ω |
| **High Signal Levels** | 4.5 V to 28 V, or open circuit >100k Ω to ground |

### 6.4.2 Transmit Gate Input (BUSY)

The Transmit Gate input signal is a radio sync signal that is used for transmission with frequency hopping radios. This signal is used to sense the "busy" signal output of radios when such a signal is available. The transmit gate input signal has the characteristics identified in Table 11.

**Table 11: Transmit Gate Input Signal Characteristics**

| | |
|---|---|
| **Low Signal Levels** | ±0.5 V, or grounded with <1000 Ω |
| **High Signal Levels** | 4.5 V to 28 V, or open circuit >100k Ω to ground |

### 6.4.3 Push To Talk Output (PTT)

The PTT output signal is asserted when the PCIDM is ready to transfer data to the interfacing radio. The PTT output signal characteristics are identified in Table 12.

**Table 12: PTT Output Signal Characteristics**

| | |
|---|---|
| **Signal Levels** | Active: Grounded, 0 to +1.0 Vdc<br>Inactive: High impedance, 100k Ω to ground<br>(usually pulled up to a positive voltage within the radio) |
| **Current Sink** | 40 mA (through 25 Ω to ground) |
| **External Voltage** | 0 to +28 Vdc |

### 6.4.4 Ready To Send Output (RTS)

The RTS output signal is asserted when the PCIDM is ready to transfer data to the interfacing radio. RTS output signal characteristics are identified in Table 13.

**Table 13: RTS Signal Characteristics**

| | |
|---|---|
| **Signal Levels** | Active: +3 to +12 Vdc<br>Inactive: -3 to -12 Vdc |

### 6.4.5 Mute Output (MUTE)

The mute output signal may be used to indicate the presence of active data, or for other functions as implemented. This signal may be used to eliminate the sound of data transmissions. The mute output radio control signal has the characteristics identified in Table 14.

**Table 14: MUTE Output Signal Characteristics**

| | |
|---|---|
| **Signal Levels** | Mute: Grounded, 0 to +1.0 Vdc<br>Inactive: High impedance, 100k Ω to ground |
| **Sink Current** | 40 mA (through 25 Ω to ground) |
| **External Voltage** | 0 to +28 Vdc |

### 6.4.6 Analog Data Mode Control Output (ADMC)

The ADMC output signal is used to select the radio's analog data mode. Although the PCIDM hardware supports this signal, the PCIDM software does not currently utilize this signal. The ADMC output signal characteristics are identified in Table 15.

**Table 15: ADMC Output Signal Characteristics**

| | |
|---|---|
| **Signal Levels** | Active: Grounded, 0 to –1.0 Vdc<br>Inactive: High impedance, ≥100 kΩ |
| **Current Rating** | 8.5 mA (source) |
| **External Voltage** | 0 to –15 Vdc |

### 6.4.7 Digital Data Mode Control Output (DDMC)

The DDMC output signal is used to select the radio's digital data mode. Although the PCIDM hardware supports this signal, the PCIDM software does not currently utilize this signal. The DDMC output signal characteristics are identified in Table 16.

**Table 16: DDMC Output Signal Characteristics**

| | |
|---|---|
| **Signal Levels** | Active: Grounded, 0 to –1.0 Vdc<br>Inactive: High impedance, ≥100 kΩ |
| **Current Rating** | 8.5 mA (source) |
| **External Voltage** | 0 to –15 Vdc |

In synchronous data mode, DDMC is controlled by CPTT and is normally active. When CPTT is active, DDMC is inactive. This mechanism allows voice communications when the PCIDM is connected to a KY-58. The CPTT input signal and DDMC output signal are shown together in Figure 9.


**Figure 9: CPTT and DDMC Synchronous Mode Signal Correlation**

## 6.5 Voice Priority

When operating in ASK or CPFSK modes with Voice Priority selected, voice transmission has priority over all data. No data will be sent out if voice is present during a channel transmission time slot.

## 6.6 Serial Asynchronous Ports

The PCIDM has two RS-232C asynchronous interfaces. These ports will be used in the future to provide remote control of radios.

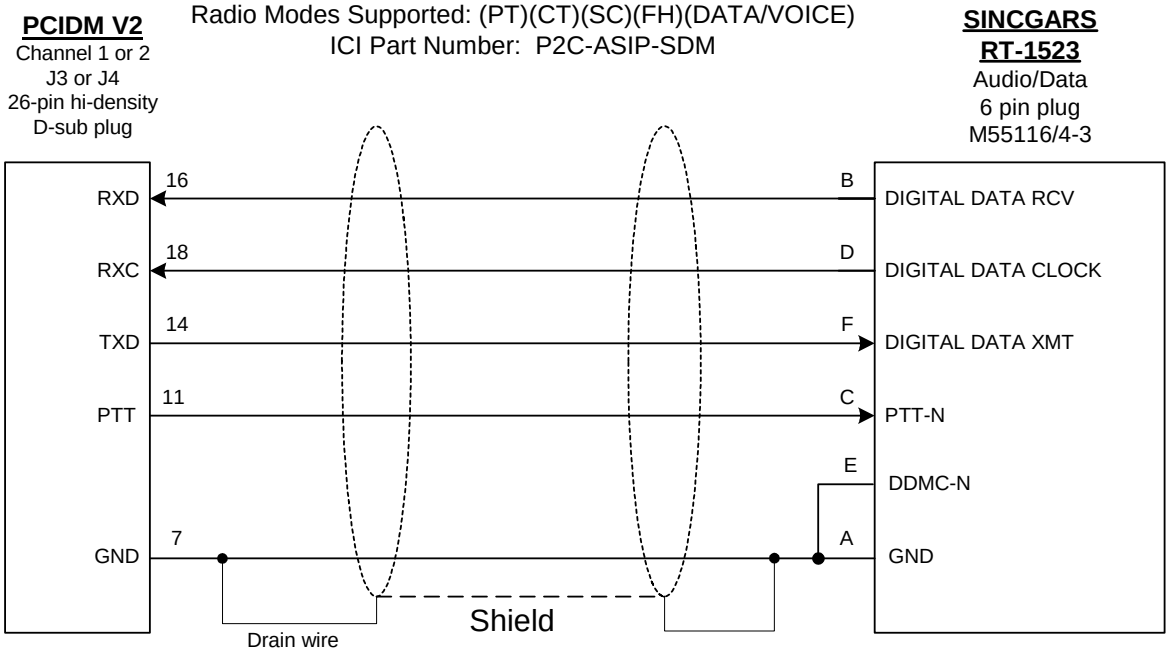
# 7 Cables

The cable diagrams in this section show how to connect the PCIDM to various radios. This list is not complete. If you need to connect to a radio not shown here, and are not able to do so using the information provided in Section 6 Radio Interface, contact the ICI Support Desk using the information listed in Section 13 Contact Information.

## 7.1 RT-1523E SINCGARS (SDM) (NRZ)

**PCIDM V2 - ASIP - SDM - Cable**

ASIP = Ground SINCGARS = RT-1523E(C)/U
SDM = Synchronous Data Mode
NRZ = Non-Return-To-Zero
Radio Modes Supported: (PT)(CT)(SC)(FH)(DATA/VOICE)
ICI Part Number: P2C-ASIP-SDM



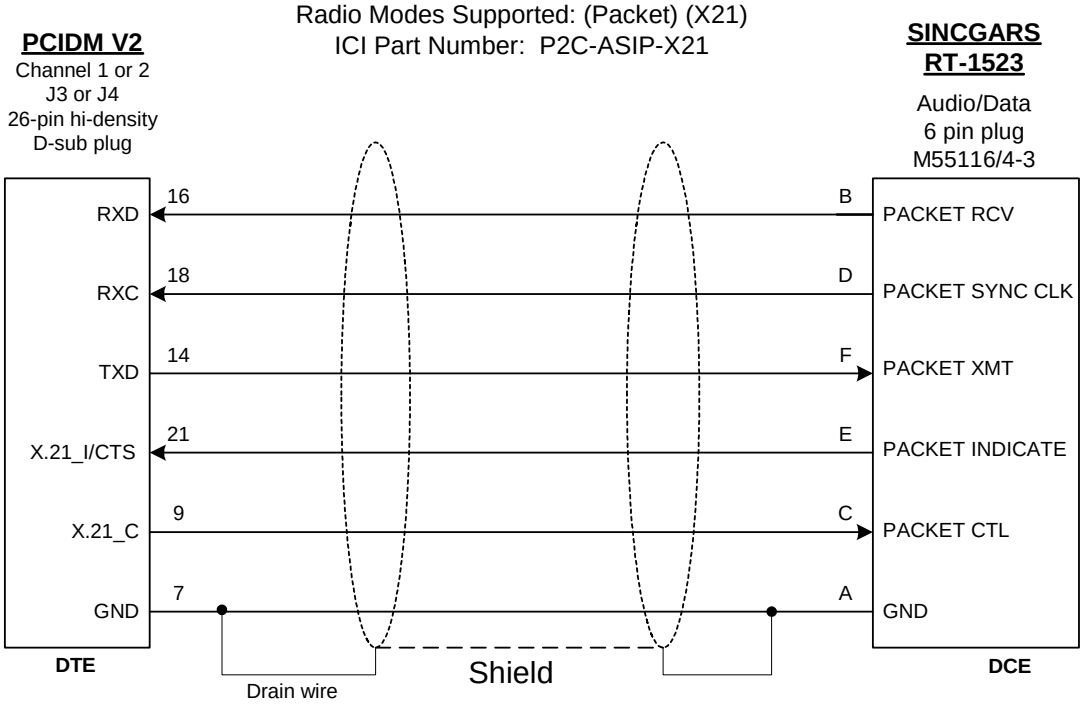

**PARTS**

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| M55116/4-3 | 6 position military AUDIO/DATA connector |

## 7.2 RT-1523E SINCGARS (PACKET) (X.21)

### PCIDM V2 - ASIP - X21 - Cable

ASIP = Ground SINCGARS = RT-1523E(C)/U
Radio Modes Supported: (Packet) (X21)
ICI Part Number: P2C-ASIP-X21



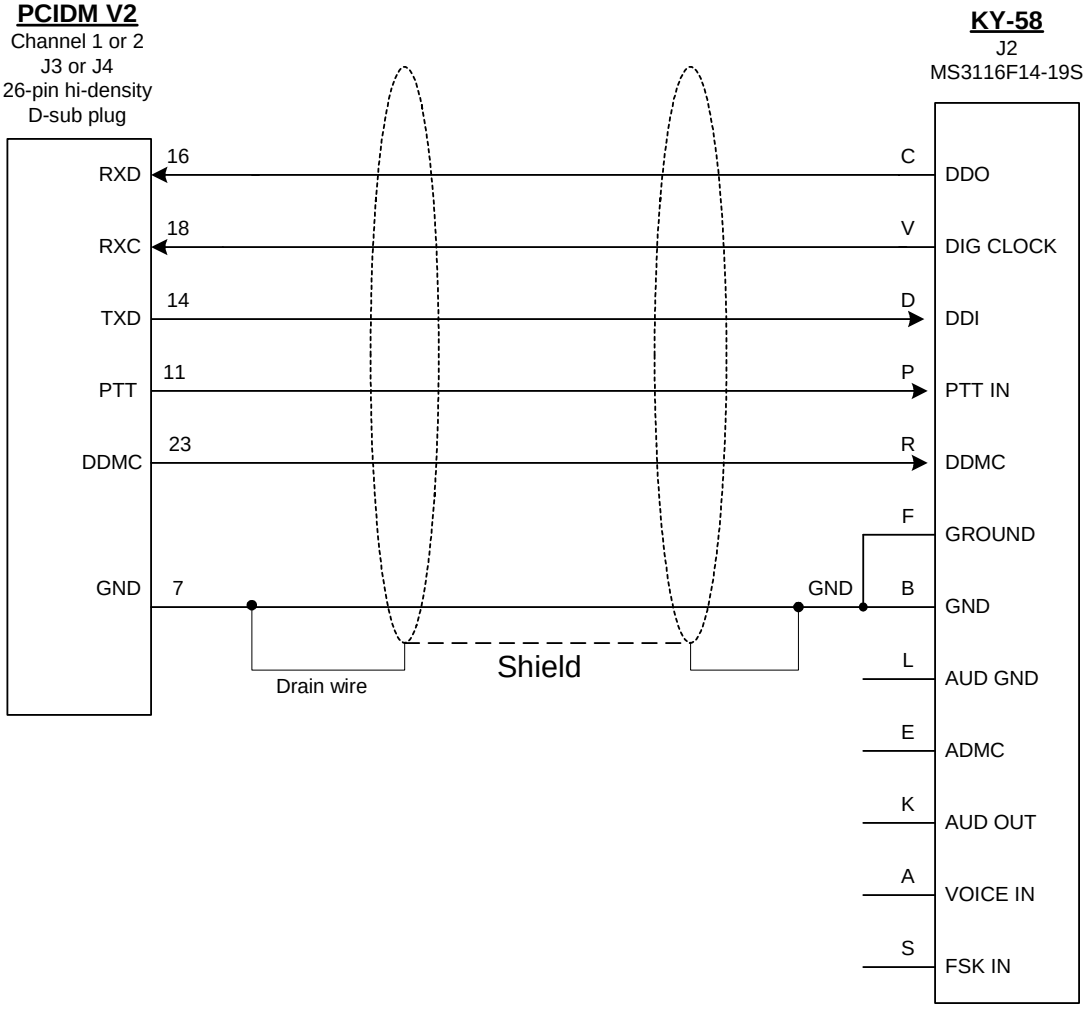

### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| M55116/4-3 | 6 position military AUDIO/DATA connector |

## 7.3 KY-58 (NRZ)

### PCIDM V2 - KY58 - Cable

(DIGITAL)(SDM)(16k) (MIL-STD-188-114) (DATA ONLY)
NRZ=Non-Return-To-Zero
ICI Part Number: P2C-KY-58




### Parts

| | |
|---|---|
| AMP 204503-1 | PCIDM V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7 conductor 24 AWG shielded PVC cable (0.2in O.D.) (National Wire & Cable Los Angles, CA) |
| MS3116F14-19S | KY-58-J2 SOCKET Connector (solder) (alt.: MS3126F14-19S, crimp) |
| NQ724FSJ | 7 conductor 24 AWG shielded PVC cable (0.2in O.D.) (National Wire & Cable Los Angles, CA) |

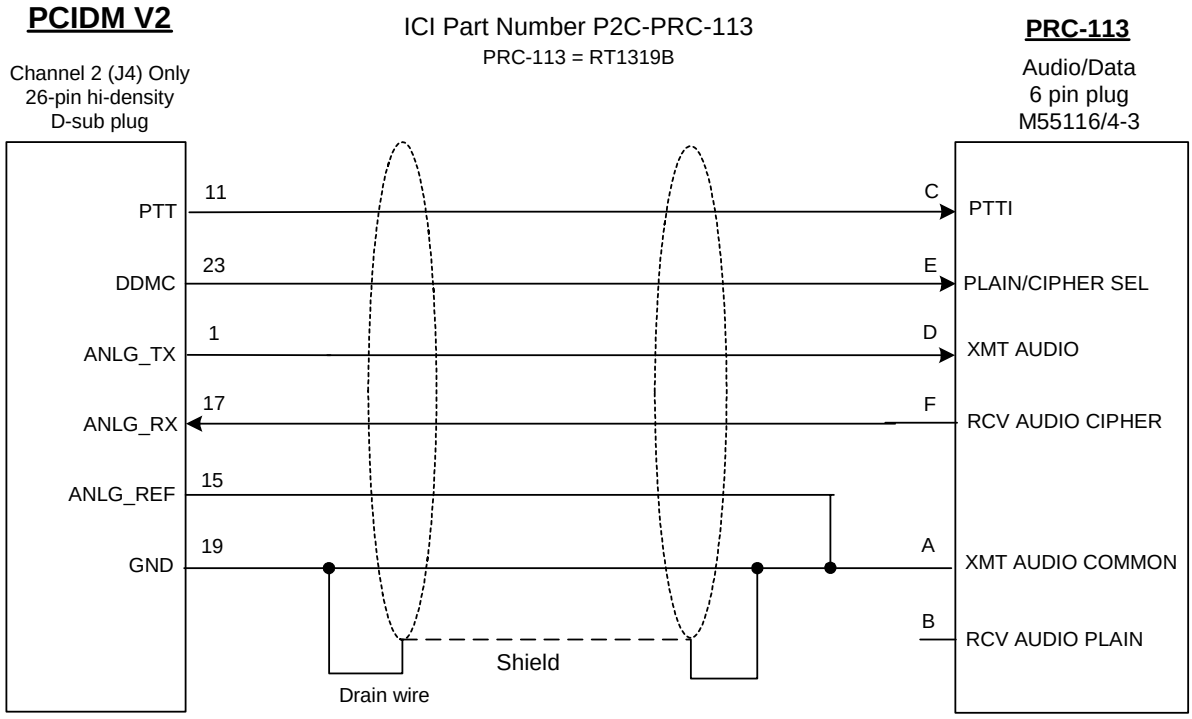
## 7.4 PRC-113 (ASK) (FSK)

**PCIDM V2 - PRC-113 Cable**

Asynchronous, ASK, FSK

ICI Part Number P2C-PRC-113

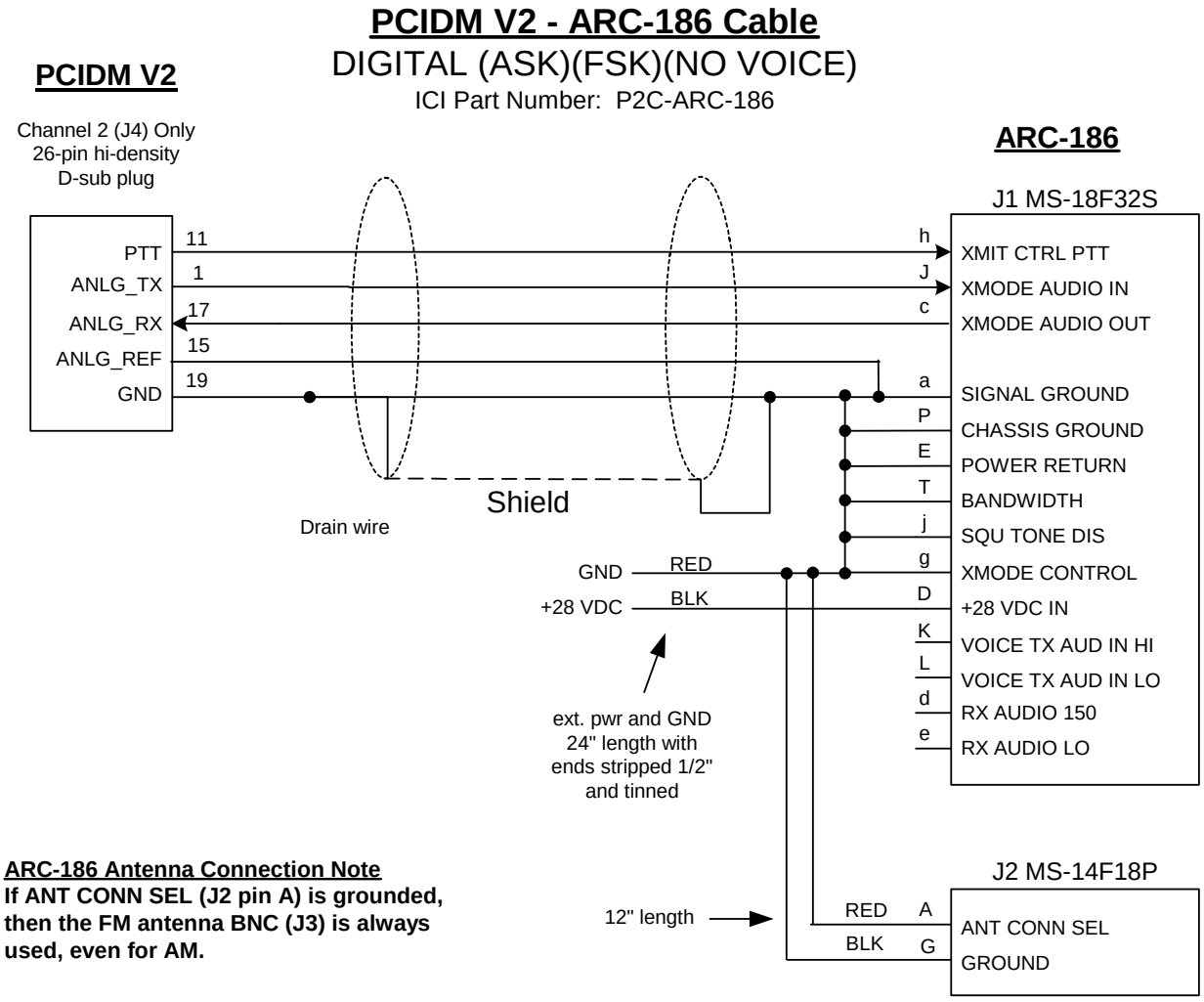
PRC-113 = RT1319B




### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| M55116/4-3 | 6 position military AUDIO/DATA connector |

## 7.5 ARC-186 (ASK) (FSK)




**ARC-186 Antenna Connection Note**
**If ANT CONN SEL (J2 pin A) is grounded, then the FM antenna BNC (J3) is always used, even for AM.**

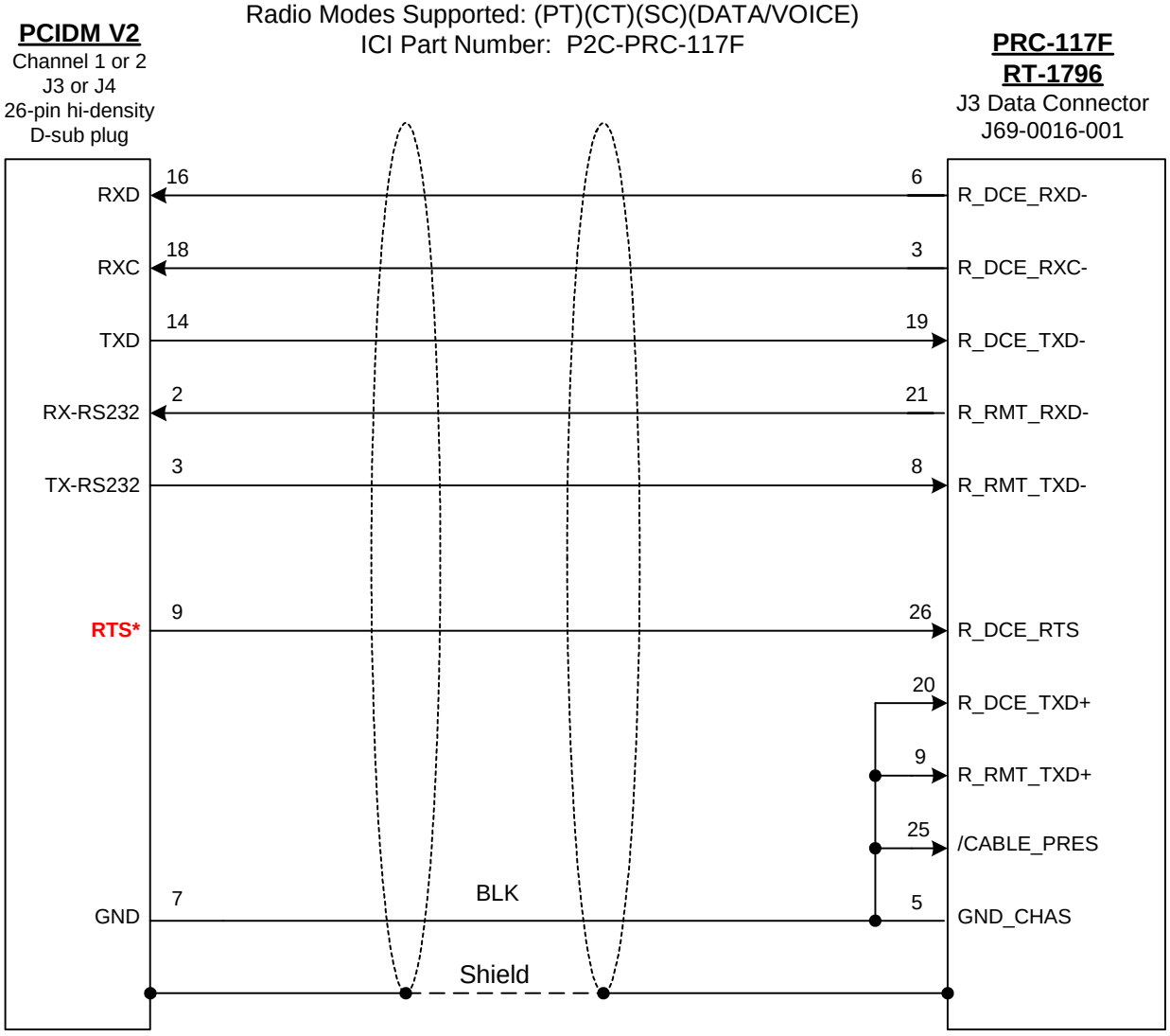
### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| MS27484T18F32S | MS-18F32S SOCKET (ARC-186-J1) |
| MS27506F18-2 | MS-18F32S BACKSHELL |
| MS27484T14F18P | MS-14F18P PLUG (ARC-186-J2) |
| MS27506F14-2 | MS-14F18P BACKSHELL |
| Belden 9409 | 1 pair 18 AWG (from J1 (MS-18F32S) to J2 (MS-14F18P) and from J1 to ext. pwr and GND |
| McMasterCarr 9035A220 | 3/8" cable clamp screws replaces supplied screws on J2 MS-14F18P |
| McMasterCarr 9035A270 | 1/2" cable clamp screws replaces supplied screws on J1 MS-18F32S |

## 7.6 PRC-117F (NRZ)

### PCIDM V2 R2 - PRC-117F - Cable

Radio: PRC-117F = RT-1796
Radio Interface: NRZ = Non-Return-To-Zero
Radio Modes Supported: (PT)(CT)(SC)(DATA/VOICE)
ICI Part Number: P2C-PRC-117F




### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| J69-0016-001 | Harris matting connector for PRC-117F J3 Data Connector (Harris Corp. 714-244-5830) |
| 031M6-ISOFS300NF1603-6S | Isodyne backshell and heatshrink boot (Isodyne Inc 316-682-5634) (Harris #J09-0039-001) |

### NOTE:

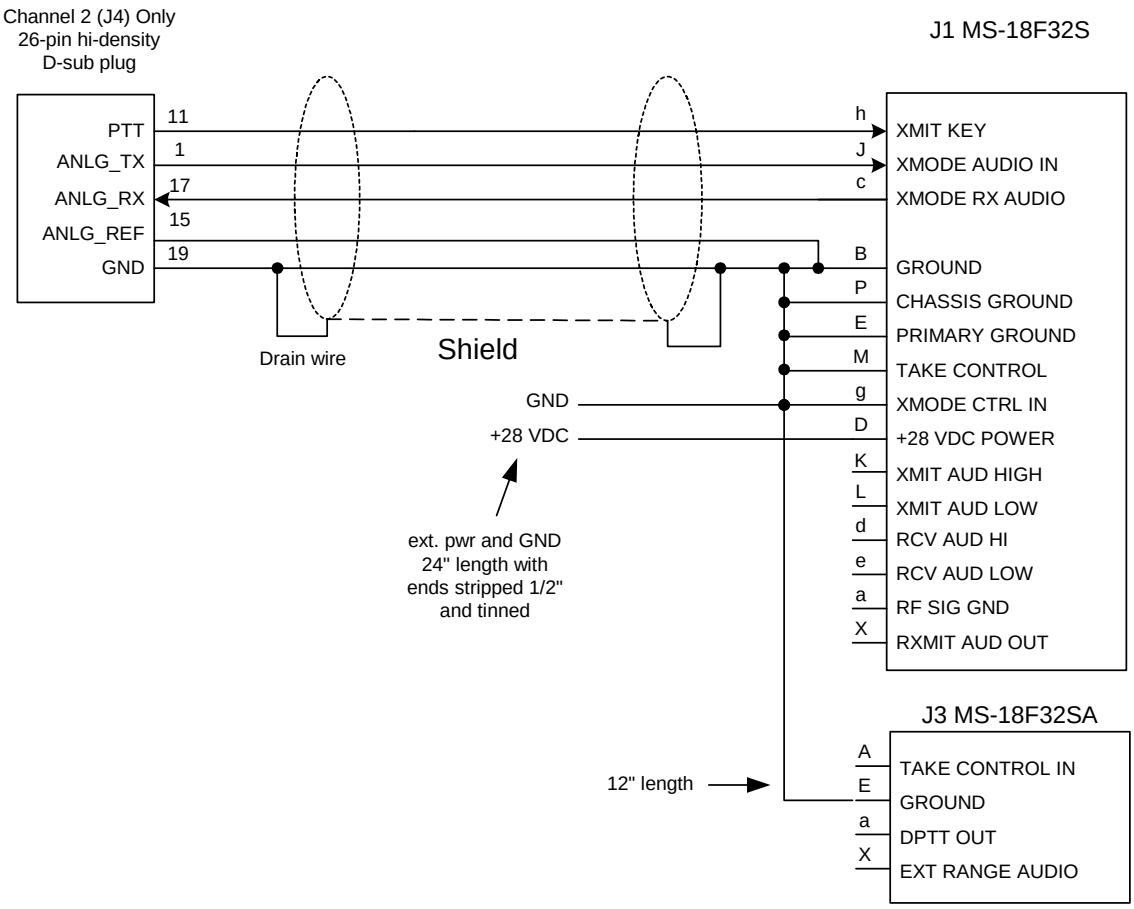
**PCIDM V2 R2 is Required for this cable. The RTS signal required for this cable is available only on PCIDM V2 units with serial numbers 350 or greater.**

## 7.7 ARC-164 (ASK) (FSK)

**PCIDM V2 - ARC-164 Cable**

DIGITAL (ASK) (SC) (NO VOICE)

ICI Part Number P2C-ARC-164-ASK



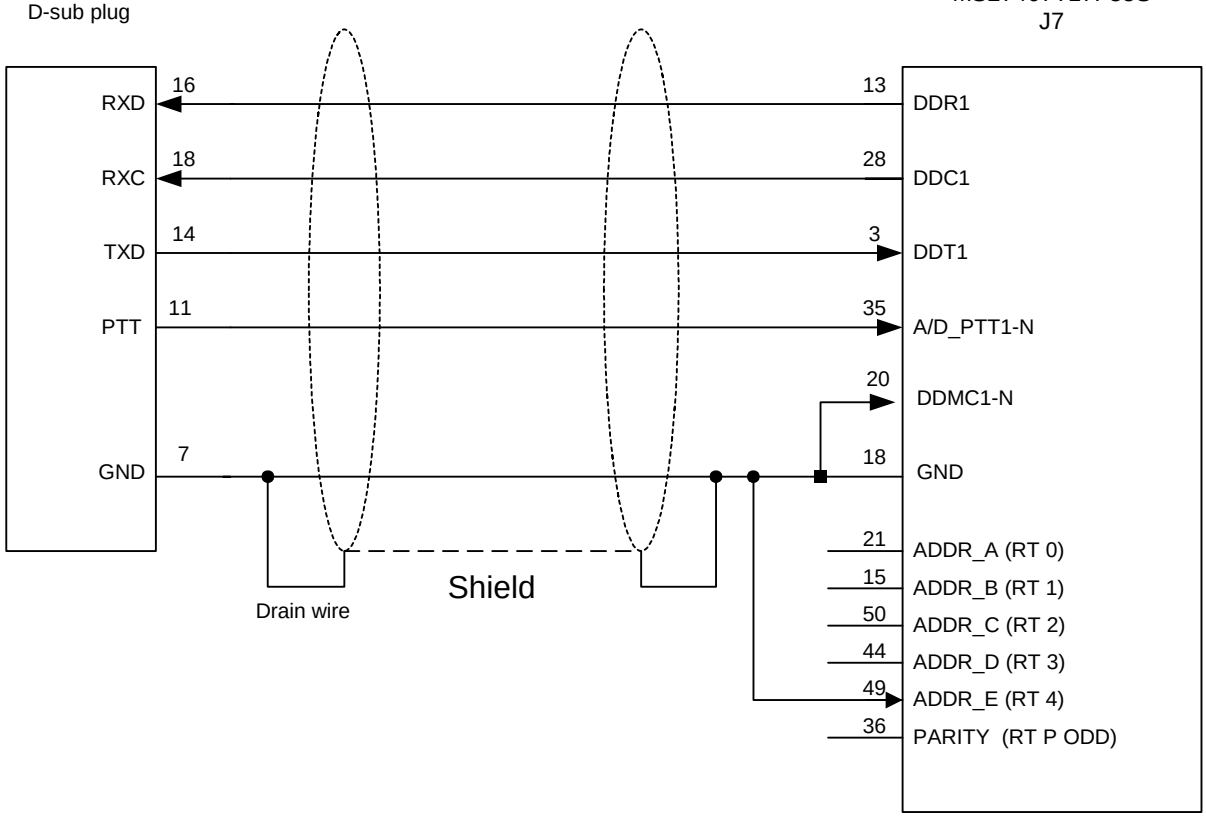

### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| J69-0016-001 | Harris matting connector for PRC-117F J3 Data Connector (Harris Corp. 714-244-5830) |
| 031M6-ISOFS300NF1603-6S | Isodyne backshell and heatshrink boot (Isodyne Inc 316-682-5634) (Harris #J09-0039-001) |
| MS27484T18F32S | MS-18F32S SOCKET (ARC-164-J1) |
| MS27506F18-2 | MS-18F32S BACKSHELL |
| MS27473T18F32SA | MS-18F32SA SOCKET (ARC-164-J3) |
| MS27506F18-2 | MS-18F32SA BACKSHELL |
| Belden 9409 | 1 pair 18 AWG (from J1 (MS-18F32S ) to J3 (MS-18F32SA) and from J1 to ext. pwr and GND |
| McMasterCarr 9035A270 | 1/2" cable clamp screws replace supplied screws on J1 MS-18F32S |
| McMasterCarr 9035A220 | 3/8" cable clamp screws replace supplied screws on J2 MS-14F18P |

## 7.8 ARC-201D (NRZ)

### PCIDM V2 - ARC-201D SDM - Cable

(DIGITAL) (NRZ) (MIL-STD-188-114) (NO VOICE)
ICI Part Number: P2C-ARC-201D-SDM
RT Address = 15
ARC-201D SDM data modes supported:
600, 1200, 2400, 4800, 9600, 16k



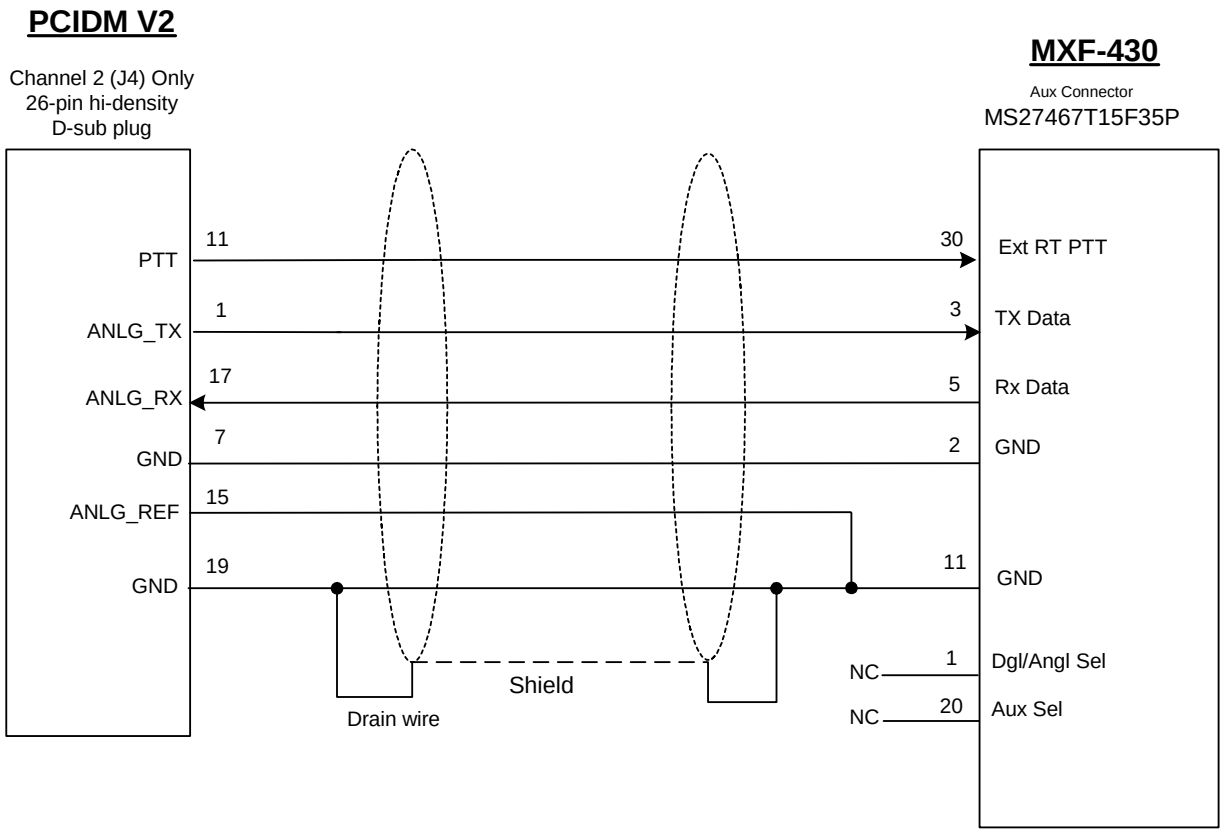

### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| J69-0016-001 | Harris matting connector for PRC-117F J3 Data Connector (Harris Corp. 714-244-5830) |
| 031M6-ISOFS300NF1603-6S | Isodyne backshell and heatshrink boot (Isodyne Inc 316-682-5634) (Harris #J09-0039-001) |
| MS27467T17F35S | ARC-201D (J7) Plug |
| MS27506F16-2 | ARC-201D (J7) Strain Relief |

## 7.9 MXF-430 (ASK)

# PCIDM V2 - MXF-430-ASK

MXF-430 = Raytheon MXF-430
**Asynchronous (ASK 16kbps Only)**
Radio Modes Supported:(DATA/PT)(VOICE)
ICI Part Number P2C-MXF-430-ASK




## PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| MS27467T15F35P | Mil-C-38999 Mil circular connector with backshell and strain relief olive drab finish |

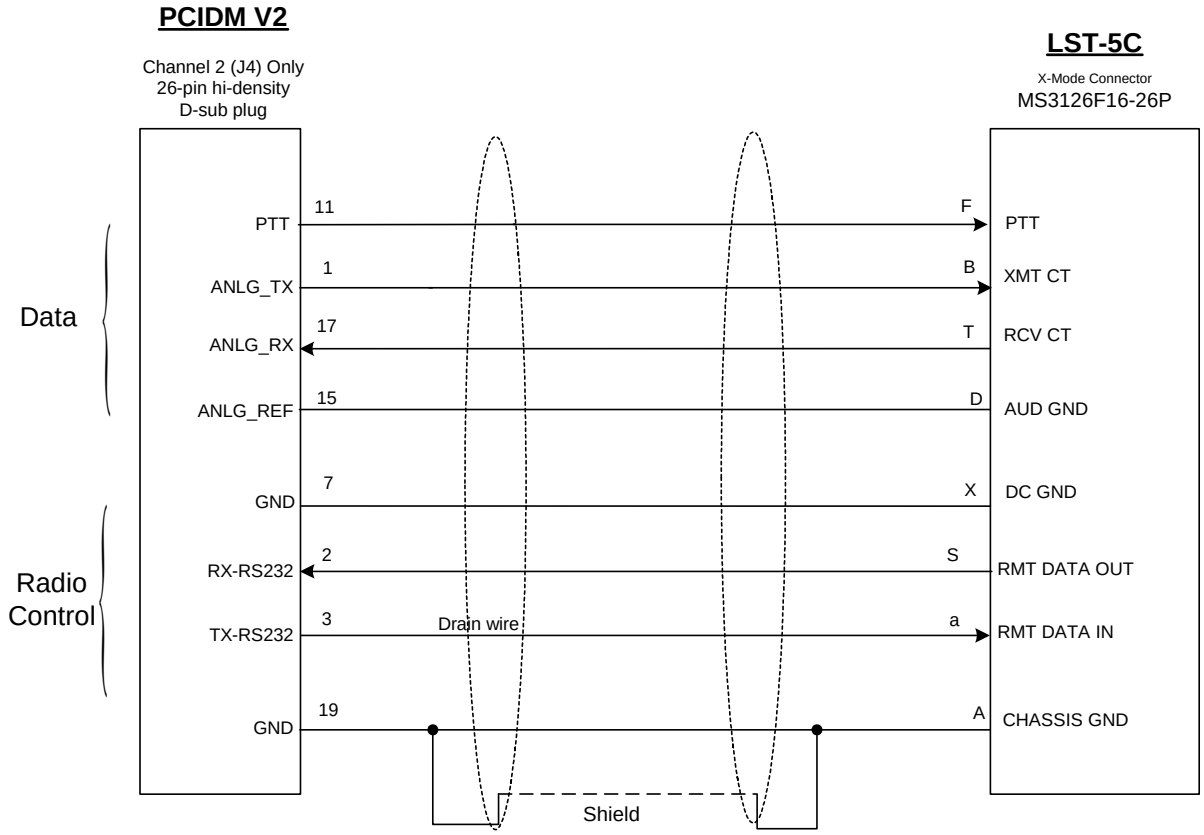
## ADDITIONAL REQUIREMENTS

MXF-430 Aux Connector Pin 1 (Dgl/AnlgSel) No Connection
MXF-430 Aux Connector Pin 20 (Aux Sel) No Connection
MXF-430 when set to Data Mode (Operate Menu has "D") Tx and Rx data is possible, voice operation is not possible. In data mode the radios internal modem digitizies the recieved data and presents this at the aux interface.
MXF-430 when set to Voice Mode (Operate Menu has "V") Tx and Rx voice (over the handset) is possible and Rx data (via the aux connector) is possible. Tx of data is not possible in Voice mode.

## 7.10 LST-5C (ASK)

### PCIDM V2 - LST-5C-ASK

General Dynamics (orig made by Motorola) LST-5c
**Asynchronous (ASK/FSK 16Kbps)**
Radio Modes Supported:(DATA/Voice/PT/Radio Control)
ICI Part Number P2C-LST5C-ASK




### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| MS3126F16-26P | Mil-C-26482 Series 1 connector with backshell and strain relief olive drab finish. Contacts require 20AWG. |

### RADIO SETTINGS

The LST-5c must be set to CT in order for this cable to work.
The LST-5c does not have a crypto built in.
CT means wideband. Voice over the handest is possible in CT mode.
The LST-5c internal modem must be off.
The radio can be controlled via the remote control interface.

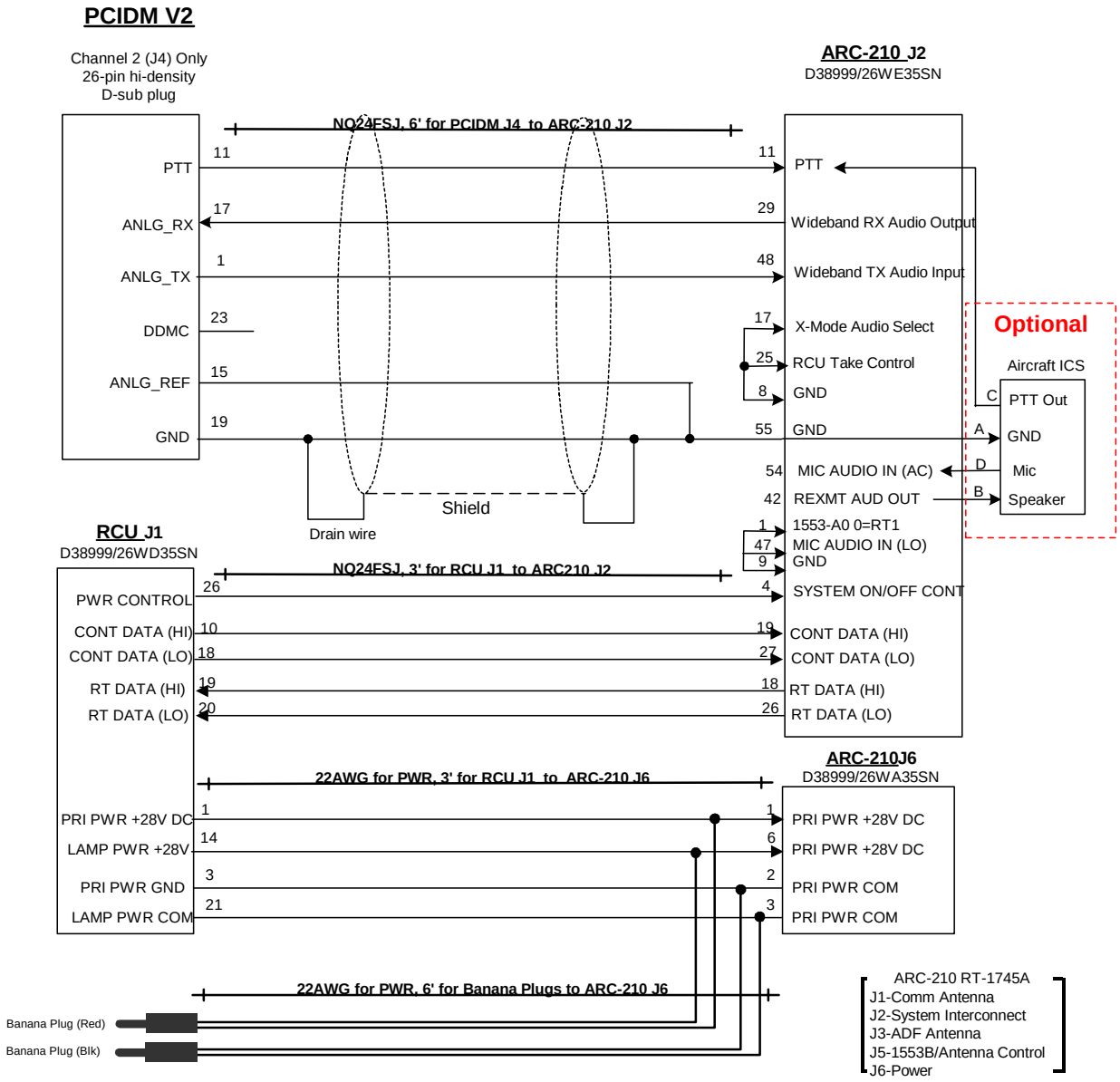
## 7.11 ARC-210 (ASK)

**PCIDM V2 - ARC-210 Cable**

Asynchronous, ASK, FSK (Data/Voice/PT)(16Kbps)

RT-1745A

ICI Part Number P2C-ARC-210-ASK



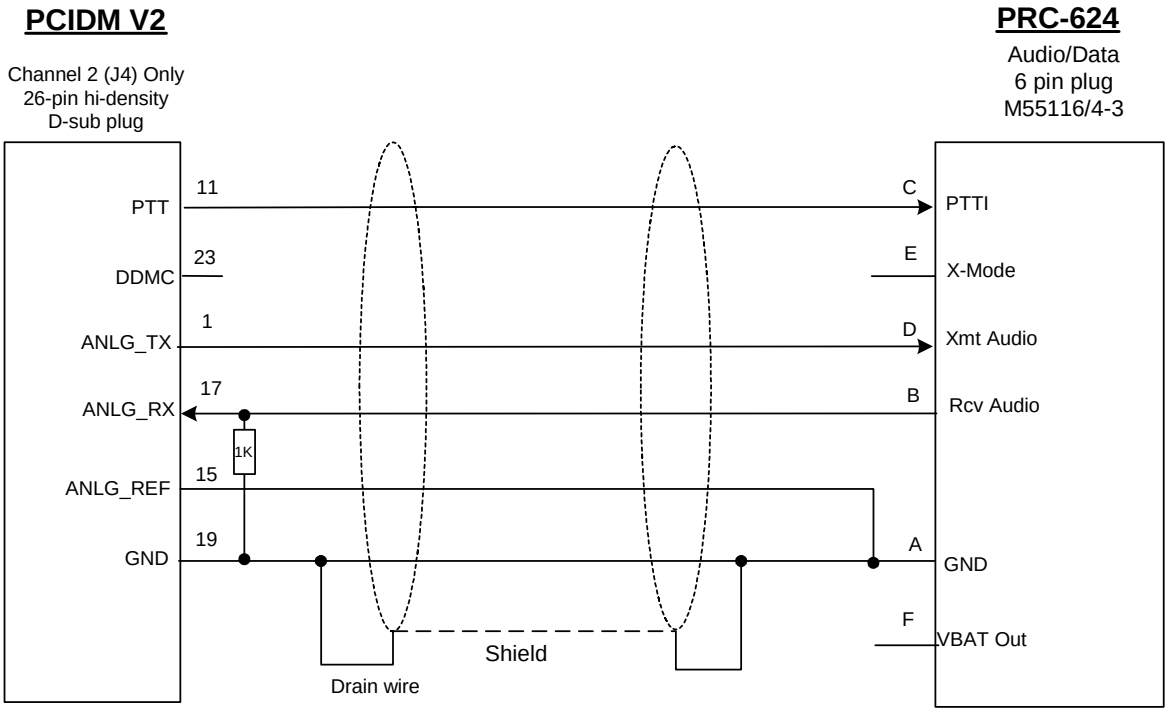

**Parts**

| | |
|---|---|
| AMP 204503-1 | PCIDM V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7 conductor 24 AWG shielded PVC cable (0.2in O.D.) (National Wire & Cable Los Angles, CA) |

## 7.12 PRC-624 (FSK)

### PCIDM V2 - PRC-624 FSK Cable

PRC-624 = RT-624
Analog/Asynchronous/FSK (1200bps)
Radio Modes Supported:(DATA, NO VOICE)
ICI Part Number P2C-PRC-624-FSK




### PARTS

| | |
|---|---|
| AMP 204503-1 | PCIDM (V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position hi-density male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| NQ724FSJ | 7-conductor 24 AWG shielded PVC cable (0.2-in O.D.) (National Wire & Cable, Los Angeles, CA) |
| M55116/4-3 | 6 position military AUDIO/DATA connector |
| | 1 K-ohm resistor |

### NOTES

Squelch on the PRC-624 must be off.
The volume knob on the PRC-624 must be set to just under the maximum level.

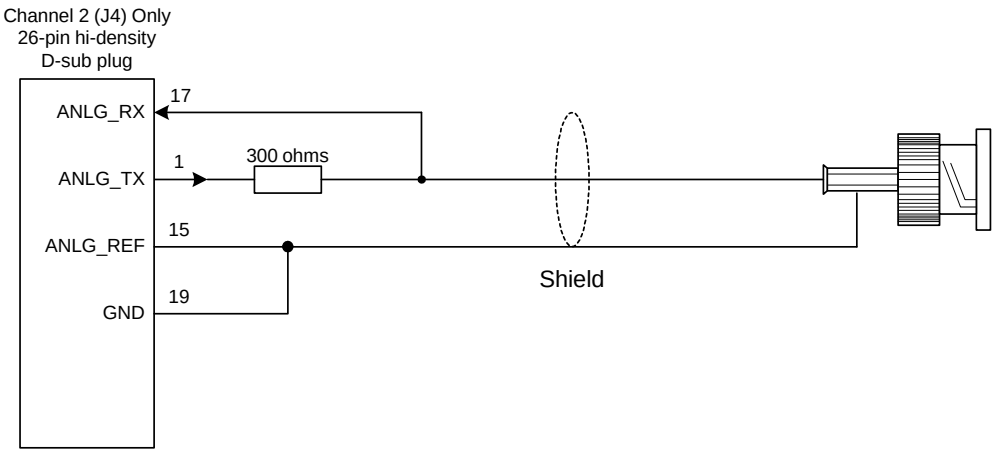
## 7.13 Analog BNC cable (ASK)(FSK)

Analog BNC cables can be used to connect several PCIDM cards in ASK or FSK mode without using radios.

**PCIDM V2 - Analog BNC - Cable**

For use with PCIDM V2 Channel 2 only
Modulation Modes Supported: (ASK) (FSK)
ICI Part Number: P2C-ABC-1

**PCIDM V2**




**Parts**

| | |
|---|---|
| AMP 204503-1 | PCIDM V2 (J3, J4) 26-position hi-density D-sub male connector (MIL-C-24308) |
| AMP 204370-2 | Crimp pins for 26-position male connector (MIL-C-24308) **Crimp tool required |
| AMP 748677-2 | Shielded plastic cable clamp kit for 26-position connector with 4-40 jack screws |
| Amphenol 31-315 | BNC 50 ohm RG-174 crimp plug |
| RG-174/U | 50 ohm coax cable |
| Resistor | 300 ohm, 1/4watt, axial, carbon film resistor |

# 8 Theory of Operation

## 8.1 Block Diagram

Figure 10 shows the simplified block diagram that describes the PCIDM protocol stack.

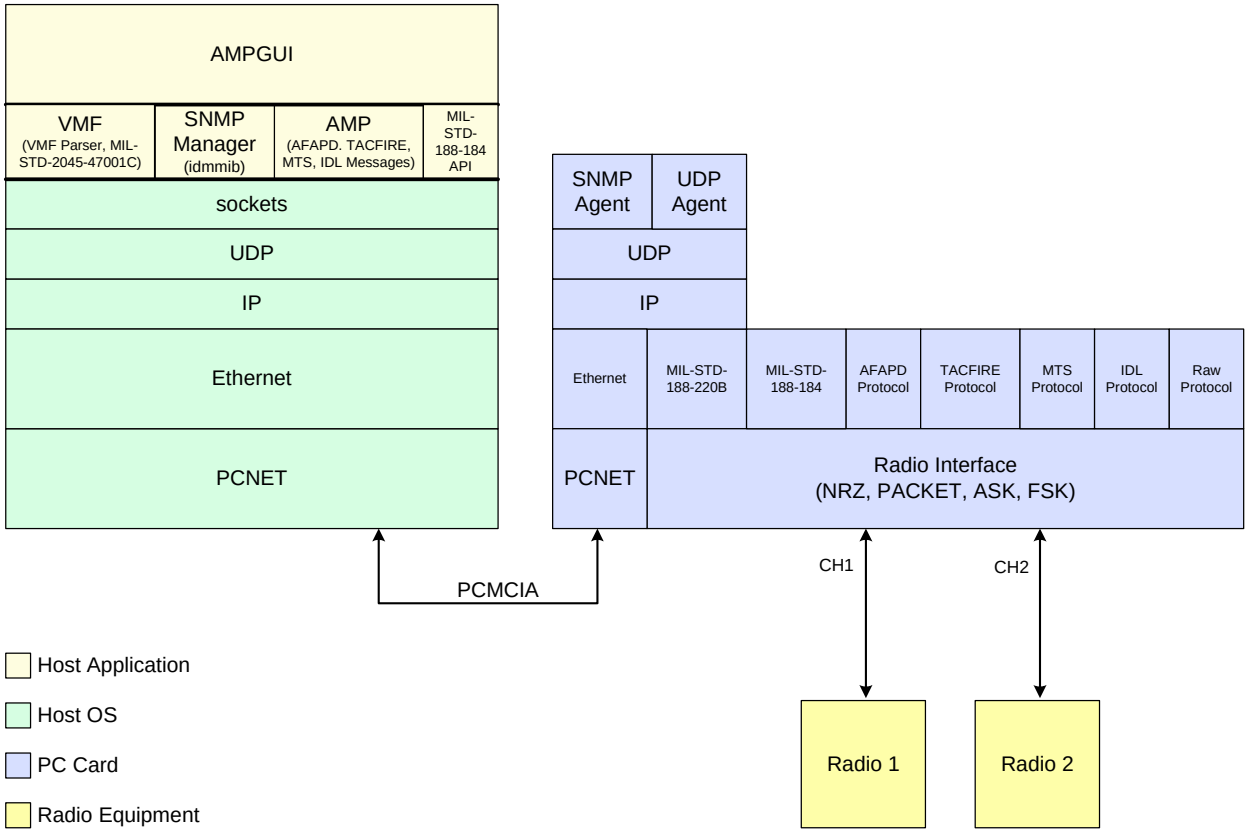



**Figure 10: PCIDM Protocol Stack Simplified Block Diagram**

## 8.2 Simple Static Internet Network

The diagram shown in Figure 11 shows two PCIDM cards configured for Static Internet (SI). Static Internet uses static IP routes and MIL-STD-188-220 Type-2 with 7 bit station addresses.

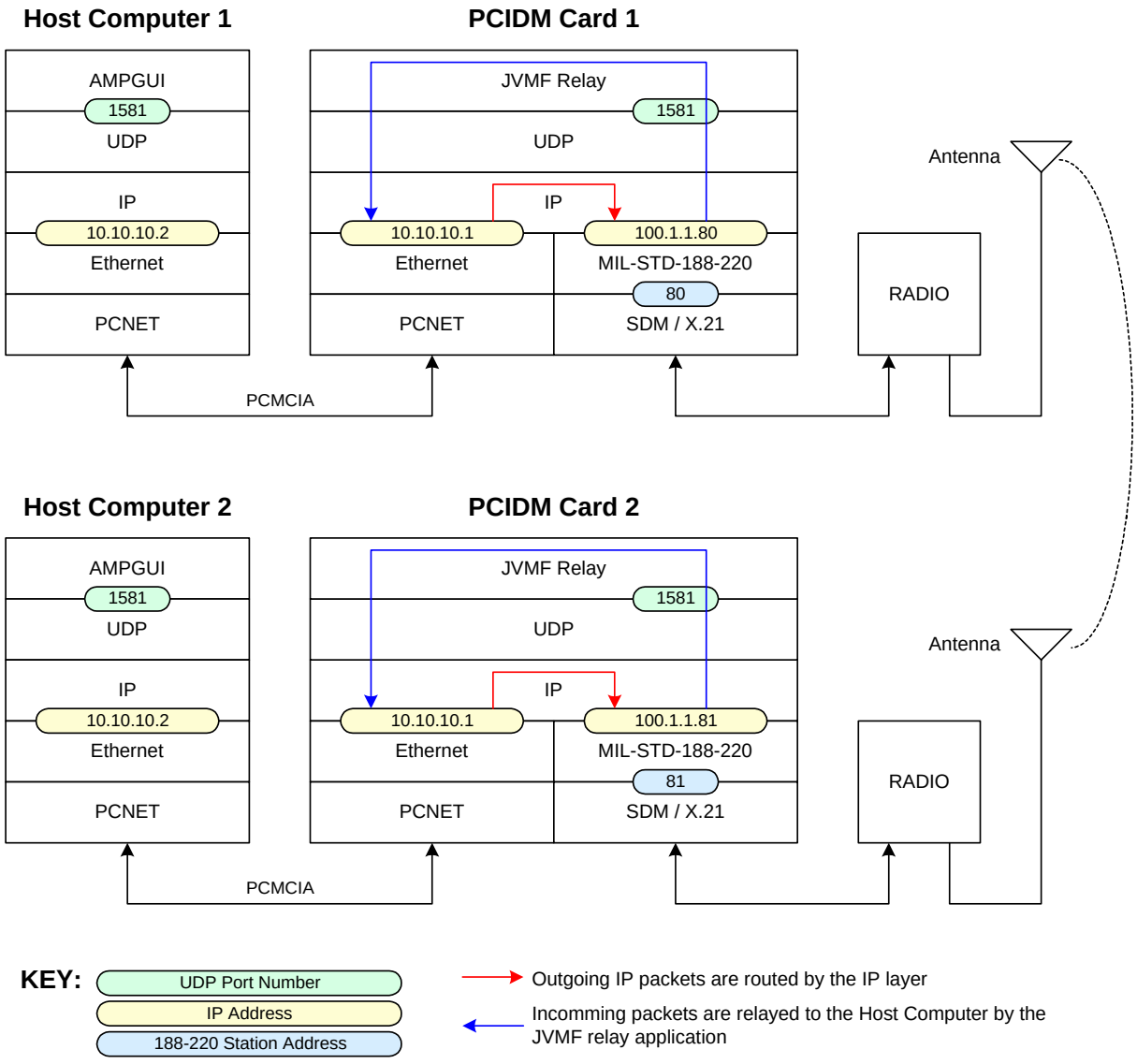



**Figure 11: Static Internet Configuration Diagram**

### 8.2.1 VMF transmission via the Static Internet network

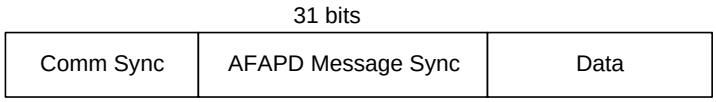
The following list describes the steps performed by the PCIDM software in transmitting a JVMF message from Host Computer 1 to Host Computer 2.

1. AMPGUI on Host Computer 1 is used to send a VMF message to URN 81.
2. The Unit Host table is used to determine that URN 81 maps to IP address 100.1.1.81.
3. The JVMF body is encoded.
4. The JVMF header is encoded.
5. The JVMF message is sent via UDP / IP:
   Source IP: 10.10.10.2
   Destination IP: 100.1.1.81
   Source Port: 1581
   Destination Port: 1581
6. Host Computer 1 route table lookup for destination IP 100.1.1.81 matches:
   Destination: 0.0.0.0 (default route)
   Net Mask: 0.0.0.0
   Next Hop: 10.10.10.1
   Interface: 10.10.10.2
7. Host Computer 1 transmits the IP packet via the 10.10.10.2 interface.
8. The packet is transferred over the PCMCIA interface.
9. PCIDM Card 1 receives the IP packet via the 10.10.10.1 interface.
10. PCIDM Card 1 route table lookup for destination IP 100.1.1.81 matches:
    Destination: 100.1.1.0
    Net Mask: 255.255.0.0
    Next Hop: 100.1.1.80
    Interface: 100.1.1.80
11. PCIDM Card 1 transmits the IP packet via the 100.1.1.80 interface.
12. The packet is transmitted by one radio and received by the other radio
13. PCIDM Card 2 receives the IP packet via the 100.1.1.81 interface.
14. The destination IP address matches a PCIDM Card 2 IP address.
15. The IP payload is sent up to the UDP layer.
16. The destination UDP port is 1581.
17. The UDP payload is sent to the VMF relay application.
18. The VMF relay application sends the UDP payload to 10.10.10.2 via UDP / IP.
19. PCIDM Card 2 route table lookup for destination IP 10.10.10.2 matches:
    Destination: 10.10.10.0
    Net Mask: 255.255.255.0
    Next Hop: 10.10.10.1
    Interface: 10.10.10.1
20. PCIDM Card 2 transmits the IP packet via the 10.10.10.1 interface.
21. The packet is transferred over the PCMCIA interface.
22. Host Computer 2 receives the IP packet via the 10.10.10.2 interface.
23. The destination IP address matches a Host Computer 2 IP address.
24. The IP payload is sent up to the UDP layer.
25. The destination UDP port is 1581.
26. The UDP payload is sent to AMPGUI.
27. The VMF message header decoded.
28. The VMF message payload is decoded.

## 8.3 AFAPD Transmission Formats

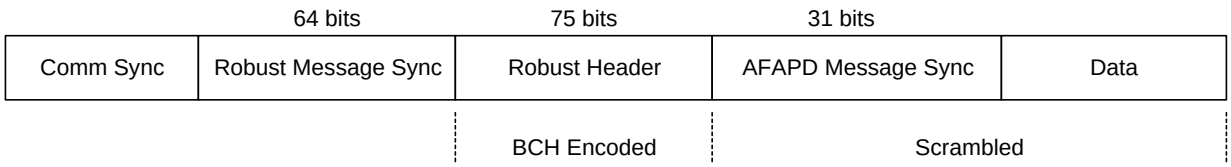
AFAPD is usually transmitted using ASK modulation at 16000 bits/second. Figure 12 shows the AFAPD transmission formats.

**AFAPD TRANSMISSION FORMAT**




AFAPD Message Sync = 11111001 10100100 00101011 1011000

**AFAPD ROBUST TRANSMISSION FORMAT**




Robust Message Sync = 01001001 11001100 11101101 10111111 00000010 01101101 01011110 00111000

Robust Header For Scrambing (BCH encoded) =11000101 11011111 10001011 10111111 00010111 01111110 00101110 11111100 01011101 111

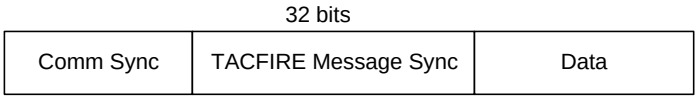
AFAPD Message Sync (unscrambled) = 11111001 10100100 00101011 1011000

**Figure 12: AFAPD Transmission Formats**

## 8.4 TACFIRE Transmission Formats

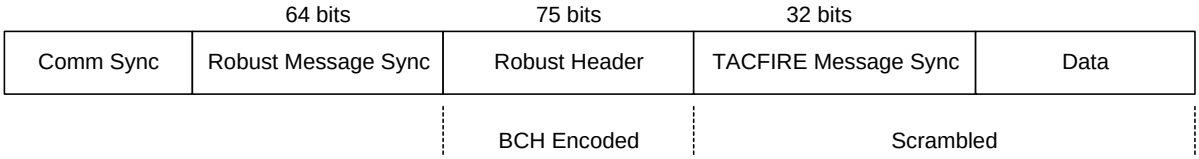
TACFIRE is usually transmitted using FSK modulation at 1200 bits/second. Figure 13 shows the TACFIRE transmission formats.

**TACFIRE TRANSMISSION FORMAT**




TACFIRE Message Sync = 01101000 01101000 01101000 11110001

**TACFIRE ROBUST TRANSMISSION FORMAT**




Robust Message Sync = 01001001 11001100 11101101 10111111 00000010 01101101 01011110 00111000

Robust Header For Scrambing (BCH encoded) =11000101 11011111 10001011 10111111 00010111 01111110 00101110 11111100 01011101 111

TACFIRE Message Sync (unscrambled) = 01101000 01101000 01101000 11110001

**Figure 13: TACFIRE Transmission Formats**

## 8.5 Internet Group Management Protocol (IGMP)

The Internet Group Management Protocol (IGMP) is used by IP hosts to report their host group memberships to any immediately-neighboring multicast routers. Like ICMP, IGMP is an integral part of IP. It is required to be implemented by all hosts conforming to level 2 of the IP multicasting specification. IGMP messages are encapsulated in IP datagrams, with an IP protocol number of 2. All IGMP messages of concern to hosts have the formats shown in Figure 14.

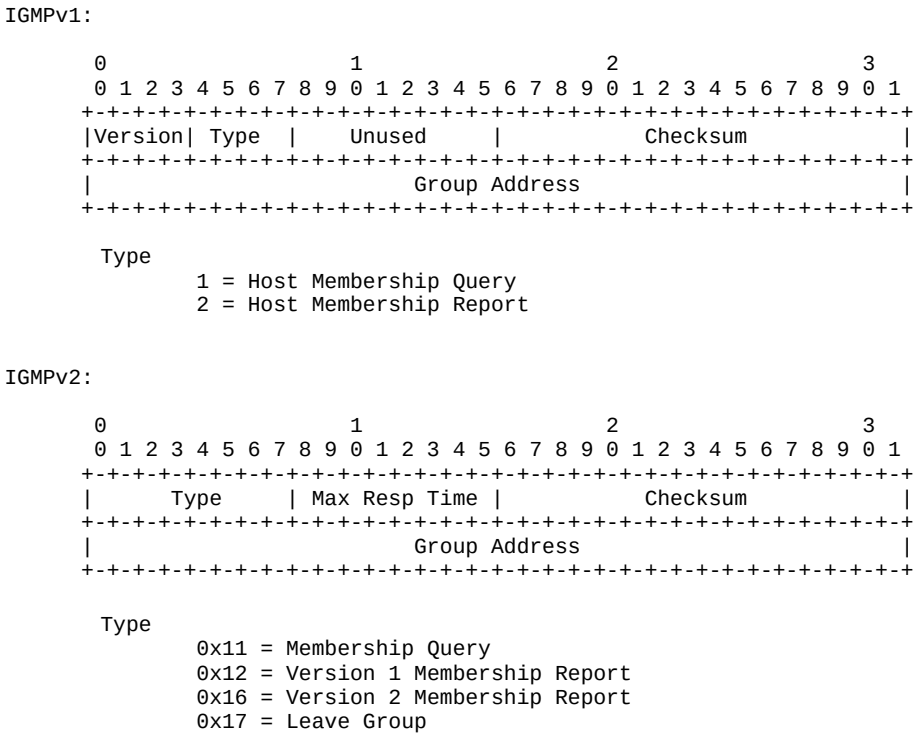



**Figure 14: IGMP Message Formats**

**Informal IGMP Protocol Description**

Multicast routers send Host Membership Query messages (hereinafter called Queries) to discover which host groups have members on their attached local networks. Queries are addressed to the all-hosts group (address 224.0.0.1), and carry an IP time-to-live of 1. Hosts respond to a Query by generating Host Membership Reports (hereinafter called Reports), reporting each host group to which they belong on the network interface from which the Query was received. In order to avoid an "implosion" of concurrent Reports and to reduce the total number of Reports transmitted, several techniques are used.

Reference RFC-1112 and RFC-2236 for more information.

## 8.6 ICMP Router Discovery (RFC-1256)

Before a host can send IP datagrams beyond its directly-attached subnet, it must discover the address of at least one operational router on that subnet. Typically, this is accomplished by reading a list of one or more router addresses from a (possibly remote) configuration file at startup time. On multicast links, some hosts also discover router addresses by listening to routing protocol traffic. Both of these methods have serious drawbacks: configuration files must be maintained manually -- a significant administrative burden -- and are unable to track dynamic changes in router availability; eavesdropping on routing traffic requires that hosts recognize the particular routing protocols in use, which vary from subnet to subnet and which are subject to change at any time. This document specifies an alternative router discovery method using a pair of ICMP [10] messages, for use on multicast links. It eliminates the need for manual configuration of router addresses and is independent of any specific routing protocol.

The ICMP router discovery messages are called "Router Advertisements" and "Router Solicitations". Each router periodically multicasts a Router Advertisement from each of its multicast interfaces, announcing the IP address(es) of that interface. Hosts discover the addresses of their neighboring routers simply by listening for advertisements. When a host attached to a multicast link starts up, it may multicast a Router Solicitation to ask for immediate advertisements, rather than waiting for the next periodic ones to arrive; if (and only if) no advertisements are forthcoming, the host may retransmit the solicitation a small number of times, but then must desist from sending any more solicitations. Any routers that subsequently start up, or that were not discovered because of packet loss or temporary link partitioning, are eventually discovered by reception of their periodic (unsolicited) advertisements. (Links that suffer high packet loss rates or frequent partitioning are accommodated by increasing the rate of advertisements, rather than increasing the number of solicitations that hosts are permitted to send.)

The router discovery messages do not constitute a routing protocol: they enable hosts to discover the existence of neighboring routers, but not which router is best to reach a particular destination. If a host chooses a poor first-hop router for a particular destination, it should receive an ICMP Redirect from that router, identifying a better one.
A Router Advertisement includes a "preference level" for each advertised router address. When a host must choose a default router address (i.e., when, for a particular destination, the host has not been redirected or configured to use a specific router address), it is expected to choose from those router addresses that have the highest preference level. A network administrator can configure router address preference levels to encourage or discourage the use of particular routers as default routers.

A Router Advertisement also includes a "lifetime" field, specifying the maximum length of time that the advertised addresses are to be considered as valid router addresses by hosts, in the absence of further advertisements. This is used to ensure that hosts eventually forget about routers that fail, become unreachable, or stop acting as routers.

The default advertising rate is once every 7 to 10 minutes, and the default lifetime is 30 minutes. This means that, using the default values, the advertisements are not sufficient as a mechanism for "black hole" detection, i.e., detection of failure of the first hop of an active path -- ideally, black holes should be detected quickly enough to switch to another router before any transport

connections or higher-layer sessions time out. It is assumed that hosts already have mechanisms for black hole detection, as required by [1]. Hosts cannot depend on Router Advertisements for this purpose, since they may be unavailable or administratively disabled on any particular link or from any particular router. Therefore, the default advertising rate and lifetime values were chosen simply to make the load imposed on links and hosts by the periodic multicast advertisements negligible, even when there are many routers present. However, a network administrator who wishes to employ advertisements as a supplemental black hole detection mechanism is free to configure smaller values.

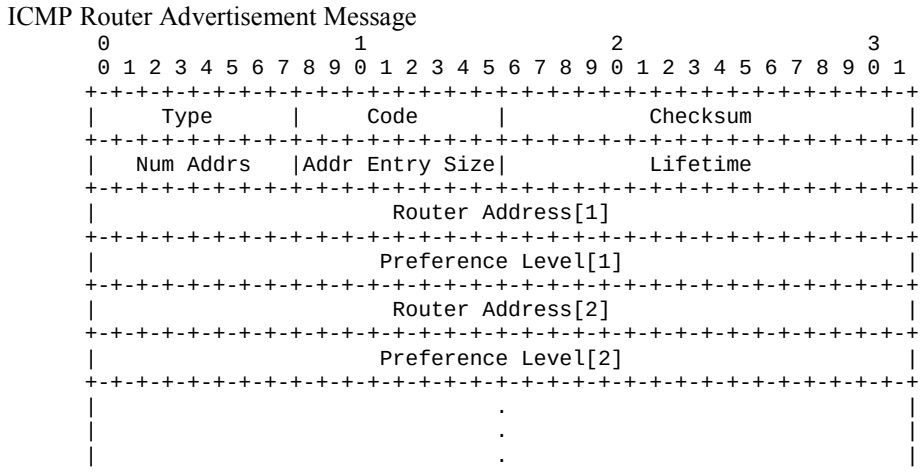



**Figure 15: ICMP Router Advertisement Message**

## 8.7 Passive ARP (PARP)

Passive Address Resolution Protocol (PARP) is an extension of Address Resolution Protocol (ARP). Passive ARP populates the ARP table with static entries using the source MIL-STD-188-220 link layer address and source IP address from received IP packets. ARP table entries added by PARP are static. Static ARP table entries to not age or expire, like normal ARP table entries.

Reinitializing an interface (channel) has a side effect of clearing the active ARP table. Passive ARP is included for interoperability with the F/A-18 and DCS-2000.

Passive ARP SNMP MIB settings are defined by:

"c:\program files\pcidm\mibs\ici-protocol-ip-parp-mib.txt"

Passive ARP can be enabled by using AMPGUI MIB Loader to load:

"c:\program files\pcidm\mcf\set-passive-arp.mcf"

# 9 PCIDM Remote Control

Figure 16 and the following procedure describe how to configure a remote computer, host computer, and PCIDM card, such that the remote computer can access the PCIDM card.

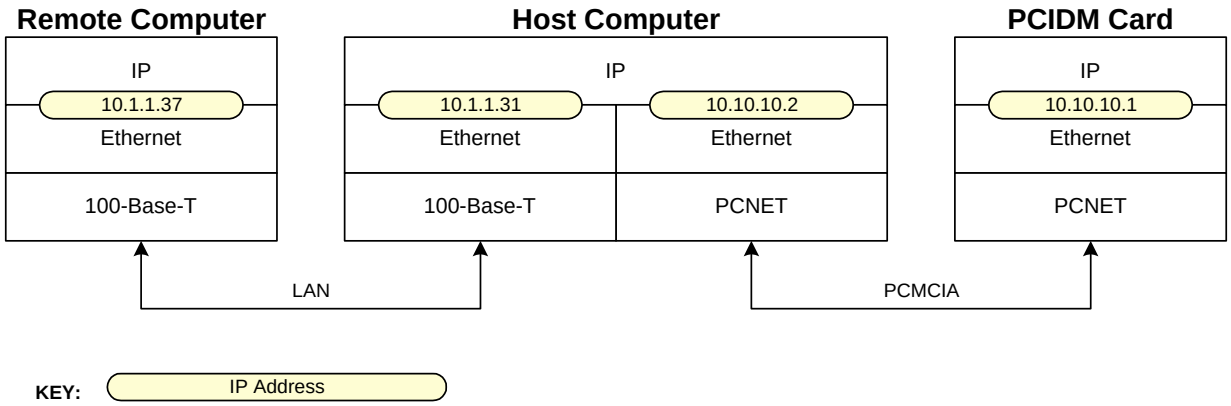



**Figure 16: PCIDM Remote Control**

1. Make sure IP forwarding is enabled on the host computer

Windows NT:

a. Right Click **Network Neighborhood**.
b. Select **Protocols** tab.
c. Select **TCP/IP**.
d. Click **Properties** button.
e. Select **Routing** tab.
f. Check **Enable IP Forwarding**.

Windows 2000/XP:

a. Start **regedit.exe**.
b. Go to `HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters`.
c. Double click **IPEnableRouter**.
d. Set the value to **1**.
e. Click **OK**.
f. Close regedit.
g. Reboot the machine.

Windows 98/ME

a. Start **regedit.exe**.
b. Go to `HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\VxD\MSTCP`
c. Click **Edit** > **New** > **String Value**.
d. Change the name to **EnableRouting**.
e. Double click **EnableRouting**.
f. Set the value to **1**.
g. Click **OK**.
h. Close **regedit**.
i. Reboot the machine.

2. Add a route on the remote computer to describe how to reach the PCIDM card.
   Type the following command on the remote computer:
   ```
   route add 10.10.10.1 10.1.1.31
   ```
   The route on the remote machine will not persist through a reboot.

3. Add a route on the PCIDM card to describe how to reach the remote computer.
   Execute the following steps on the host computer:
   a. Notepad "`c:\program files\pcidm\mcf\static_route.mcf`"
   b. Modify the file so that reads:
   ```
   set iciProtocolIpRouteIfIndex.1 5
   set iciProtocolIpRouteDest.1 10.1.1.37
   set iciProtocolIpRouteMask.1 255.255.255.0
   set iciProtocolIpRouteNextHop.1 10.10.10.2
   set iciProtocolIpRouteStatus.1 full
   set iciProtocolIpAdminCmd.0 reinitialize
   ```
   c. Run **Ampgui**.
   d. Click **Configure** > **Mib Loader**.
   Host: `10.10.10.1` (this is the address of the host to load the mib into (ie. The pcidm card))
   File: `c:\program files\pcidm\mcf\static_route.mcf`
   e. Click **load**.

The PCIDM PCNET interface is interface number 5, which corresponds to value assigned to the `iciProtocolIpRouteIfIndex` MIB parameter. The .1 at the end of each MIB parameter is the index. If the MIB parameter is a scalar, the index is always 0. If the parameter is a table column, the index is used to specify the row in the table.

# 10 Trouble Shooting

Check the following items:

- PCIDM IP Address and Net Mask
  Click **PCIDM Control Panel**.
- Windows Adapter IP Address, Net Mask, and Default Gateway
  Click **Start** > **Settings** > **Control Panel** > **Network**.
- PCIDM Control Panel Status
  Ensure all lights are green.
- PCIDM Configuration
  Click **Start** > **PCIDM** > **AMPGUI** > **Configure** > **PCIDM V2 Settings**

# 11 Application Notes

## 11.1 Dynamic Internet (DI)

The PCIDM supports a dynamic internet mode with a SINCGARS (RT-1523E) radio in packet mode, MIL-STD-188-220B+ link layer protocol, and router discovery (RFC-1256+) and IGMP+. In dynamic internet mode, a host equipped with a PCIDM, can move from network to network, and automatically detect the other nodes on the network using router discovery. Router discovery automatically populates the IP routing table and ARP table, as nodes are discovered. Dynamic internet mode substantially reduces the need for static routes.

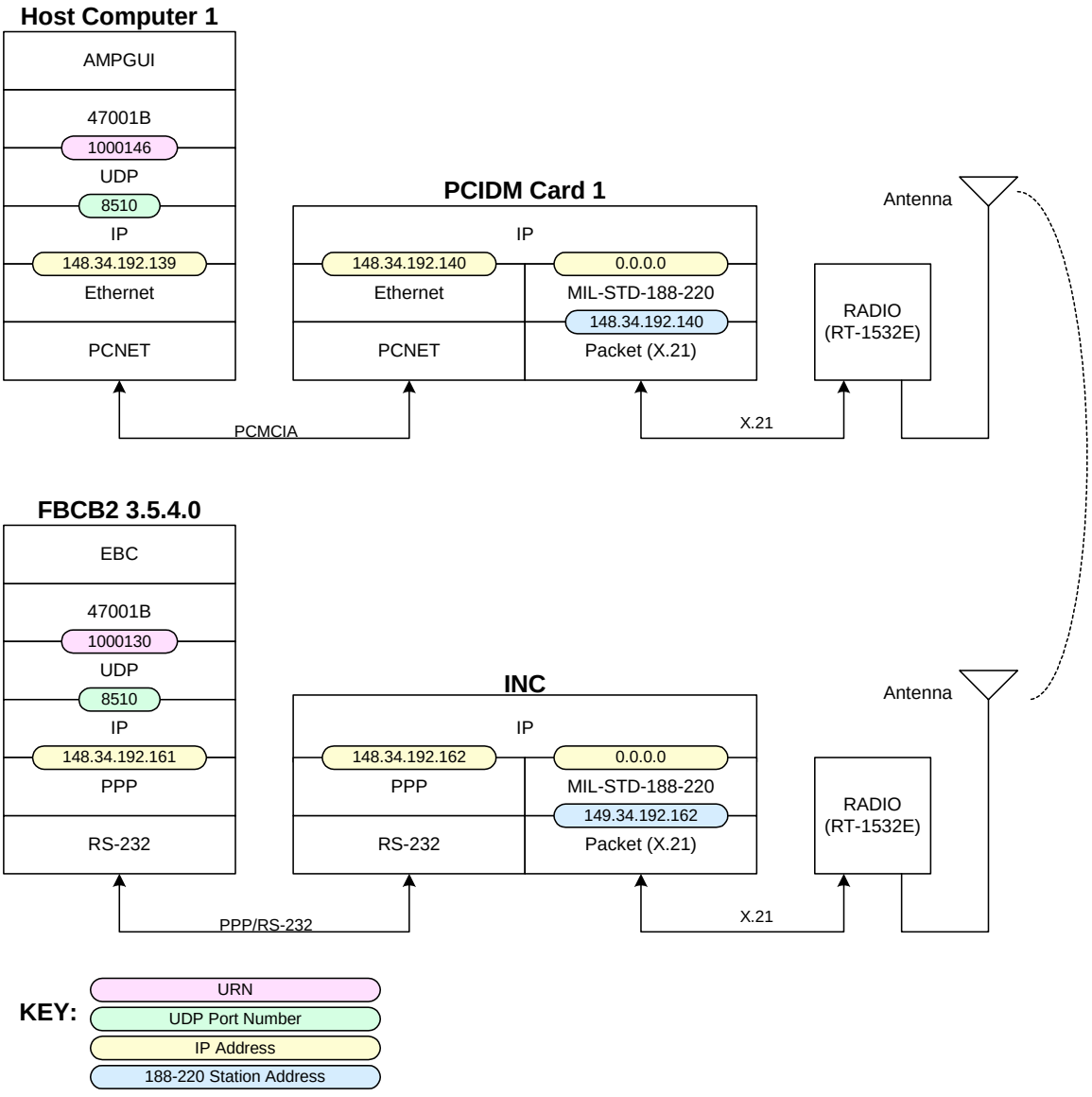



**Figure 17: Dynamic Internet Mode Diagram**

Dynamic Internet uses Router Discovery (RFC-1256+) and IGMP+. IP addresses within the Dynamic Internet do not contain any routing information, they are simple unique identifiers. Newer versions of FBCB2 use port 1581 instead of port 8510.

### 11.1.1 PCIDM Configuration for Dynamic Internet

The PCIDM configuration shown in Table 17 is recommended for Dynamic Internet mode. This configuration assumes the PCIDM is connected to an RT-1523E radio. The AMPGUI MIB Loader can be used to speed PCIDM configuration.

**Table 17: PCIDM Configuration for Dynamic Internet Mode**

| Parameter | Value | Comment |
|---|---|---|
| **Channel** | | |
| Protocol | MIL-STD-188-220B | |
| Modulation | Packet | DI uses X.21 Packet Mode Interface |
| Data Rate | 16000 | |
| Comm Sync Time | NA | Not used by packet mode |
| Output Voltage | NA | Not used by packet mode |
| Scrambling | Disabled | Not used by packet mode |
| Loopback | Disabled | |
| **MIL-STD-188-220** | | |
| Physical Layer | Packet | |
| Station Class | Type 1,2,4 | Class |
| NAD Method | V-NAD | |
| EDC Mode | None | |
| Traffic Load | Normal | |
| Address Mode | 32 bit | |
| Station ID | | Same as PCIDM PCNET IP address |
| Number Of Stations | 10 | Number of stations on network |
| Subscriber Rank | 0 | |
| Prepend Default Router | Enabled | |
| ARP Conversion | Disabled | Not Used By DI |
| Use Only Type 2 To Transmit I-PDUs | Disabled | Not Used By DI |
| **IP** | | |
| IP Address | 0.0.0.0 | Interface is unnumbered on DI |
| Net Mask | 255.255.255.0 | |
| IGMP Role | Host | |
| Router Discovery | Enabled | |
| RD Advertisement Interval Min | 20 seconds | |
| RD Advertisement Interval Max | 30 seconds | |
| RD Advertisement Lifetime | 60 seconds | |

## 11.2 Static Internet (SI) Compatibility

Static Internet networks use the RT-1523E SINCGARS radio in 4800 bps data mode. The PCIDM interface to the RT-1523E is NRZ at 4800 bps. Figure 18 shows the Static Internet (SI) Compatibility diagram.

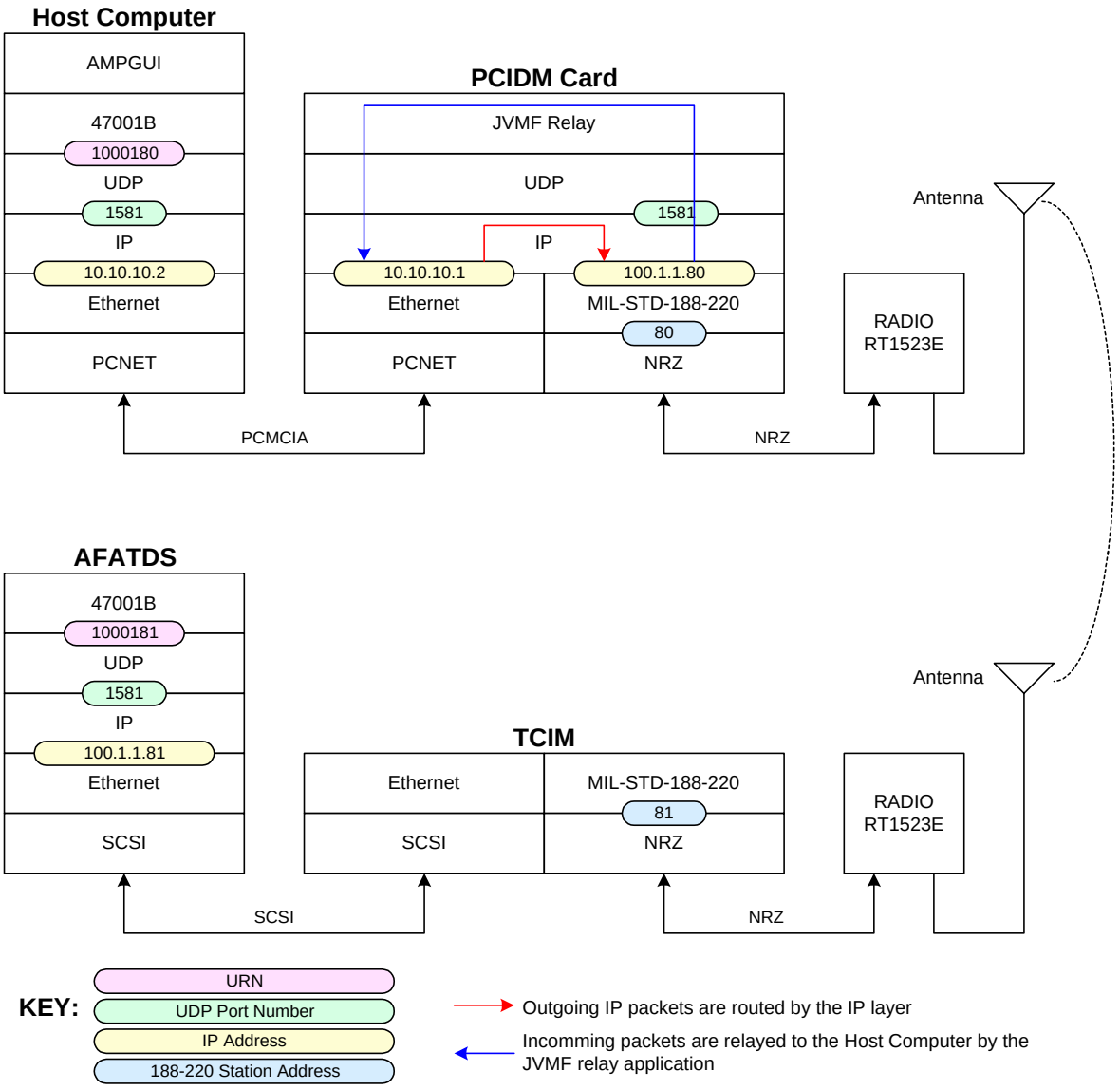



**Figure 18: Static Internet Compatibility Diagram**

### 11.2.1 PCIDM Configuration for Static Internet

The PCIDM configuration shown in Table 18 is recommended for Static Internet (SI) compatibility. This configuration assumes the PCIDM is connected to an RT-1523E radio. The AMPGUI MIB Loader can be used to speed PCIDM configuration.

**Table 18: PCIDM Configuration for Static Internet**

| Parameter | Value | Comment |
|---|---|---|
| **Channel** | | |
| Protocol | MIL-STD-188-220B | |
| Modulation | NRZ | SI uses SDM/NRZ mode |
| Data Rate | 4800 | |
| Comm Sync Time | 0 seconds | |
| Output Voltage | NA | Not used by NRZ |
| Scrambling | Disabled | |
| Loopback | Disabled | |
| **MIL-STD-188-220** | | |
| Physical Layer | Synchronous | |
| Station Class | Type 1,2,4 | Class |
| NAD Method | DAP-NAD | |
| EDC Mode | FEC, TDC | |
| Traffic Load | Normal | |
| Address Mode | 7 bit | |
| Station ID | 80 | As assigned |
| Number Of Stations | 10 | Number of stations on network |
| Subscriber Rank | 0 | |
| Prepend Default Router | Disabled | |
| ARP Conversion | Enabled | Required by SI |
| Use Only Type 2 To Transmit I-PDUs | Enabled | Required by SI |
| **IP** | | |
| IP Address | 100.1.1.81 | As assigned |
| Net Mask | 255.255.255.0 | As assigned |
| IGMP Role | Disable | |
| Router Discovery | Disabled | |
| RD Advertisement Interval Min | NA | |
| RD Advertisement Interval Max | NA | |
| RD Advertisement Lifetime | NA | |

## 11.3 F-16 Compatibility

The F-16 Block 40 and Block 50 aircraft data communications system is comprised of an IDM 302 LRU, ARC-164 HQ2 UHF radio, ARC-186 VHF radio, and a single KY-58. The IDM 302 hardware runs the IDM Air Force Version 5 software.

The KY-58 can be switched into the communications channel of either radio. Each of the three configurations shown in Figure 19 is possible.

The F-16 block 40 and block50 are wired differently in CRAD 1 mode. The F-16 block 40 uses the digital port, which supports multidwell (hopping), in cipher text mode.

The IDM does not support scrambling on the secure port. Therefore, it is recommended that scrambling be disabled when communicating with an F-16 in cipher text mode.

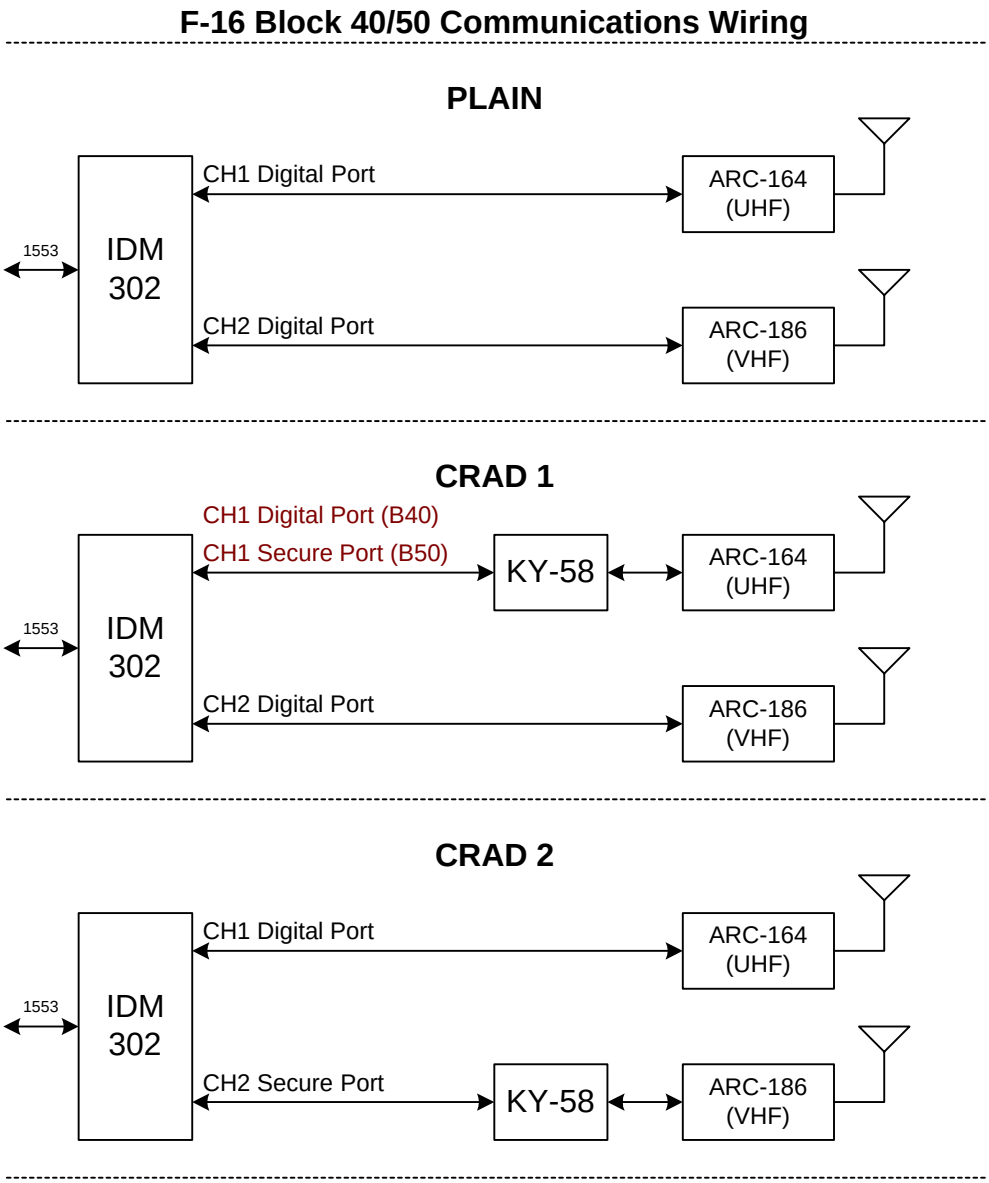



**Figure 19: F-16 Block 40/50 Communications Wiring Diagram**

### 11.3.1 F-16 AFAPD Timing

The recommended F-16 Block 40 T5 DTC IDM parameters are listed in Table 19.

**Table 19: F-16 AFAPD Timing Parameters**

| Channel 1 (ARC-164) (UHF) | Analog Port | Digital Port |
|---|---|---|
| Key Delay | 0.5 sec | 0.5 sec |
| Comm Sync | 0.3 sec | 0.3 sec |
| Tx Gate Time Out | 1.0 sec | 1.0 sec |
| Link Delay | 0.5 sec | 0.0 sec |
| Secure Link Delay | 0.0 sec | 0.0 sec |
| Secure Key Time Out | 1.5 sec | 1.5 sec |
| **Channel 2 (ARC-186) (VHF)** | **Analog Port** | **Digital Port** |
| Key Delay | 0.5 sec | 0.5 sec |
| Comm Sync | 0.3 sec | 0.3 sec |
| Tx Gate Time Out | 1.0 sec | 1.0 sec |
| Link Delay | 0.5 sec | 0.0 sec |
| Secure Link Delay | 0.0 sec | 0.0 sec |
| Secure Key Time Out | 1.5 sec | 1.5 sec |

### 11.3.2 PCIDM Configuration

Recommended PCIDM configuration values for F-16 interoperability are shown in Figure 20.

**Plain Text (PT)**

| | |
|---|---|
| Commsync | **0.3** seconds |
| Scrambling | **Enable** |
| | |
| AFAPD timing | |
| Key Delay Time | 0.5 seconds |
| Processing Time Per Byte | 0 seconds |
| Equipment Turnaround Time | 0.5 seconds |
| Receive Processing Delay | 0.05 seconds |
| Transmit Processing Delay | 0.08 seconds |

**Cipher Text (CT) (without time delay (TD))**

| | |
|---|---|
| Commsync | **0** seconds |
| Scrambling | **Disable** |
| | |
| AFAPD timing | |
| Key Delay Time | 0.5 seconds |
| Processing Time Per Byte | 0 seconds |
| Equipment Turnaround Time | 0.5 seconds |
| Receive Processing Delay | 0 seconds |
| Transmit Processing Delay | 0 seconds |

**Figure 20: PCIDM Configuration for F-16 Interoperability**

### 11.3.3 F-16 CAS Message

Sending an X202 Mission Update (9-line)(CAS) message to the F-16 allows the pilot to access the information shown in Figure 21. The Initial Point and Target Locations are stored in two steerpoint locations, and four CAS pages provide all other CAS information. The DED displays shown apply to the F-16 Block 40 Tape 6.

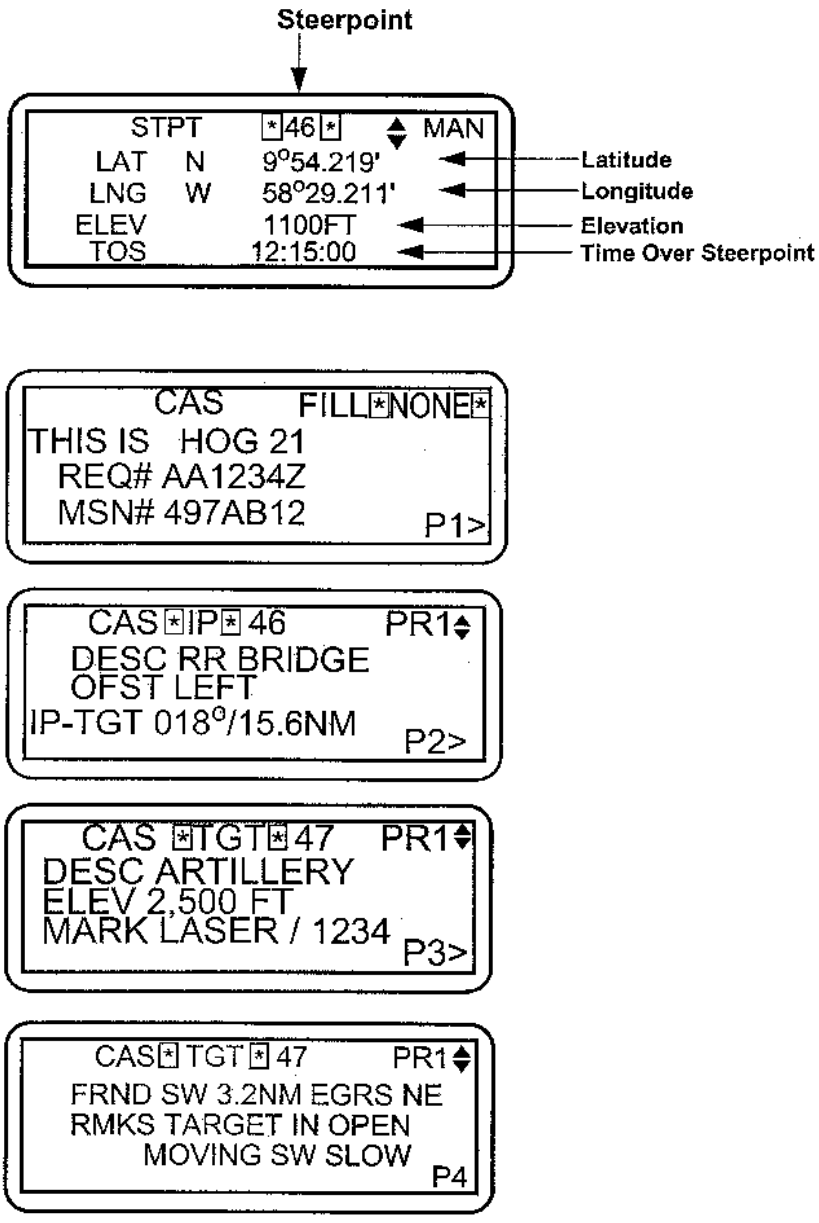



**Figure 21: F-16 CAS Messages**

## 11.4 Apache Longbow Compatibility

The Apache Longbow includes the following communications equipment:

- 1 IDM
- 2 ARC-201D
- 1 ARC-164
- 1 ARC-186

Apache Longbow Lot 4 employs the IDM 302 hardware running IDM Army 2.9H software. The IDM Army 2.9H software supports the AFAPD and TACFIRE protocols. The Apache Longbow used during DCX 2000 employed the IDM 303 hardware running the IDM Army 5.0 software. The IDM Army 5.0 software adds the MIL-STD-188-220B protocol and VMF message support.

### 11.4.1 TACFIRE over FSK

IDM Army 2.9H software will not receive a TACFIRE message over FSK transmitted with scrambling enabled. Ensure that scrambling is disabled with transmitting over FSK.

## 11.5 F/A-18 DCS-2000 Compatibility

The PCIDM supports communication with the DCS-2000 radio, which is used for digital communications in some F/A-18 aircraft. Figure 22 shows the F/A-18 DCS-2000 Compatibility overview diagram.

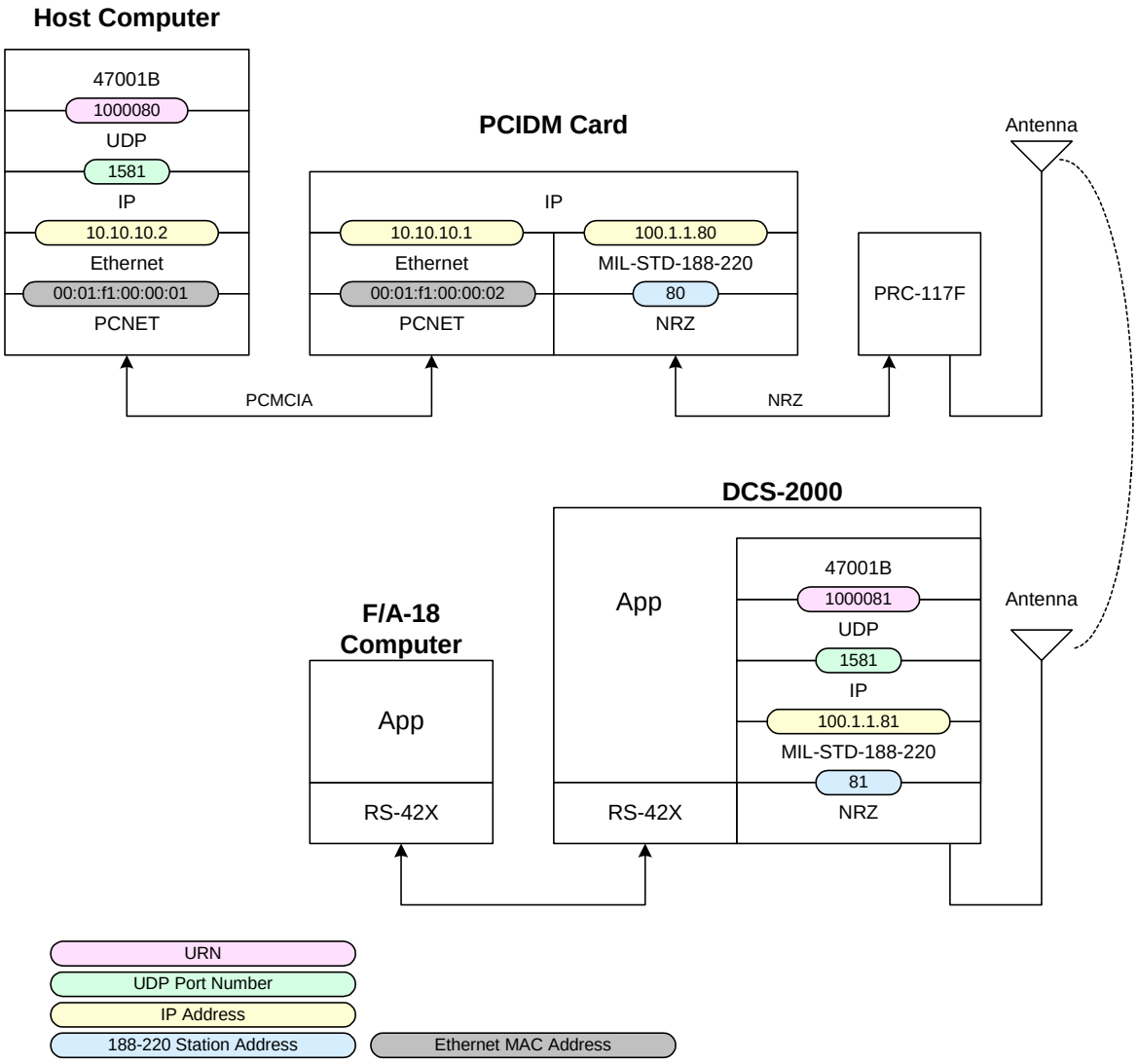



**Figure 22: F/A-18 DCS-2000 Compatibility Overview Diagram**

Communication with DCS-2000 requires DCS software version 15C-038 or higher. Communication with F/A-18 requires OFP 17-C or equivalent for VMF R2, or 19-C or equivalent for VMF R5.

When the DCS-2000 receives a VMF message from the PCIDM, it records the source address tuple, which includes the source MIL-STD-188-220 station address, the source IP address, and the source URN (URN, IP, STATION). The URN and the IP address are associated with the host, and the station address is associated with the PCIDM.

When the DCS-2000 sends a VMF message back to the PCIDM, it sends the message to the same tuple (URN, IP, STATION), which includes the station of the PCIDM, the IP of the host, and the URN of the host. The PCIDM will accept and terminate the MIL-STD-188-220 message, as the destination station address matches the PCIDM's station address. The PCIDM's IP stack will forward the IP packet to the host, since the PCIDM routing table includes a route to the host. The host will accept and terminate the IP packet, because the destination IP address matches the host's IP address. The MIL-STD-2045-47001B layer will accept and terminate the MIL-STD-2045-47001B message (VMF message header), as the destination URN matches the host's URN.

The host can determine the source URN (from the MIL-STD-2045-47001B header) of broadcast and unicast messages. The host can determine the source IP address (using the recvfrom() socket call) for unicast messages. Broadcast messages terminate in IP on the PCIDM and are passed to the host via the UDP agent, with the source IP address of the PCIDM. The host does not have access to the source station address. The MIL-STD-188-220 layer is terminated on the PCIDM, and does not exist on the host. IP does not forward the link layer addresses of the hops along route. The last link layer source address on the route is actually the MAC address on the Ethernet or PCNET.

The DCS-2000 sends only MIL-STD-188-220 Type-3 messages, requiring a protocol-level (MIL-STD-188-220) ACK. The ACK is generated by the PCIDM without intervention by the host. If the ACK is not received within about 2 seconds, the DCS-2000 will resend the message up to five additional times.

The DCS-2000 does not appear to support IP multicast transmission, as messages directed to multiple recipients are transmitted once for each destination.

The PCIDM also implements Passive ARP (see section 8.7) which provides better DCS-2000 interoperability.

### 11.5.1 PCIDM Configuration for F/A-18 DCS-2000 compatibility

The following PCIDM configuration is recommended for DCS-2000 compatibility. This configuration assumes the PCIDM is connected to a PRC-117F radio. The AMPGUI MIB Loader can be used to speed PCIDM configuration.

**Table 20: PCIDM Configuration Table for F/A-18 DCS-2000 Compatibility**

| Parameter | Value | Comment |
|---|---|---|
| **Channel** | | |
| Protocol | MIL-STD-188-220B | |
| Modulation | NRZ | DCS uses SDM/NRZ mode |
| Data Rate | 16000 | |
| Comm Sync Time | 0 seconds | Setting for Cipher text (preferred) (Plain text would require >= 0.350 seconds of comm. sync) |
| Output Voltage | NA | Not used by NRZ |

**Table 20: PCIDM Configuration Table for F/A-18 DCS-2000 Compatibility**

| Parameter | Value | Comment |
|---|---|---|
| Scrambling | Disabled | The DCS-2000 does not support this type of scrambling |
| Loopback | Disabled | |
| **MIL-STD-188-220** | | |
| Physical Layer | Synchronous | |
| Station Class | Class A | Types 1 and 3 only |
| NAD Method | DAP-NAD | |
| EDC Mode | FEC, TDC, Scrambling | |
| Traffic Load | Normal | |
| Address Mode | 7 bit | |
| Station ID | 15 | Typically last octet of IP address |
| Number Of Stations | 6 | 4 aircraft plus 2 controllers |
| Subscriber Rank | 6 | |
| Link Rate | 16000 | Must be same as Channel Data Rate above |
| Prepend Default Router | Disabled | |
| ARP Conversion | Disabled | Not used by DCS |
| **MIL-STD-188-220 Misc** | | |
| Non Relayer Status | Enabled | |
| Data Link Concatenation | Disabled | |
| Quiet Status | Disabled | |
| Busy State Timer | 60s | |
| Link Fail Threshold | 7 | |
| Max Octet IPDU Size | 768 | |
| Topology Update Interval | NA | Not used by DCS |
| DTE ACK Preparation Time | 0.600s | |
| DTE Processing Time | 0.600s | |
| Equipment Preamble Time | 0.650s | |
| Net Busy Detect | 0.669s | |
| Equipment Lag | 0.015s | |
| Tolerance Time | 0.050s | |
| Urgent Percent | 10% | |
| Priority Percent | 10% | |
| Phasing Transmission Time | 0.050s | |
| Turnaround Time | 0.600s | |

**Table 20: PCIDM Configuration Table for F/A-18 DCS-2000 Compatibility**

| Parameter | Value | Comment |
|---|---|---|
| Response Mode | Always-on | |
| **IP** | | |
| IP Address | 1.1.1.15 | As assigned |
| Net Mask | 255.255.0.0 | |
| IGMP Role | Disable | |
| Router Discovery | Disabled | |
| RD Advertisement Interval Min | NA | |
| RD Advertisement Interval Max | NA | |
| RD Advertisement Lifetime | NA | |
| Router Preference | NA | |

### 11.5.2 Typical TACP F/A-18 VMF Message Sequence

Figure 23 shows a typical sequence for TACP F/A-18 VMF messages.

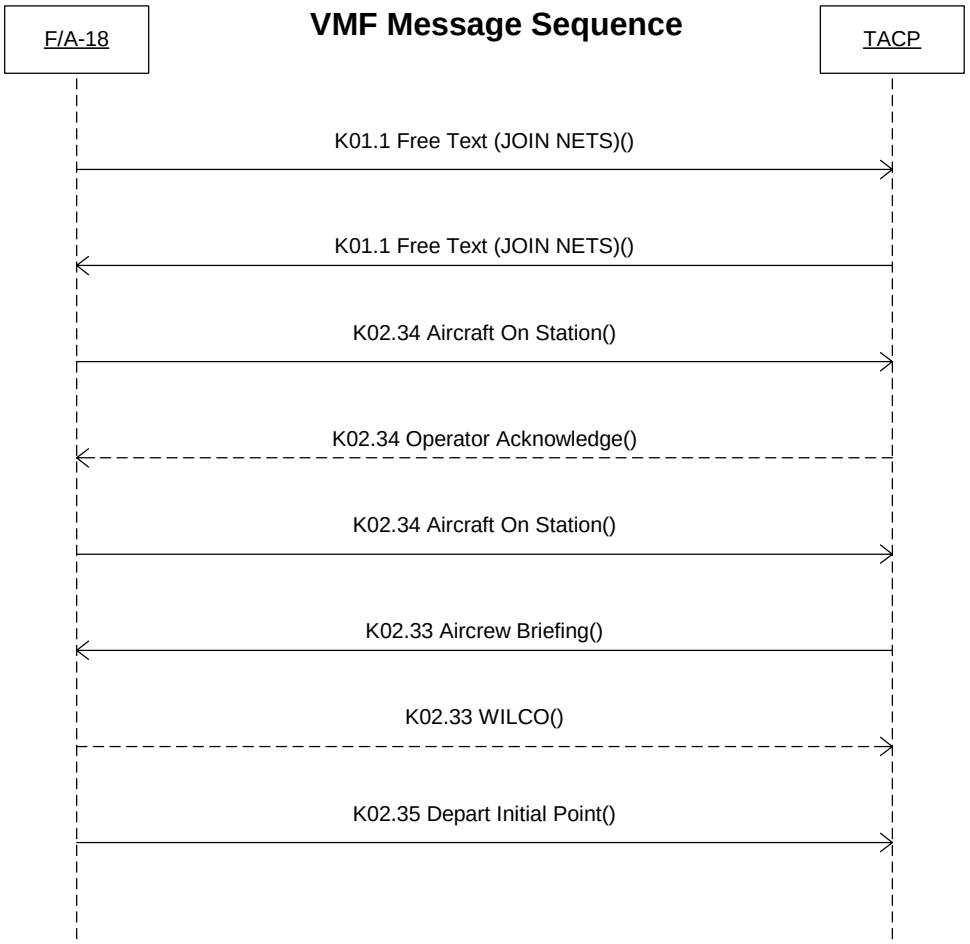



**Figure 23: Typical TACP F/A-18 VMF Message Sequence**

## 11.6 MIL-STD-188-184 Compatibility

The PCIDM implementation of MIL-STD-188-184 is interoperable with the VDC-400. The PCIDM can be used to change Notes and Email with the VDC-400.

The following settings are recommended as a starting point:

FEC rate: 1/2
No ARQ: off (ARQ enabled)
Max TX Packets: 64
Max RX Packets: 64

The following MIL-STD-188-184 configuration combinations should be avoided:

**Table 21: MIL-STD-188-184 Configuration Combinations to be Avoided**

| FEC Rate | Data Rate (bps) | No ARQ | Max Packets |
|---|---|---|---|
| 3/4 | 16000 | Off | > 64 |
| 7/8 | 16000 | Off | > 64 |
| 3/4 | 16000 | On | irrelevant |
| 7/8 | 16000 | On | Irrelevant |

The VDC-400 does not support scrambling. This can present a problem if using a radio in plain text (PT) at 16000 bps, as adequate bit transitions may not be present. Using cipher text (CT) will avoid this problem, as the encryption algorithm has a side effect of adding bit transitions. The PCIDM does support scrambling, and will work with a radio in plain text (PT) mode at 16000 bps, if scrambling is enabled.

The PCIDM supports one of the two types of compression supported by the VDC-400.

## 11.7 IDM Secure Port does not support scrambling

The IDM 302 hardware running IDM Air Force 5.x software does not support scrambling on the secure port. Scrambling must be disabled on the PCIDM in order to communicate with the IDM secure port.

## 11.8 Phasing and Commsync

The terms phasing and commsync can be used interchangeably. Phasing is often an alternating 1010 pattern used to help the receiving modem derive the bit timing from the received signal. In some instances, radios provide phasing within the radio. Other radios, in selected modes, leave the addition of phasing to the external modem. The PCIDM channel settings provide a method to adjust the amount of phasing (or commsync) time used. In general, a crypto device or radio that provides crypto functionality in cipher text mode, will provide phasing as part of the crypto preamble. Some radios provide phasing even in some plain text modes.

**Table 22: PCIDM Commsync Setting**

| Radio | PT/CT | Data Mode | PCIDM Modulation | PCIDM Commsync Required |
|---|---|---|---|---|
| PRC-117F | PT | 16000 | NRZ | YES |
| PRC-117F | CT (Vinson) | 16000 | NRZ | NO |
| RT-1523E | PT | 16000 | NRZ | Recommend YES |
| RT-1523E | CT | 16000 | NRZ | NO |
| RT-1523E | PT | 4800 | NRZ | NO |
| RT-1523E | CT | 4800 | NRZ | NO |
| RT-1523E | PT | 4800N | NRZ | NO |
| RT-1523E | CT | 4800N | NRZ | NO |
| RT-1523E | PT | PACKET | PACKET | NO |
| RT-1523E | CT | PACKET | PACKET | NO |
| ANY | PT/CT | ANY | ASK | YES |
| ANY | PT/CT | ANY | FSK | YES |
| ANY | PT/CT | PACKET | PACKET | NO |

**NOTE:**

The RT-1523E radio is in transparent mode when configured for 16000. Plain text transparent mode does not provide phasing or forward error correction. All other data rates 4800, 1200, 4800N, 1200N, etc, provide phasing, and a form of forward error correction.

# 12 Release Notes

## 12.1 PCIDM V2.40 2001.09.12

PCIDM V2.4 contains all major features of PCIDM V2.5 with the exception of FSK modulation.

PCIDM V2.4 contains the following features that were not present in PCIDM V2.1:

1. Simplified configuration
2. ASK modulation at 16000 bps (allows interface with analog radios, ex. PRC-113)
3. Support for Windows 2000 and Windows ME
4. Updated SDK
5. Radio Control support in SDK (via PCIDM RS-232 radio control port)

## 12.2 PCIDM V2.50 2001.10.30

1. Linux Device Driver
2. Support for SCIDM Hardware
   2.1. SCIDM abbreviates Single Card Improved Data Modem
   2.2. The SCIDM is a PCIDM in a PMC (PCI Mezzanean Card) form factor

## 12.3 PCIDM V2.51 2002.05.02

1. Support for PCIDM V2 R2 Hardware
2. Support for PCIDM V2 R2 RTS signal
3. MTS Protocol (Marine Tactical System)
4. FSK enhancements
   4.1. Additional tone pairs
        1200/2400 Hz
        1300/2100 Hz
        1300/1700 Hz
   4.2. Additional data rates
   4.3. Support for 2400bps Duobinary FSK
5. ASK enhancements
   5.1. Additional data rates

## 12.4 PCIDM V2.60 2002.10.11

1. IDL Protocol (Intra-flight Data Link)
   1.1. IDL is used by the F-16 for near real time position awareness
2. LW-PCIDM Hardware Support
   2.1. LW-PCIDM abbreviates Land Warrior Personal Computer Improved Data Modem
   2.2. The LW-PCIDM card does not required a host computer (Hostless Mode)
   2.3. LW-PCIDM hardware includes 10-Base-T Ethernet and a Bluetooth option.
   2.4. The LW-PCIDM card can be affixed to the back of an MBITR PRC-148 radio.
3. Removed PCIDM control panel use of Raw Sockets
   3.1. Raw Sockets required administrator privileges on some Windows operating systems
4. Support for PPP over RS-232
5. MBITR packet mode precedence control
6. Initial Tacter PCIDM Hardware Support
   6.1. The Tacter PCIDM is embedded in the Tadaran Tacter RHC-31A rugged computer
7. Enhanced Linux Support
   7.1. RPM for Redhat 7.3

## 12.5 PCIDM V2.70 2003.09.02

1. MIL-STD-188-184 link layer protocol
   1.1. Rate ½, ¾ , 7/8 and 1 forward error correction
   1.2. Unicast, Broadcast
   1.3. Compatible with ViaSat VDC-400
2. MIL-STD-188-184 application features
   2.1. Notes
3. MIL-STD-188-184 features **not** supported:
   3.1. Multicast
   3.2. Compression
   3.3. E-Mail
   3.4. E-Mail Attachments
   3.5. IP over MIL-STD-188-184
4. MIL-STD-188-220 performance improvements
5. Full MIL-STD-188-220 configuration exposure
   5.1. MIL-STD-188-220 MIB updated to match MIL-STD-188-220B standard
6. Tacter PCIDM hardware support
   The Tacter PCIDM is an ISA card embedded in the Tacter RHC-31a rugged handheld computer.
7. Full AH-64D Apache Longbow AFAPD message set
8. VMF R2 support for F/A-18 DCS-2000 interoperability
   8.1. K01.1 Free Text
   8.2. K02.33 Aircrew Briefing
   8.3. K02.34 Aircraft On-Station
   8.4. K02.35 Aircraft Depart IP
9. Initial IDM PMC hardware support

## 12.6 PCIDM V2.71 2003.11.06

10. Added Tacter PCIDM Windows 2000 driver support
11. Added Windows XP shared interrupt support
    11.1. Updated Windows XP device driver to support shared interrupts
    11.2. Updated Windows XP inf file to support new driver
12. Added AFAPD A503 IDM Initialization message support
13. Upgraded from InstallShield 6.3.0 to InstallShield 6.3.1 for better Windows XP support

## 12.7 PCIDM V2.80 2004.07.09

1. MIL-STD-188-184 enhancements
   1.1. Email is now supported.
   AMPGUI now supports sending email (up to 512 K bytes in size) over MIL-STD-188-184. Email can include file attachments, and can be sent to one or many destinations.
   1.2. Multicast is now supported.
   1.3. Compression is now supported.
2. VMF R5 and MIL-STD-2045-47001C support
   VMF R5 is compatible with Army Aviation Software Block 1 (SWB1) .
   Backward compatibility is maintained with VMF R2, VMF R3 and MIL-STD-2045-47001B.
3. FalconView 3.3.0 support
   AMPGUI can plot received Apache Longbow AFAPD message data on the FalconView map. Present positions, targets, and zones can be displayed. Data created within FalconView can also be used to create and send AFAPD messages to the Apache Longbow. FalconView is the mapping engine used by AMPS and PFPS. See the AMPGUI user's manual for details on using AMPGUI with FalconView.
4. PCIDM Network Monitor
   The PCIDM Network Monitor allows the user to monitor MIL-STD-188-220, MIL-STD-188-184, AFAPD, and MTS radio network traffic.
5. Raw Physical layer access
   The Raw interface provides the user application direct access to the physical layer.
   A user defined link layer can use the PCIDM to gain access to the radio.
6. Passive ARP
   Added Passive ARP (PARP) support for better F/A-18 DCS-2000 interoperability.
7. MIL-STD-188-220 statistics
   The PCIDM now provides a method to obtain statistics on current MIL-STD-188-220 queues as well as transmit and receive packet count.

## 12.8 PCIDM V2.85 2004.10.08

1. Improved AMPGUI FalconView Integration
   1.1. AFAPD X202 FalconView Integration
   Allows populating an AFAPD X202 from the FalconView map The X202 message can then be sent to the F-16 for close air support This feature also allows for Apache Longbow to F-16 target handoff.
2. MTS VIXL Support
   Provides the ability to exchange VIXL JPEG images with the Kiowa
3. Improved MTS support for AV-8B compatibility

## 12.9 PCIDM V2.86 2004.11.26

1. Improved MTS interoperability with the AV-8B and ATHS2
   MTS Network Layer Station Serial Number was made accessible.

# 13 Contact Information


| | |
|---|---|
| **Email Support:** | support@pcidm.com |
| **Email Sales:** | sales@pcidm.com |
| **Web:** | www.innocon.com<br>www.pcidm.com |
| **Voice:** | 703.893.2007 |
| **Fax:** | 703.893.5890 |
| **Mail:** | Innovative Concepts Inc.<br>8200 Greensboro Drive<br>Suite 700<br>McLean, Virginia, 22102<br>USA |