

# ASM-31

## 2-Wire Multirate Short Range Modem Installation and Operation Manual

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Always observe standard safety precautions during installation, operation and maintenance of this product. Only a qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this instrument. No adjustment, maintenance or repairs should be performed by either the operator or the user.

## Telecommunication Safety

The safety status of each of the ports on ASM-31 is declared according to EN 41003 and is detailed in the table below:

Ports	Safety Status
DTE, Ethernet	SELV Circuit operating with Safety Extra-Low Voltage
Line	TNV-1 Circuit whose normal operating voltage is within the limits of SELV, on which overvoltages from Telecommunications Networks are possible.

# **Regulatory Information**

## **FCC-15 User Information**

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## **Warning per EN 55022**

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

# Declaration of Conformity

**Manufacturer's Name:** RAD Data Communications Ltd.

**Manufacturer's Address:** 24 Raoul Wallenberg St.  
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declares that the product:

**Product Name:** **ASM-31**

Conforms to the following standard(s) or other normative document(s):

<b>EMC:</b>	EN 55022 (1994)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
	EN 50082-1 (1992)	Electromagnetic compatibility – Generic immunity standards for residential, commercial and light industry.
<b>Safety:</b>	EN 60950 (1992/93)	Safety of information technology equipment, including electrical business equipment.

## Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The product was tested in a typical configuration.

Tel Aviv, October 7, 1996



Haim Karshen  
VP Quality

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# Quick Start Guide

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Installation of ASM-31 should be carried out only by an experienced technician. If you are familiar with ASM-31, use this quick start guide to set it up for operation.

This guide describes the standalone version of the modem.

Perform the installation procedures for both the local and the remote units.

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## 1. Installing ASM-31

### Setting the Internal Jumpers and Switches

Set the ASM-31 internal jumpers and switches correctly for the chosen operating mode. Refer to the table below for the possible settings.

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**Warning**

**Make sure that the power cord is disconnected before removing the unit's cover.**

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Item	Jumper/Switch	Function	Possible Settings	Factory Setting
1	DIP switch, SW6			
	Section 1	Selects the ASM-31 operation mode	<b>ON</b> – Asynchronous operation <b>OFF</b> – Synchronous operation	OFF
	Section 2	Selects the character length	<b>ON</b> – 8 bit <b>OFF</b> – 7 bit	ON
	Section 3	Enables or disables parity	<b>ON</b> – Parity enabled <b>OFF</b> – Parity disabled	ON
	Section 4	Selects parity type	<b>ON</b> – Even parity <b>OFF</b> – Odd parity	ON
	Section 5	Selects number of stop bits	<b>ON</b> – One stop bit <b>OFF</b> – Two stop bits	ON
Section 6	Selects the DCD mode	<b>ON</b> – DCD-ON. The DCD signal turns on when ASM-31 reaches synchronization with the remote unit.	ON	
		<b>OFF</b> – DCD-CNT. The DCD signal of the local unit follows the RTS signal of the remote unit.		

**Note:** The DCD signal is OFF when a digital loopback is active (ASM-31 receives RLB command or DIG is active), or there is no synchronization between the modems.

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Item	Jumper/Switch	Function	Possible Settings	Factory Setting
	Section 7	Selects the DSR mode	<b>ON</b> – DSR-ON. The DSR signal turns on to indicate to the DTE that the local unit is powered up.  <b>OFF</b> – DSR-DTR. The DSR signal of the local unit follows the DTR signal of the remote unit.	ON
	Section 8	Reserved for future use		
2	Data Rate switch, SW7	Selects the baud rate	<b>1</b> – 1.2 kbps (sync/async), <b>2</b> – 2.4 kbps (sync/async), <b>3</b> – 4.8 kbps (sync/async), <b>4</b> – 9.6 kbps (sync/async), <b>5</b> – 19.2 kbps (sync/async), <b>6</b> – 38.4 kbps (sync/async), <b>7</b> – 48 kbps (sync), <b>9</b> – 64 kbps (sync) <b>A</b> – 128 kbps (sync), <b>E</b> – 16 kbps (sync) <b>F</b> – 32 kbps (sync)	9 – 64 kbps
<i>Note: Positions 0, B, C, D of the SW7 switch are not in use.</i>				
3	Clock Source jumper	Selects the ASM-31 timing reference	<b>INT</b> – Internal clock <b>EXT</b> – External clock <b>LBT</b> – Receive clock	INT
4	LLB jumper	Controls the LLB activation via the DTE interface	<b>EN</b> – The LLB activation from the DTE is enabled  <b>DIS</b> – The LLB activation from the DTE is disabled	DIS
<i>Note: The LLB jumper is not available for the ASM-31 modems with X.21, G.703 and Ethernet interfaces.</i>				
5	RLB jumper	Controls the RLB activation via the DTE interface	<b>EN</b> – The RLB activation from the DTE is enabled  <b>DIS</b> – The RLB activation from the DTE is disabled	DIS
<i>Note: The RLB jumper is not available for the ASM-31 modems with X.21, G.703 and Ethernet interfaces.</i>				
6	CHAS_GND	Controls the connection between signal ground and chassis ground	<b>CON</b> – Signal ground is connected to the chassis ground  <b>DIS</b> – Signal ground is disconnected from the chassis ground	CON

## Connecting the Cables

### Connecting the Line

#### ► To connect the line:

- Connect the line cable to the RJ-45 or terminal block connector on the ASM-31 rear panel.



### Connecting the DTE

- ▶ **To connect the DTE:**
  - Connect the DTE cable to the appropriate ASM-31 rear panel connector.

### Connecting the Power

- ▶ **To connect AC power to ASM-31:**
  1. Connect the power cable to the power connector on the ASM-31 rear panel.
  2. Connect the power cable to the mains outlet.  
The unit will be turned on automatically upon connection to the mains.
- ▶ **To connect DC power to ASM-31:**
  - Refer to *DC Power Supply Connection Supplement*.

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## 2. Operating ASM-31

ASM-31 does not require operator attention once installed and configured.

### Verifying Performance

When data is being transferred, observe that the following front panel LEDs light or blink:

- PWR: On
- RTS: On
- TD: Blinking or Off
- RD: Blinking or Off
- DCD: On
- LOSS: Off
- ERR: Off
- TEST: Off.



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# Chapter 1

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## Introduction

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### 1.1 Overview

#### General

ASM-31 is a synchronous/asynchronous short-range modem that operates at full duplex over 2-wire lines. The ASM-31 modem has a transmission range of 5.5 km (3.4 miles) over 26 AWG wire and operates at user-selectable data rates from 1.2 kbps to 128 kbps (up to 38.4 kbps at async mode).

#### Versions

The following versions of the ASM-31 modem are available:

- ASM-31 standalone unit
- ASM-31/R: a plug-in card for installation in the ASM-MN-214, 19-inch modem rack, holding up to 14 cards (see *Chapter 5* for the ASM-31/R description).

#### Power Supply Options

The following power supply versions are available:

- AC source: 115 VAC or 230 VAC
- DC source: -48 VDC.

#### Application

Figure 1-1 shows a typical ASM-31 point-to-point application.

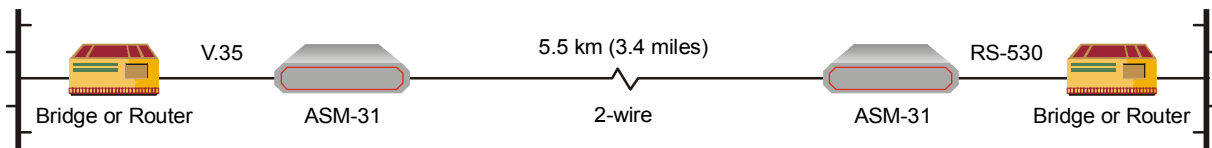


Figure 1-1. Typical Point-to-Point Application

## Features

ASM-31, sync/async short range modem, operates full duplex over 2-wire twisted pair, at selectable data rates from 1.2 kbps up to 128 kbps.

ASM-31 operates using 2B1Q line coding, and provides an operating range of up to 5.5 km (3.4 miles), independent of the data rate. An adaptive equalizer provides noise immunity and high performance over low quality lines.

Full duplex operation is achieved using the echo cancellation technique. This method entails setting one modem to be Master clock and the other to be Slave clock.

### DTE Interface

ASM-31 supports the following DTE interface types: V.24/RS-232, V.35, X.21, RS-530, G.703 Codirectional, IR-ETH (Ethernet bridge), IR-ETH/Q (Ethernet bridge with VLAN support) or IR-IP (IP router).

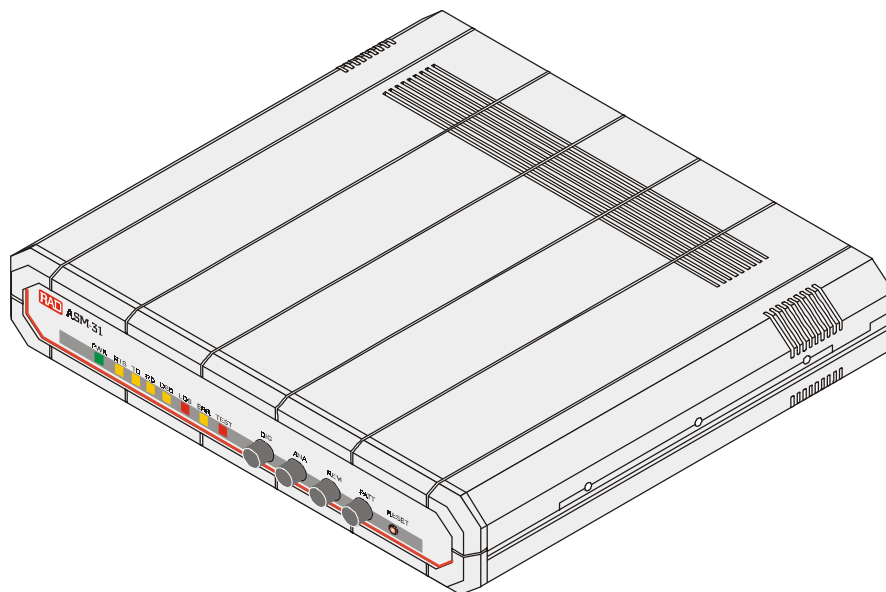
### Diagnostics

ASM-31 features diagnostic capabilities including implementation of local analog and digital loopbacks and remote digital loopback. The operator at either end of the line may test both modems and the line in a number of loopback modes. The loopbacks are controlled by either a front panel pushbutton or from the DTE interface.

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## 1.2 Physical Description

ASM-31 is available as a standalone unit or a rack-mount card for the ASM-MN-214 modem rack. *Figure 1-2* shows the 3-D view of the ASM-31 standalone unit.



*Figure 1-2. ASM-31 Standalone Unit*

The ASM-31 front panel includes eight LEDs, which indicate the status of power, data flow control signals and diagnostics. The pushbuttons control the ASM-31 diagnostic loopbacks, the RESET button allows to perform the overall reset of the modem's operation. For detailed description of the front panel, see *Chapter 3*.

The ASM-31 back panel includes a DTE interface connector, two line connectors and a power connector (AC or DC). The rear panel is described in the greater detail in *Chapter 2*.

The internal jumpers and switches are used to configure the ASM-31 modem to the various operation modes. For the details on jumper locations and settings, refer to *Setting the Internal Jumpers* in *Chapter 2*.

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## 1.3 Functional Description

ASM-31 incorporates interface circuits for the DTE, an adaptive echo-canceller, an automatic adaptive equalizer, a modulator and demodulator. ASM-31 is coupled to the dedicated line through an isolation transformer, which protects against AC or DC overvoltages. The protection circuitry enables operation even when DC is connected to the line.

### Timing Source

Usually, the ASM-31 modems operate in pairs. One of the modems must be set to the INT clock to receive the clock reference from its internal oscillator, or to the EXT to use the clock derived from the DTE interface. If the modem includes the X.21 digital interface, reception of sample data from the line uses the clock derived from the DTE interface (using unassigned pins of the X.21 connector).

Another modem must be always set to LBT clock to receive timing signal from the line.

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## 1.4 Technical Specifications

<b>Line Interface</b>	<i>Type</i>	2-wire unconditioned dedicated line (twisted pair)
	<i>Line Coding</i>	2B1Q
	<i>Range</i>	Up to 5.5 km (3.4 miles) over 26 AWG line, independent of data rate
	<i>Level</i>	Up to 14 dBm
	<i>Impedance</i>	135 $\Omega$
	<i>Standard</i>	Complies with ANSI T1.601.1988 specifications
	<i>Connectors</i>	3-clip terminal block and RJ-45

<b>DTE Interface</b>	<i>Type</i>	<ul style="list-style-type: none"> <li>• V.24/RS-232: via 25-pin D-type, female connector</li> <li>• V.35: via 34-pin, female connector</li> <li>• X.21: via 15-pin D-type, female connector</li> <li>• RS-530: via 25-pin D-type, female connector</li> <li>• G.703 Codirectional: via 5-clip terminal block or RJ-45 connector</li> <li>• IR-ETH: via RJ-45 or BNC connector</li> <li>• IR-ETH/Q: via RJ-45 connector</li> <li>• IR-IP: via RJ-45 connector</li> </ul>
	<i>Data Rates</i>	<p>Synchronous: 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 48, 64, 128 kbps</p> <p>Asynchronous: 1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kbps</p>
<b>Diagnostics</b>	<i>Loopbacks</i>	<ul style="list-style-type: none"> <li>• Local analog (ANA): activated by front-panel pushbutton or via DTE interface pins (not available for X.21, G.703 and Ethernet interfaces)</li> <li>• Local digital (DIG): activated by front-panel pushbutton</li> <li>• Remote digital (REM): activated by front-panel pushbutton or via DTE interface pins (not available for X.21, G.703 and Ethernet interfaces)</li> </ul>
	<i>Master Clock</i>	<p>INT: supplied by the internal oscillator</p> <p>EXT: received from the DTE interface</p>
	<i>Slave Clock</i>	LBT: derived from the line signal
<b>Indicators</b>	<i>PWR (green)</i>	Power
	<i>TD (yellow)</i>	Transmit Data (Circuit 103)
	<i>RD (yellow)</i>	Receive Data (Circuit 104)
	<i>RTS (yellow)</i>	Request to Send (Circuit 105)
	<i>DCD (yellow)</i>	Data Carrier Detect (Circuit 109)
	<i>LOS (red)</i>	Loss of Signal
	<i>ERR (red)</i>	Bit Error
	<i>TEST (yellow)</i>	Test is active
<b>Physical</b>	<i>Height</i>	44 mm / 1.7 in (1U)
	<i>Width</i>	215 mm / 8.5 in
	<i>Depth</i>	243 mm / 9.6 in
	<i>Weight</i>	1.15 kg / 2.5 lb



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<b>Power</b>	<i>AC Voltage</i>	115 or 230 VAC ( $\pm 10\%$ ), 47 to 63 Hz, 5W
	<i>DC Voltage</i>	24 VDC (18 to 36 VDC) ( $\pm 10\%$ ) or -48 VDC (-36 to -72 VDC) ( $\pm 10\%$ )
	<i>Fuses</i>	0.1A, slow-blow for 230V 0.2A, slow-blow for 115V
<b>Environment</b>	<i>Temperature</i>	0–50°C / 32–122°F
	<i>Humidity</i>	Up to 90%, non–condensing



# Chapter 2

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## Installation and Setup

This chapter describes installation and setup procedures for the standalone ASM-31 modem.

ASM-31 is delivered completely assembled. It is designed for tabletop or 19-inch rack installation. For instructions on installation of a single unit or two units in a 19-inch rack, refer to the *Rack Mounting Kit for 19-inch Racks* guide that comes with the RM kit.

After installing the unit, refer to *Chapter 3* to assure normal operation.

In case a problem encountered, refer to *Chapter 4* for test and diagnostic instructions.



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**Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved.**

**Always observe standard safety precautions during installation, operation, and maintenance of this product.**

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### 2.1 Site Requirements and Prerequisites

An AC-powered ASM-31 should be installed within 1.5m (5 ft) of an easily accessible grounded AC outlet. The outlet should furnish 115 VAC or 230 VAC (depending on rated voltage of unit).

A DC-powered ASM-31 unit requires -48 VDC or 24 VDC power source, which must be adequately isolated from the mains supply. In order to prevent a fire hazard, a suitable fuse should be installed in the DC line.

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature of ASM-31 is 0 to 50°C (32 to 122°F) at relative humidity of 90%, non-condensing.

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### 2.2 Package Contents

The ASM-31 package includes the following items:

- One ASM-31 unit
- ASM-31 Installation and Operation Manual
- AC power cord or DC power supply connector kit.

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## 2.3 Installation and Setup

ASM-31 is a standalone device intended for tabletop or bench installation. It is delivered completely assembled. No provision is made for bolting the unit on the tabletop.

► **To install ASM-31:**

1. Determine the required configuration of ASM-31 and set the internal jumpers accordingly.
2. Connect the line (see *Connecting the Line* below).
3. Connect the DTE (see *Connecting the DTE* below).
4. Connect power to the unit (see *Connecting the Power* below).



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**Access to the inside of the equipment is permitted only to the authorized and qualified personnel.**

**To avoid accidental electric shock, always disconnect the interface cables and the power cord before removing the unit from its casing.**

**Line voltages are present inside ASM-31 when it is connected to power and/or the lines. Moreover, under certain fault conditions, dangerous voltages may appear on the lines connected to the unit.**

**Any adjustment, maintenance and repair of the opened instrument under voltage must be avoided as much as possible and, when inevitable, should be carried out only by a skilled technician who is aware of the hazard involved. Capacitors inside the unit may still be charged even after the unit has been disconnected from its source of power.**

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**Caution** ASM-31 contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, avoid touching the internal components. Before moving jumpers, touch the ASM-31 frame.

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## Configuring ASM-31

This section describes how to configure ASM-31 for a typical application. *Figure 2-1* illustrates the layout of the ASM-31 printed-circuit board. *Table 2-1* provides details on the functions of the internal jumpers and switches, and their default settings.

► **To configure ASM-31:**

1. Disconnect all the cables connected to ASM-31.
2. Turn the unit over (bottom facing up).
3. Unscrew the four cover screws and keep them in a safe place.
4. Turn the unit over (bottom facing down).
5. Remove the ASM-31 top cover by pulling it straight up.
6. Select the modem's operation mode: synchronous or asynchronous (SW6, section 1).

7. Select the clock source (JP3). One of the modems should be set to EXT or INT clock, another modem – to LBT.
8. Select the data rate (SW7). The data rate must be the same for both master and slave units.
9. If the modems operate in the asynchronous mode, select the character length, parity type (or disable parity), and number of stop bits. These parameters must be the same for both modems (SW6, sections 2–5).
10. Select the DCD mode (SW6, section 6):
  - DCD-ON – The data carrier is always ON.
  - DCD-CNT – The DCD signal of the local unit follows the RTS signal of the remote unit.

In this case when the remote modem receives Ready To Send signal from its DTE, it sends Clear To Send back to the DTE and simultaneously raises the data carrier on the line. The local modem detects the data carrier, raises Data Carrier Detect signal and sets itself ready for the data receipt.
11. Close the ASM-31 cover by reversing the procedure described in steps 5–2.

Now you can proceed with the line, DTE and power connections as described below.

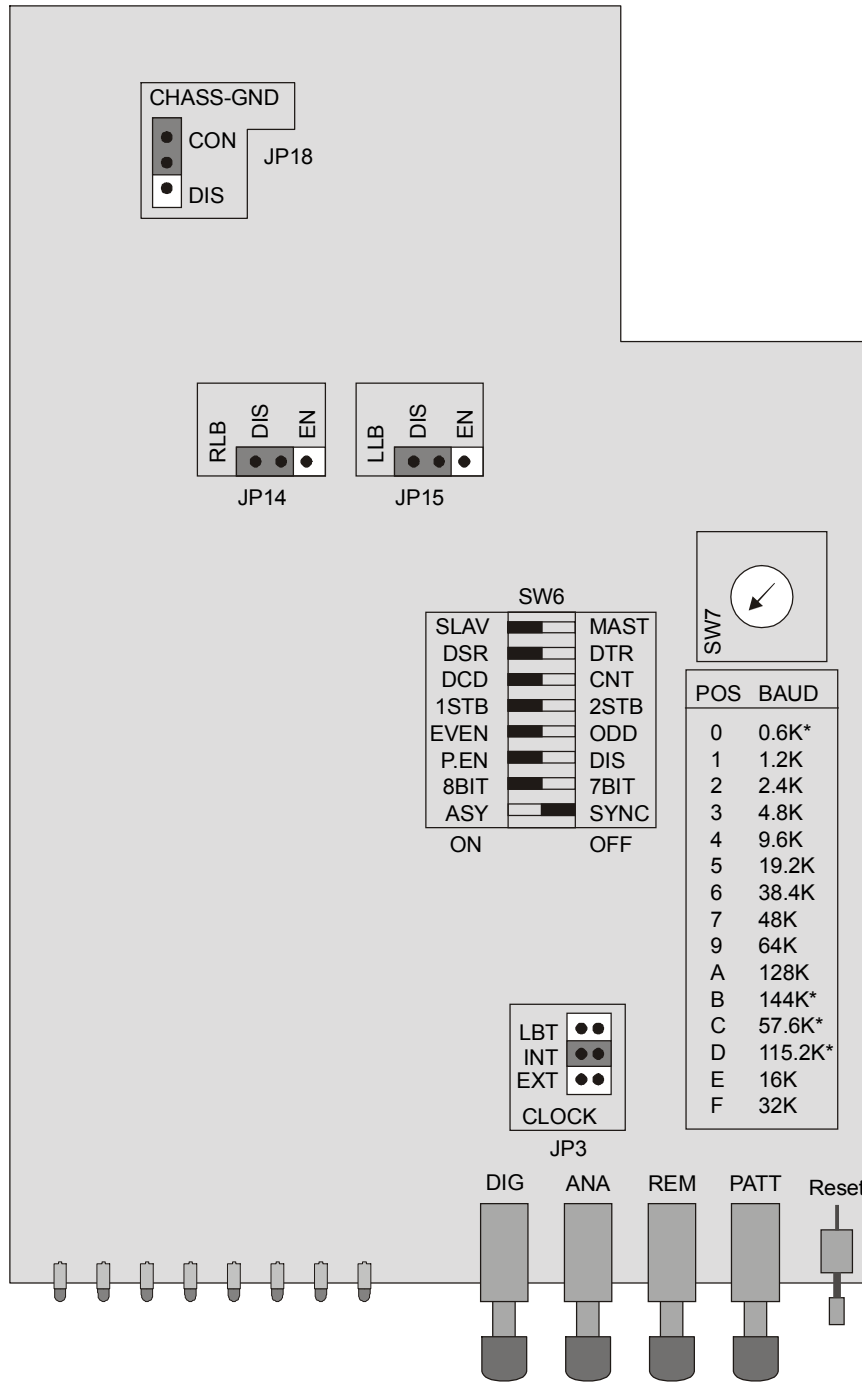


Figure 2-1. ASM-31 PCB Layout

**Note** Positions 0, B, C, D of the SW7 switch marked with an asterisk (\*) are not in use.

Table 2-1. ASM-31 Internal Jumpers and Switches

Item	Jumper/Switch	Function	Possible Settings	Factory Setting	
1	DIP switch, SW6	Section 1	Selects the ASM-31 operation mode	<b>ON</b> – Asynchronous operation <b>OFF</b> – Synchronous operation	OFF
			Section 2	Selects the character length	<b>ON</b> – 8 bit <b>OFF</b> – 7 bit
		Section 3	Enables or disables parity	<b>ON</b> – Parity enabled <b>OFF</b> – Parity disabled	ON
		Section 4	Selects parity type	<b>ON</b> – Even parity <b>OFF</b> – Odd parity	ON
		Section 5	Selects number of stop bits	<b>ON</b> – One stop bit <b>OFF</b> – Two stop bits	ON
		Section 6	Selects the DCD mode	<b>ON</b> – DCD-ON. The DCD signal turns on when ASM-31 reaches synchronization with the remote unit.  <b>OFF</b> – DCD-CNT. The DCD signal of the local unit follows the RTS signal of the remote unit.	ON
		Section 7	Selects the DSR mode	<b>ON</b> – DSR-ON. The DSR signal turns on to indicate to the DTE that the local unit is powered up.  <b>OFF</b> – DSR-DTR. The DSR signal of the local unit follows the DTR signal of the remote unit.	ON
		Section 8	Reserved for future use		
2	Data Rate switch, SW7	Selects the baud rate	<b>1</b> – 1.2 kbps (sync/async), <b>2</b> – 2.4 kbps (sync/async), <b>3</b> – 4.8 kbps (sync/async), <b>4</b> – 9.6 kbps (sync/async), <b>5</b> – 19.2 kbps (sync/async), <b>6</b> – 38.4 kbps (sync/async), <b>7</b> – 48 kbps (sync), <b>9</b> – 64 kbps (sync) <b>A</b> – 128 kbps (sync), <b>E</b> – 16 kbps (sync) <b>F</b> – 32 kbps (sync)	9 – 64 kbps	

**Note:** The DCD signal is OFF when a digital loopback is active (ASM-31 receives RLB command or DIG is active), or there is no synchronization between the modems.

Table 2-1. ASM-31 Internal Jumpers and Switches (Cont.)

Item	Jumper/Switch	Function	Possible Settings	Factory Setting
3	Clock Source jumper, JP3	Selects the ASM-31 timing reference	<b>INT</b> – Internal clock <b>EXT</b> – External clock <b>LBT</b> – Receive clock	INT
4	LLB jumper, JP15	Controls the LLB activation via the DTE interface	<b>EN</b> – The LLB activation from the DTE is enabled <b>DIS</b> – The LLB activation from the DTE is disabled	DIS
<i>Note: The LLB jumper is not available for the ASM-31 modems with X.21, G.703 and Ethernet interfaces.</i>				
5	RLB jumper, JP14	Controls the RLB activation via the DTE interface	<b>EN</b> – The RLB activation from the DTE is enabled <b>DIS</b> – The RLB activation from the DTE is disabled	DIS
<i>Note: The RLB jumper is not available for the ASM-31 modems with X.21, G.703 and Ethernet interfaces.</i>				
6	CHAS_GND, JP18	Controls the connection between signal ground and chassis ground	<b>CON</b> – Signal ground is connected to the chassis ground <b>DIS</b> – Signal ground is disconnected from the chassis ground	CON

**Note** The LLB and RLB jumpers control the LLB and RLB activation only from the DTE interface. The jumper settings do not affect the ANA and REM pushbutton operation.

## Connecting the Interfaces

Figure 2-2 illustrates the AC-powered ASM-31 unit rear panel.

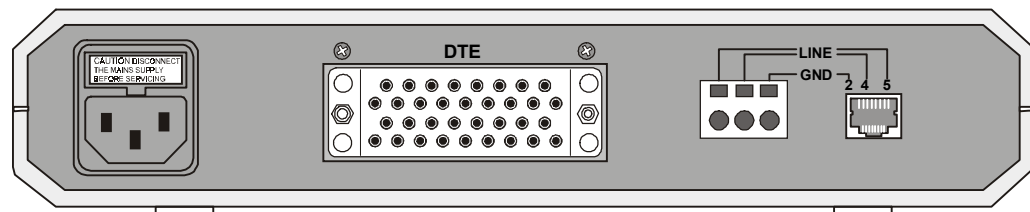


Figure 2-2. ASM-31 Rear Panel (AC Version)



### Connecting the Line

The ASM-31 line interface terminates in an 8-pin RJ-45 connector and 3-clip terminal block.

- **To connect the RJ-45 connector:**
  - Connect the line cable to the RJ-45 connector.
- **To connect the terminal block connector:**
  1. Insert the screwdriver into a square hole.

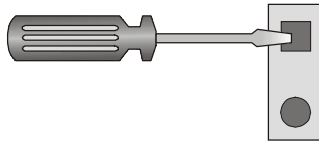


Figure 2-3. Connecting the Terminal Block – Step 1

2. Raise the inserted screwdriver, putting pressure on the ramp within the square hole.

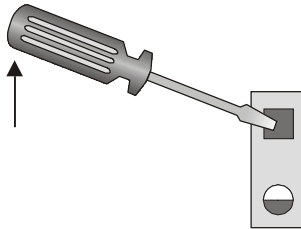


Figure 2-4. Connecting the Terminal Block – Step 2

3. Insert the stripped end of the wire and remove the screwdriver.

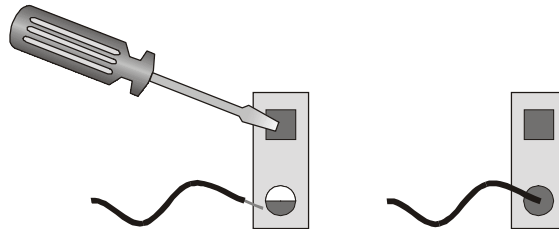


Figure 2-5. Connecting the Terminal Block – Step 3

### Connecting the DTE

The rear-panel DTE connector provides interface for data input/output, clock reference and control signal exchange between ASM-31 and the DTE. RAD offers interface cables for the DTE connection, refer to *Table 2-2* for the DTE interface connector description.

Table 2-2. DTE Interfaces and Matching Connector Cables

DTE Interface	Description	RAD Cable
V.24/RS-232	25-pin, D-type, female (see <i>Appendix A</i> for the connector pinout)	CBL-HBT/V24
V.35	34-pin, female (see <i>Appendix A</i> for the connector pinout)	CBL-HBT/V35

Table 2-2. DTE Interfaces and Matching Connector Cables (Cont.)

DTE Interface	Description	RAD Cable
X.21	15-pin, D-type, female (see <i>Appendix A</i> for the connector pinout)	CBL-HBT/X21
RS-530	25-pin, D-type (see <i>Appendix A</i> for the connector pinout)	CBL-HBT/RS-530 (provided with modem)
IR-G.703	5-clip terminal block or RJ-45 (see <i>Appendix E</i> for the module description)	
IR-ETH	RJ-45 or BNC (see <i>Appendix B</i> for the module description)	
IR-ETH/Q	RJ-45 (see <i>Appendix C</i> for the module description)	
IR-IP	RJ-45 (see <i>Appendix D</i> for the module description)	

## Connecting the Power

To connect ASM-31 to the power source, refer to the appropriate section below, depending on your version of the unit (AC or DC).



**Before switching on this unit and connecting any other cable, the protective earth terminals of this unit must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.**

**Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.**

**The line fuse is located in an integral-type fuse holder located on the rear panel. Make sure that only fuses of the required rating, as marked on the rear panel, are used for replacement. Do not use repaired fuses or short-circuit the fuse holder. Always disconnect the mains cable before removing or replacing the fuse. Whenever it is likely that the fuse protection has been damaged, make the unit inoperative and secure it against unintended operation.**

### AC Power Connection

AC power should be supplied to ASM-31 through the 1.5m (5 ft) standard power cable terminated by a standard 3-prong plug. The cable is provided with the unit.

➤ **To connect AC power:**

1. Connect the power cable to the power connector on the ASM-31 rear panel.
2. Connect the power cable to the mains outlet.

The unit will be turned on automatically upon connection to the mains.

### DC Power Connection

➤ **To connect DC power:**

- Refer to *DC Power Supply Connection Supplement*.

# Chapter 3

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## Operation

This chapter provides the following information for the ASM-31 standalone modem:

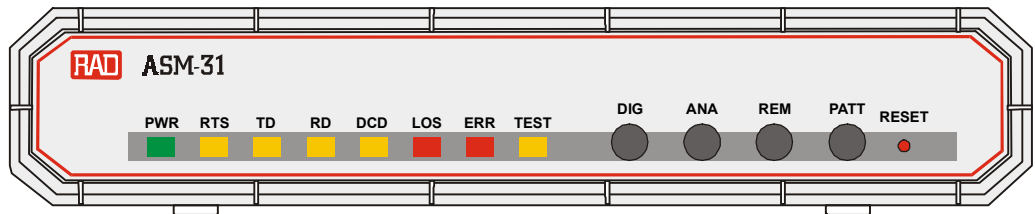
- ASM-31 front-panel indicators and controls
- Operating procedures (turn-on, front-panel indications, performance monitoring and turn-off).

Installation procedures given in *Chapter 2* must be completed and checked before attempting to operate ASM-31.

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### 3.1 Front Panel Controls and Indicators

*Figure 3-1* shows the ASM-31 front panel. *Table 3-1* lists the ASM-31 controls and indicators.



*Figure 3-1. ASM-31 Front Panel*

*Table 3-1. ASM-31 Front Panel Controls and Indicators*

Name	Type	Function
PWR	Green LED	ON – Power is on.
RTS	Yellow LED	ON – The DTE activates Request To Send.
TD	Yellow LED	ON – Steady SPACE is being transmitted. Blinks – Data is transmitted.
RD	Yellow LED	ON – Steady SPACE is being received. Blinks – Data is received.
DCD	Yellow LED	ON: <ul style="list-style-type: none"><li>• Local and remote modems are synchronized and section 6 (DCD) of the SW6 DIP switch is set to ON.</li><li>• Local and remote modems are synchronized, section 6 (DCD) of the SW6 DIP switch is set to OFF, and the RTS at remote modem is ON.</li></ul>

Table 3-1. ASM-31 Front Panel Controls and Indicators (Cont.)

Name	Type	Function
LOS	Red LED	ON – Loss of synchronization between local and remote modems.
TEST	Yellow LED	ON – ASM-31 is in any of the three loopback modes, or the PATT pushbutton is pressed.
ERR	Yellow LED	Blinks or remains lit if errors are present in the test pattern.
DIG	Pushbutton	The digital loopback pushbutton causes the local ASM-31 to loop received data to its transmitter (see <i>Figure 4-3</i> ).
ANA	Pushbutton	The local loopback (V.54 loop 3) pushbutton causes the local ASM-31 to loop its transmitter output back to its receiver (see <i>Figure 4-1</i> ). The transmitter continues to send data to the line. This loopback may also be activated from the DTE when the LLB jumper is set to EN (V.24, V.35 and RS-530 interfaces only).
REM	Pushbutton	The remote digital loopback (V.54 Loop 2) pushbutton causes the remote ASM-31 to loop received data to its transmitter (see <i>Figure 4-2</i> ). This loopback may be also activated from the terminal when the RLB jumper is set to EN (V.24, V.35 and RS-530 interfaces only).
PATT	Pushbutton	The PATT switch causes ASM-31 to send and receive a test pattern. If errors are encountered, the ERR indicator lights up.
RESET	Pushbutton	Resets the unit.

**Note** *The LLB and RLB jumpers control the LLB and RLB activation only from the DTE interface. The jumper settings do not affect the ANA and REM pushbutton operation.*

## 3.2 Operating ASM-31

### Turning On ASM-31

ASM-31 is turned on as soon as power is connected. When power is connected, the PWR indicator lights up and remains lit as long as ASM-31 receives power.

ASM-31 requires no operator attention once installed, with the exception of occasional monitoring of front panel indicators. Intervention is only required when the modem must be configured to new operational requirements, or the diagnostic tests must be performed.

## Normal Indications

Table 3-2 shows the correct status of the ASM-31 indicators, a few seconds after the power-up. The LOS, ERR and TEST indicators are blinking during the modem initialization.

Table 3-2. ASM-31 Indicator Status

Indicator	Status
PWR	ON
RTS	Depends on DTE RTS signal status.
TD	Depends upon the data being transmitted.
RD	Depends upon the data being received.
DCD	Depends on synchronization from the remote modem.
LOS	ON until synchronization between modems is achieved.

If the LEDs do not reflect the above status, ensure that:

- One modem is set to internal or external clock, and the other to loopback clock.
- The four front-panel pushbuttons are in the OFF position

## Turning Off ASM-31

To turn off the modem, remove the AC power cord from the AC power source.



# Chapter 4

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## Troubleshooting and Diagnostics

This chapter contains procedures for performing system diagnostic tests for ASM-31. Use the test procedures provided in this chapter to:

- Verify normal system operation
- Isolate faulty equipment
- Identify other sources of system malfunction.

The tests are activated by control pushbuttons on the ASM-31 front panel and monitored via LED indicators. For description of ASM-31 controls and indicators and their functionality, see *Chapter 3*.

---

### 4.1 V.54 Loopback Tests

ASM-31 supports several types of loopback tests for evaluating the operation of the data system equipment and its line circuits. Using these loopbacks, you can test communication between the attached equipment, internal circuitry of the local and remote modems.

Loopback test are best performed in the following order:

1. Local analog loopback
2. Remote digital loopback
3. Local digital loopback

Before testing the operation of the data system equipment and line circuits, ensure that all the units are powered up and configured properly.

**Note** *If you want to run the RLB and LLB tests via the DTE interface pins, ensure that the RLB and LLB jumpers are set to EN (see Table 2-1 and Figure 2-1). The LLB and RLB activation via the DTE interface pins is not available for the X.21, G.703 and Ethernet interfaces.*

---

## Local Analog Loopback (LLB)

The local analog loopback (LLB) test checks the performance of the local ASM-31 modem, the local DTE, and the connections between them (see *Figure 4-1*). The test is performed separately at the local and the remote site.

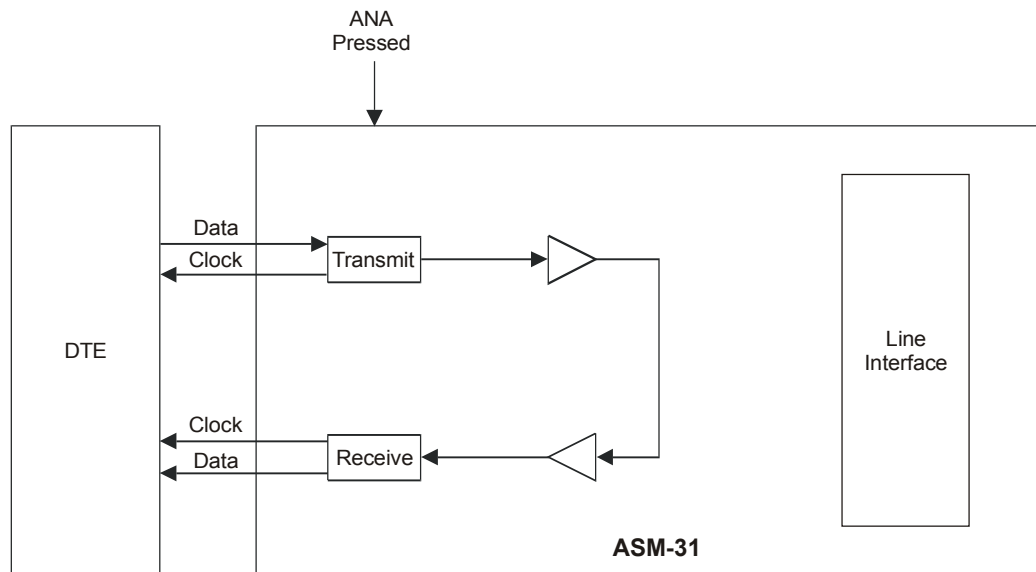


Figure 4-1. Local Analog Loopback

### ► To perform the local analog loopback test:

1. Press the ANA pushbutton.
  - The TEST LED on the ASM-31 front panel lights up. The modem's transmit output is now connected to its own receiver.
2. Execute the local analog loopback with one of the following methods:
  - Using the DTE configured to the half duplex operation and checking the echoed data stream.
  - Using an external BER tester.
    - If the BER test indicates an error-free data stream, but the DTE test indicates a fault, verify that the cable between the DTE and ASM-31 is properly connected. If the problem persists, follow the DTE manufacturer's test procedures.
3. To isolate a communication line problem, perform the LLB loopback at the opposite end. If both LLB tests are error-free, the fault is probably in the communication line or in the line interfaces.
4. After completing the test or correcting the fault, press ANA pushbutton again to restore it to the Off position.

**Note** You can also activate the local analog loopback via the appropriate pin of the DTE interface. The loopback activation via the DTE pins is not available for the X.21, Ethernet and G.703 interfaces.



## Remote Digital Loopback (RLB)

The remote digital loopback (RLB) test checks the performance of the local and the remote ASM-31 units and their connecting lines. The remote digital loopback sets a loop at the remote ASM-31 unit (see *Figure 4-2*).

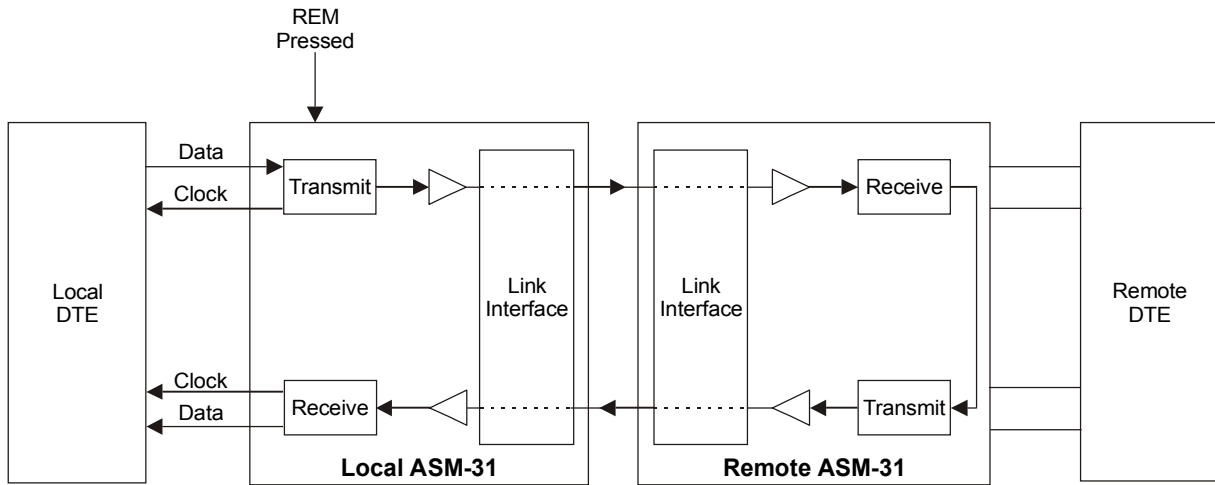


Figure 4-2. Remote Digital Loopback

### ► To activate the remote digital loopback:

1. Press the REM pushbutton on the local ASM-31 front panel.

The TEST LED on each ASM-31 front panel lights up. The receive input of the remote modem is looped back to the transmitter.

If an error occurs, while the local analog loopback test described above, was successful for both the local and remote modems, the line or the line circuits of the local or the remote unit are not operating properly.

2. After completing the test or correcting the fault, press REM pushbutton again to restore it to the Off position.

**Note** You can also activate the remote digital loopback via the appropriate pin of the DTE interface. The loopback activation via the DTE pins is not available for the X.21, Ethernet and G.703 interfaces.

## Local Digital Loopback (DIG)

The local digital loopback (DIG) test allows the operator at the remote end to check the performance of the local and remote ASM-31 units, and their connecting lines. The DIG test loops the received data back to the remote ASM-31 (see *Figure 4-3*). The local digital loopback test is equivalent to activating the remote loopback from the remote ASM-31.

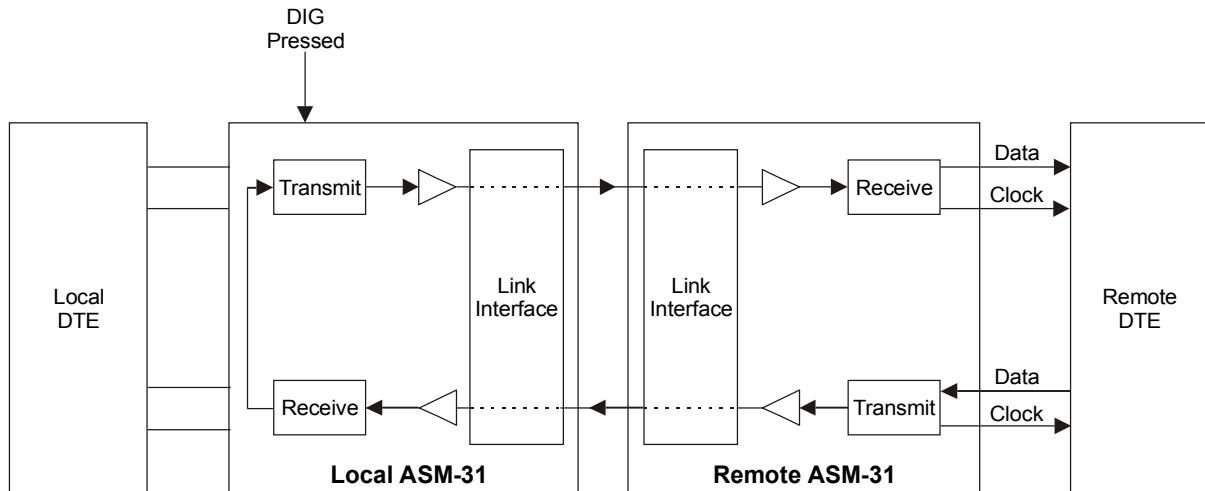


Figure 4-3. Local Digital Loopback

- **To activate the local digital loopback:**
  - Press the DIG pushbutton on the local ASM-31 front panel.
  - The TEST LED lights up.

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## 4.2 Frequently Asked Questions

**Q: What are the delays between RTS, CTS, DTR, and DSR?**

A: Local RTS-CTS delay: 1 millisecond  
 Local RTS to remote CTS: 25 milliseconds  
 Local DTR to remote DSR: 25 milliseconds

**Q: What are the transmit levels of the ASM-31?**

A: Between 13 dBm and 14 dBm. The maximum permissible attenuation is 38 dB.  
 The receiver sensitivity is -24 dBm.

**Q: Is it possible to perform a physical loopback on the 2-wire line?**

A: No. The loopbacks must be performed with the pushbuttons on the front panel of the modem.

**Q: Is it necessary to connect the local unit to a remote one in order to perform an analog loopback test?**

A: No. Any analog loopback will succeed if the modem operates properly. You can check data flow without error by connecting an HBT is to the modem.

# Chapter 5

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## ASM-31/R Card Version

This chapter describes the ASM-31/R card, designed for installation in the ASM-MN-214 card cage. The chapter contains the following sections:

- The ASM-MN-214 card cage
- The ASM-31/R card
- ASM-MN-214 power supply
- Installing the ASM-31/R card.

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### 5.1 ASM-MN-214 Card Cage

The ASM-MN-214 card cage contains one or two power supplies and up to 14 plug-in cards. The card types can be ASM-31/R or other RAD rack version modems/converters – any combination of up to 14 plug-in cards.

For each of the 14 cards, the rear panel (see *Figure 5-1*) contains a male connector for the terminal block and a DB-25 connector. A protection cover protects the terminal block connectors.

The terminal block (see *Figure 5-1*) is to be attached to the rear panel terminal block connectors. It contains screws for connecting the transmit and receive pairs and ground, if present.

The 25-pin D-type female interface connector provides all interface signals for the digital interfaces. Modems with X.21 or V.35 interface require an external mechanical adapter.

Two optional interface attachments, CIA/X21/1 and CIA/V.35/1, can be ordered separately from RAD. CIA/X21/1 converts between one DB-25 connector and an X.21 15-pin connector. CIA/V.35/1 converts between one DB-25 connector and a V.35 34-pin connector.

V.36 modem cards are supplied with a RAD adapter cable CBL 530/449F, which converts between the DB-25 connector and a V.36 37-pin connector. The adapter cable and two interface attachments are also shown in *Figure 5-1*.

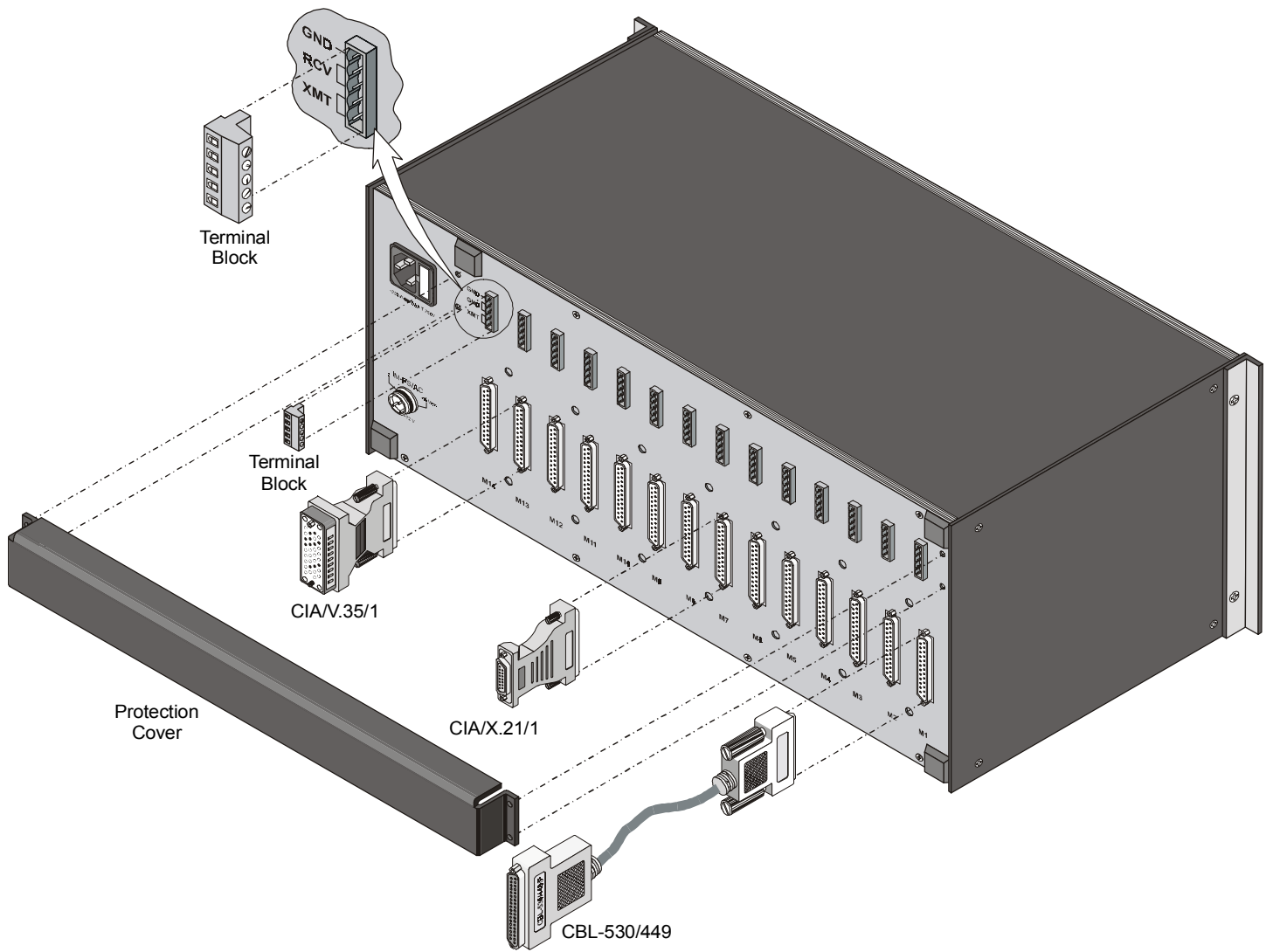


Figure 5-1. ASM-MN-214 Rear Panel

## 5.2 ASM-31/R Card

Figure 5-2 shows the ASM-31/R card front panel. The LEDs and pushbuttons of the card version are identical in their functionality to those of the standalone device. For this information, refer to *Front Panel Controls and Indicators* in Chapter 3.

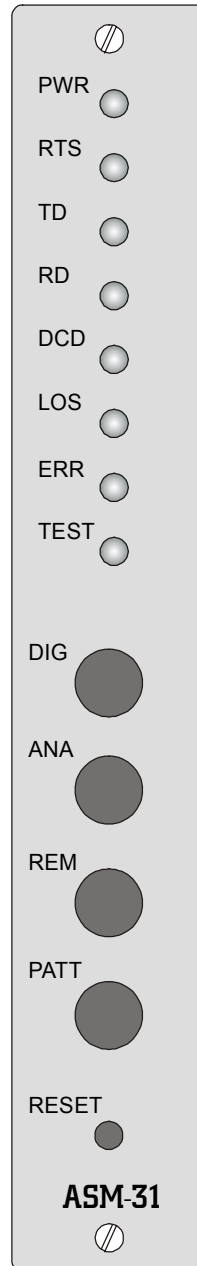


Figure 5-2. ASM-31/R Front Panel

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## 5.3 Power Supply

Power is supplied to the ASM-31/R card from the ASM-MN-214 power supply via the chassis. Each ASM-31/R card has two fuses, which protect the entire system against power failure resulting from a short circuit in one card.

The ASM-MN-214 card cage can accept both AC or DC power supplies. LED indicators located on the ASM-MN-214 front panel (see *Figure 5-3*) show activity when the power supply is connected to the mains plug. The power supply supports the full card cage with any combination of cards.

### AC Supply

The AC power supply of the ASM-MN-214 is 100, 115, or 230 VAC,  $\pm 10\%$ , 47 to 63 Hz.

### DC Supply

The DC power supply is -48 VDC (-36 to -72 VDC) or 24 VDC (18 to 32 VDC). It uses a DC/DC converter module to provide the power required for the cards.

### Power Supply with Redundancy

This special ordering option is equipped with two separate power supplies, operating together and sharing the load of the whole card cage. If either of the power supplies fails, the other one will continue to supply power to the full card cage.

Two LED indicators show activity of each power supply. They should both light when mains power is provided.

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**Note** *It is possible to combine AC and DC power supplies in the same cage.*

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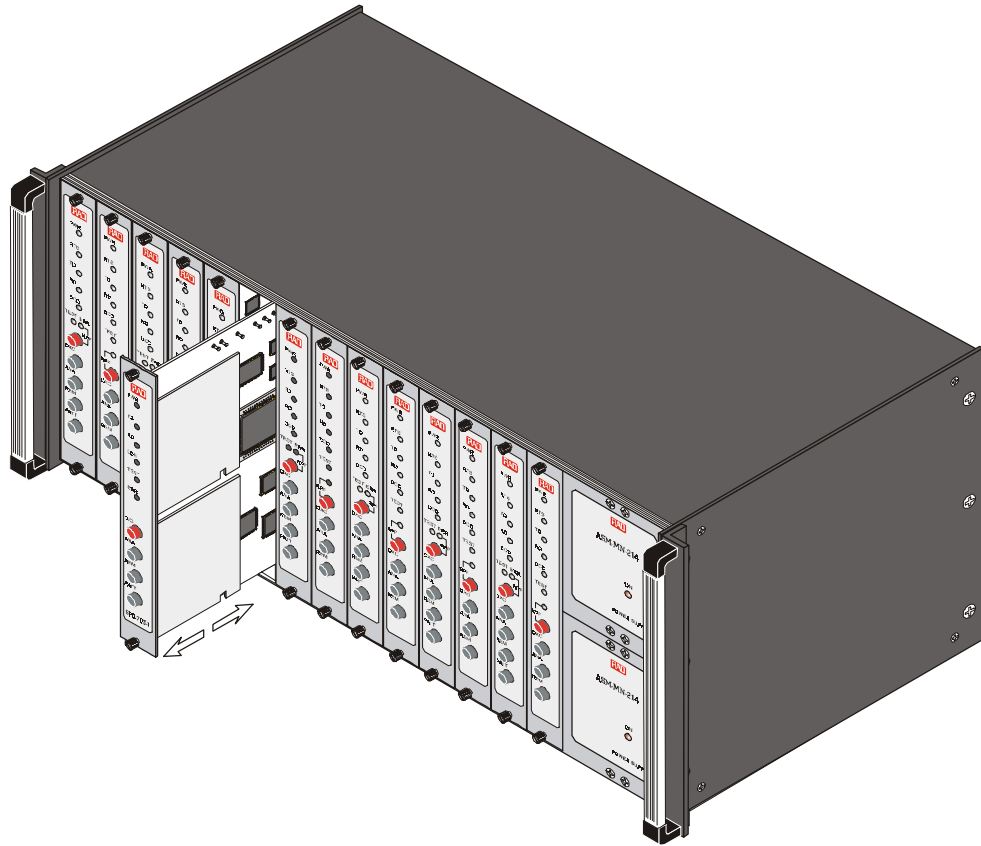


Figure 5-3. ASM-MN-214 Front Panel

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## 5.4 Installing the ASM-31/R Card

► **To install the ASM-31/R card in the ASM-MN-214 card cage:**

1. Install the ASM-MN-214 card cage in the 19-inch rack.
2. Adjust the jumpers and switches on the card as required (see *Figure 2-1* and *Table 2-1* in Chapter 2).
3. Insert the ASM-31/R card into one of the ASM-MN-214 slots. Push the bottom of the card into the cage until it is fully inserted into the edge connector inside the rack. Tighten the screws on the top and on the bottom of each card.
4. Remove the protection cover from the terminal block connectors.
5. Connect the terminal block to the ASM-MN-214 terminal block connector.
6. Connect the line wires to the XMT ports of the terminal block connector on the rear panel of the card cage.  
If using the STP cable, first connect the shield wire to the GND port of the terminal block connector (optional).
7. If required, attach the appropriate CIA (CIA/X21/1 or CIA/V.35/1) or V.36 adapter cable to the DB-25 connector on the card cage rear panel.
8. Connect the DTE cable to the DB-25 connector, other side of CIA or adapter cable (depending on your version of the card interface).
9. Connect power to the ASM-MN-214 card cage:
  - To connect AC power, connect the power cable to the mains supply.
  - To connect DC power, refer to *DC Power Supply Connection Supplement* of the ASM-MN-214 Installation and Operation Manual.



**Warning**

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**The ASM-MN-214 card cage has no power switch. Operation starts when the power is applied to the rear panel POWER connector. When applying power, first connect the plug of the power cord to the ASM-MN-214 POWER connector and then to the mains power source (outlet).**

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# Appendix A

## DTE Interface Signal Assignments

Table A-1 describes the signal assignments for the ASM-31 DTE interface connector.

Table A-1. DTE Interface Signal Assignments

Signal Function	RS-232	V.35		RS-530		X.21		Description
	DB-25 Standalone and Card Cage	DB-25 Card Cage	34-Pin Standalone Pin      Circuit	DB-25 Standalone and Card Cage Pin      Circuit	DB-25 Card Cage	DB-15 Standalone Pin      Circuit (Function)		
Protective Ground	1	1	A      Frame 101	1		1	1      ---- (Shield)	Chassis Ground. It may be isolated from Signal Ground.
Signal Ground	7	7	B      Signal 102 GND	7      AB		7	8      ---- (GND)	Common signal and DC power supply ground.
Transmitted Data	2	9 11	P      TD(A) 103 S      TD(B) 103	2      BA(A) 14      BA(B)		2 14	2      T(A) 9      T(B) (Transmit)	Serial digital data from DTE. In sync applications, the data translations must occur on the rising edge of the transmit clock.
Received Data	3	12 13	R      RD(A) 104 T      RD(B) 104	3      BB(A) 16      BB(B)		3 16	4      R(A) 11      R(B) (Receive)	Serial output from the modem receiver. In sync applications, the data translations occur on the rising edge of the clock.
Request to Send	4	4	C      RTS 105	4      CA(A) 19      CA(B)		4 19	3      C(A) 10      C(B) (Control)	A positive level to ASM-31 when data transmission is desired.

Table A-1. DTE Interface Signal Assignments (Cont.)

Signal Function	RS-232	V.35		RS-530		X.21		Description		
	DB-25 Standalone and Card Cage	DB-25 Card Cage	34-Pin Standalone		DB-25 Standalone and Card Cage		DB-15 Standalone			
			Pin	Circuit	Pin	Circuit	Pin		Circuit (Function)	
Clear to Send	5	5	D	CTS 106	5 13	CB(A) CB(B)			A positive level from ASM-31 with delay, after receipt of Request to Send, and when ASM-31 is ready to transmit.	
Data Set Ready	6	6	E	DSR 107	6 22	CC(A) CC(B)			A positive level from ASM-31 when power is on, and ASM-31 is (a) not in digital loopback mode, or (b) has not received a remote loopback signal from the remote unit.	
Data Terminal Ready	20	20	H	DTR 108	20 23	CD(A) CD(B)			Not used	
Carrier Detect	8	8	F	DCD 109	8 10	CF(A) CF(B)	8 10	5 12 (Indication)	I(A) I(B)	A positive level from ASM-31, except when a loss of the received signal is detected or when Data Set Ready is negative.
External Transmit Clock	24	19 16	U W	SCTE(A) 113 SCTE(B) 113	24 11	DA(A) DA(B)	24 11	7 14	(A)* (B)*	A serial data rate clock input from the data source. Positive clock translations must correspond to data transmissions.

\* – Unassigned pins according to the X.21 standard

Table A-1. DTE Interface Signal Assignments (Cont.)

Signal Function	RS-232	V.35		RS-530		X.21		Description	
	DB-25 Standalone and Card Cage	DB-25 Card Cage	34-Pin Standalone		DB-25 Standalone and Card Cage		DB-15 Standalone		
			Pin	Circuit	Pin	Circuit			Pin
Transmit Clock	15	14 10	Y a	SCT(A) 114 SCT(B) 114	15 12	DB(A) DB(B)	15 12	6 S(A) 13 S(B) (Signal Timing)	A transmit data rate clock for use by an external data source. Positive clock translations correspond to data translations.
Receive Clock	17	23 22	V X	SCR(A) 115 SCR(B) 115	17 9	DD(A) DD(B)			A receive data rate clock output used by an external data sink. Positive clock translations correspond to data translations.
Local Analog Loop	18	18	L and j		18	LL			A control signal input, which, when on, sets ASM-31 into local analog loopback (V.54 Loop 3).
Remote Digital Loop	21	21	N and h		21	RL			A control signal input which, when on, commands ASM-31 to send a remote loopback command (V.54 Loop 2) to the remote ASM-31.
Test Indicator	25	25	n and k		25	TM			A Control Signal output from ASM-31; positive during any test mode.



# Appendix B

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## IR-ETH Interface Module

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### B.1 General Description

IR-ETH is an interface module for RAD modems, used for converting the Ethernet (10BaseT or 10Base2) electrical levels to the modem TTL levels. It also converts the Ethernet protocol to HDLC to enable long-distance transmission and avoid the Ethernet collision limitation.

IR-ETH includes an internal, self-learning Ethernet bridge, which enables a high performance link between two Ethernet segments at a low transmission rate. The low-speed HDLC transmission is sent over the link using the modem modulation technique. It is converted back to an Ethernet signal at the remote modem.

Figure B-1 shows a typical application using an Ethernet interface bridge. Each modem is connected to an Ethernet network via the Ethernet interface bridge.

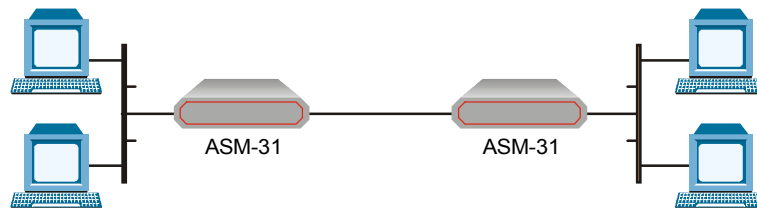


Figure B-1. Typical Application of ASM-31 with IR-ETH Module

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### B.2 IR-ETH Connector Options

Figure B-2 and Figure B-3 show the rear panel of the standalone ASM-31 with the IR-ETH interface module (RJ-45 and BNC connectors). Figure B-4 shows the DB-25 connector of the ASM-MN-214 rack, serving as DTE connector for ASM-31/R card version. Table B-1 lists the RJ-45 and DB-25 connector pinouts.

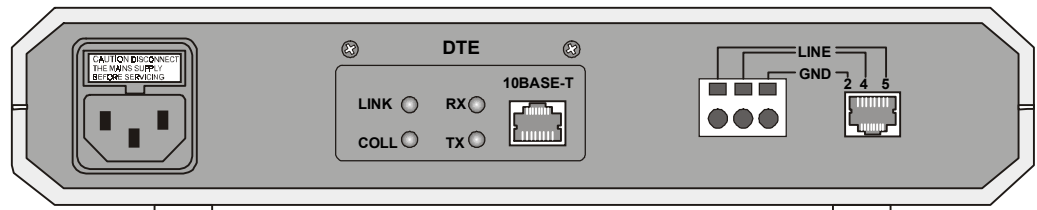


Figure B-2. Rear Panel of ASM-31 with IR-ETH Module (RJ-45 Connector)

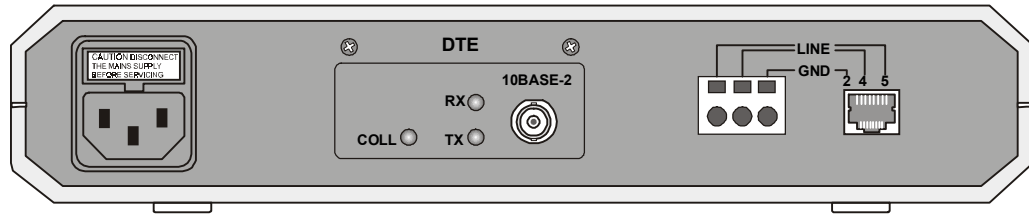
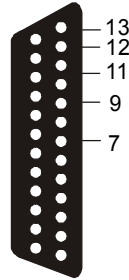


Figure B-3. Rear Panel of ASM-31 with IR-ETH Module (BNC Connector)



DB-25

Figure B-4. IR-ETH Connector for the ASM-31/R Card Version

Table B-1. RJ-45 and DB-25 Connector Pinouts

Pin		Function
RJ-45	DB-25	
3	13	RCV (+)
6	12	RCV (-)
1	11	XMT (+)
2	9	XMT (-)
-	7	GND

### B.3 Technical Specifications

<b>General</b>	<i>LAN Table</i>	10,000 addresses
	<i>Filtering and Forwarding</i>	15,000 pps
	<i>Buffer</i>	256 frames
	<i>Delay</i>	1 frame
<b>LAN</b>	<i>Standard</i>	Conforms to IEEE 802.3/Ethernet
	<i>Data Rate</i>	10 Mbps (20 Mbps 10BaseT FDX)
	<i>Connectors</i>	<ul style="list-style-type: none"> <li>• 10BaseT (UTP): Shielded RJ-45</li> <li>• 10Base2: BNC connector</li> </ul>
<b>WAN</b>	<i>Protocol</i>	HDLC
	<i>Data Rate</i>	According to the modem transmission rate

## B.4 Installation and Operation

Figure B-5 and Figure B-6 show the Ethernet bridge layout, the locations of the DIP switches, and the rear panel components for the UTP and the BNC versions, respectively.

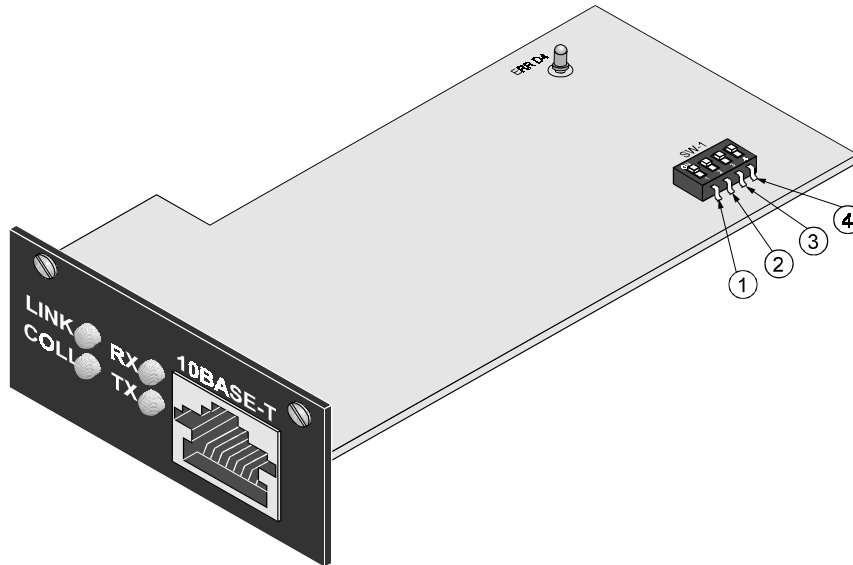


Figure B-5. IR-ETH Layout (UTP Option)

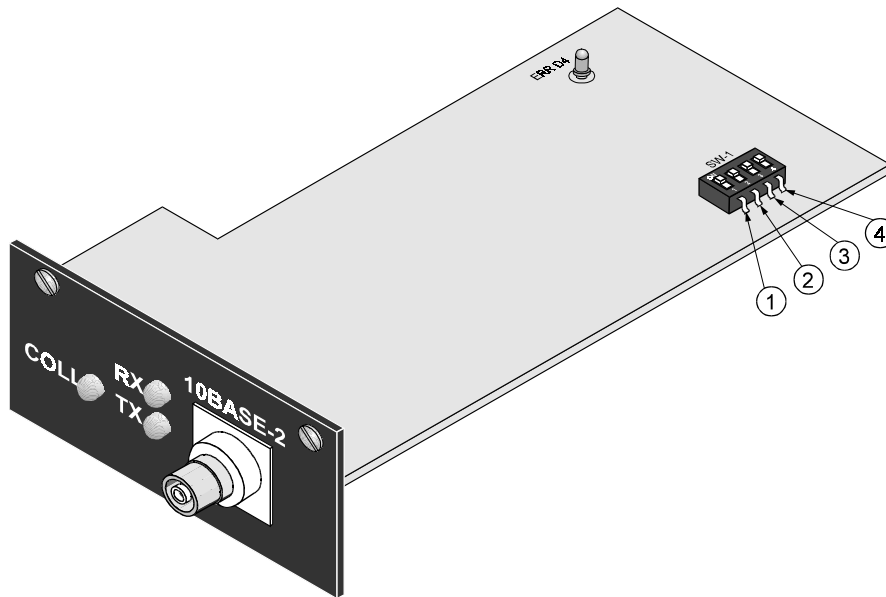


Figure B-6. IR-ETH Layout (BNC Option)

## DIP Switch Settings

Table B-2 describes functions and default settings of the DIP switch SW-1 sections.

Table B-2. DIP Switch Settings

Section Number	Name	Description	Default Setting
1	SQ/FD	ON – Full-duplex operation OFF – Half-duplex operation	OFF
<i>Note: The SQ/FD switch is not used in the IR-ETH module with BNC connector.</i>			
2	CMP	ON – Strips padding bits inserted in 64-byte frame OFF – Transmits frames over WAN as is	ON
3	FIL	ON – Passes only frames destined for another LAN OFF – Disables LAN filter; passes all frames transparently	ON
4	(nc)		

## LED Indicators

Table B-3 lists the IR-ETH LED indicators and describes their functions.

Table B-3. IR-ETH Bridge LED Indicators

LED Name	Description	Location	Color
LINK	ON indicates good link integrity	Rear panel	Green
COLL	ON indicates collision on the attached Ethernet segment	Rear panel	Yellow
RX	ON when data is received from the Ethernet attached segment	Rear panel	Yellow
TX	ON when data is transmitted from the modem to the Ethernet segment	Rear panel	Yellow
ERR D4	Bridge buffer overrun	On the IR-ETH board	Red

## Connecting to LAN

When connecting an IR-ETH interface module with the UTP option, use either a straight cable or a cross cable for the LAN connection. Use a cross cable when connecting to a port that does not implement the crossover function internally. Otherwise, use a straight cable.

**Note** *Hubs usually do implement the crossover function internally while network interface cards and other devices do not.*



# Appendix C

## IR-ETH/Q Interface Module

### C.1 General

IR-ETH/Q is an interface module for RAD modems, used for converting the Ethernet 10BaseT electrical levels to the modem TTL levels. It also converts the Ethernet protocol to HDLC to enable long distance transmission and avoid the Ethernet collision limitation. The IR-ETH/Q module also supports IEEE 802.1/Q frames.

IR-ETH/Q includes an internal, self-learning Ethernet bridge, which enables a high performance link between two Ethernet segments at a low transmission rate. The module also supports VLAN applications. The low-speed HDLC transmission is sent over the link using the modem modulation technique. It is converted back to an Ethernet signal at the remote modem.

Figure C-1 shows a typical application using an Ethernet interface bridge. Each modem is connected to an Ethernet network via the Ethernet interface bridge.

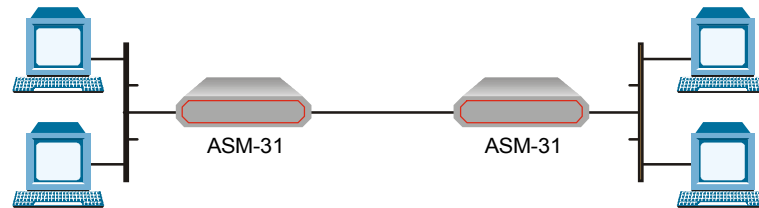


Figure C-1. Typical Application of ASM-31 with IR-ETH/Q Module

### C.2 IR-ETH/Q Connector

Figure C-2 shows the rear panel of ASM-31, equipped with IR-ETH/Q module. Table C-1 lists the module's RJ-45 connector pinout.

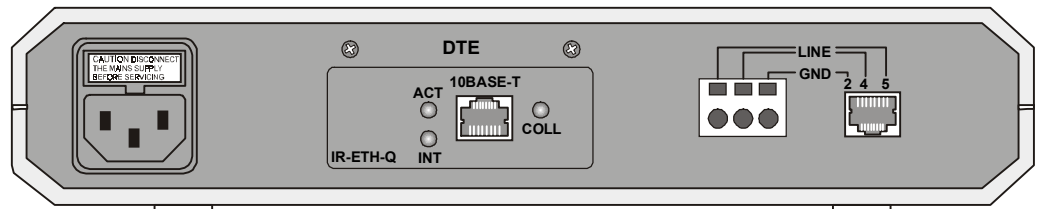


Figure C-2. Rear Panel of ASM-31 with IR-ETH/Q Module

Table C-1. RJ-45 Connector Pinout

Pin	Signal
3	RCV (+)
6	RCV (-)
1	XMT (+)
2	XMT (-)
–	GND

---

### C.3 Technical Specifications

<b>General</b>	<i>LAN Table</i>	5,000 addresses
	<i>Buffer</i>	200 kbytes
<b>LAN</b>	<i>Standard</i>	Conforms to IEEE 802.3/Ethernet and supports IEEE 802.1/Q frames
	<i>Data Rate</i>	10 Mbps (20 Mbps 10BaseT FDX)
	<i>Connectors</i>	10BaseT (UTP): Shielded RJ-45
<b>WAN</b>	<i>Protocol</i>	HDLC
	<i>Data Rate</i>	According to the modem transmission rate

## C.4 Installation and Operation

Figure C-3 shows the IR-ETH/Q rear panel and location of the S3 DIP switch.

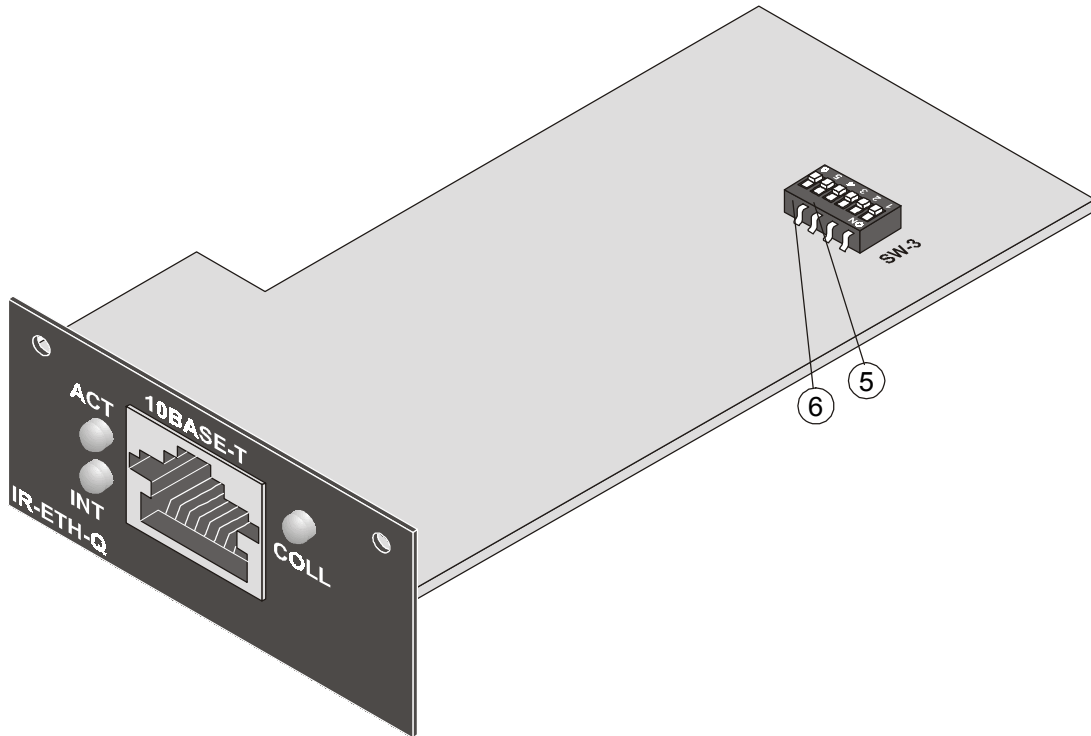


Figure C-3. IR-ETH/Q Module Layout

### Setting the DIP Switch

Configure the IR-ETH/Q module by setting the DIP switch in accordance with Table C-2.

Table C-2. DIP Switch Settings

Section Number	Name	Description	Default Setting
1-4	-	Reserved for future use. Must always be set to OFF.	OFF
5	FD/HD	ON: Ethernet bridge full-duplex mode OFF: Ethernet bridge half-duplex mode	OFF
<i>Note: IR-ETH/Q does not support autodetection. Therefore, the equipment connected to IR-ETH/Q should <b>not</b> be set to autodetection mode and the half/full duplex setting should be set manually.</i>			
6	TRANS/FIL	OFF: Passes only frames destined for another LAN ON: Disables LAN filter; passes all frames transparently	OFF

## LED Indicators

Table C-3 lists the IR-ETH/Q LED indicators and describes their functions.

Table C-3. IR-ETH/Q LED Indicators

LED Name	Description	Location	Color
INT	ON – Good link integrity	Panel	Green
COLL	ON – Collision on the attached Ethernet segment	Panel	Red
ACT	ON – Data is received from the Ethernet attached segment or data is transmitted from the modem to the Ethernet segment	Panel	Yellow

*Note:* In filtered mode, IR-ETH/Q passes frames destined only for another LAN

## Connecting to LAN

Use either a straight cable or a cross cable for the LAN connection. Use a cross cable when connecting to a port that does not implement the crossover function internally. Otherwise, use a straight cable.

**Note** *Hubs usually implement the crossover function internally, while network interface cards and other devices do not.*

# Appendix D

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## IR-IP Interface Module

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### D.1 Introduction

#### Overview

IR-IP is a high-performance, miniature IP router based on RAD's unique IP router chip, the ChipRouter.

IR-IP works by taking each Ethernet frame from the LAN and determining whether the IP packet is destined for the IP net on the Ethernet LAN. If not, IR-IP forwards the packet to the WAN link. IP packets received from the WAN link are automatically forwarded to the LAN if the IP net matches.

IR-IP includes hardware filters which handle all filtering operations at wire speed from both LAN-to-WAN and WAN-to-LAN, without dropping a single packet. Filtering and forwarding are performed at the maximum rate of 35,000 and 30,000 frames per second (wire speed), respectively. The buffer can hold 256 frames of maximum size of 1534 bytes and a throughput latency of one frame.

IR-IP is available with 10BaseT (UTP) interface and is fully IEEE 802.3/Ethernet v2 compliant. The IR-IP interface can also operate in full duplex Ethernet applications.

ASM-31 equipped with IR-IP interface module can be used as a Frame Relay Access Device (FRAD) with an integral IP router. RFC 1490 is supported for a single DLCI on the WAN link. Detection of the DLCI and the maintenance protocol is performed automatically. This allows the IR-IP to be used as the termination unit of IP services over Frame Relay at the customer premises, opposite a Frame Relay switch in the backbone.

Alternatively, Point-to-Point Protocol (PPP) can be run on the WAN link with automatic negotiation on power-up, as well as support for PAP and CHAP authentication. With this feature, IR-IP can operate opposite any PPP compliant access server or backbone router.

IR-IP supports HDLC, which is especially important for broadcast and multicast applications where bandwidth overhead is critical.

IR-IP supports IP multicast at wire speed, making it suitable for any multicast environment including high speed downstream environments, such as satellite and xDSL. Users on the LAN who register with IR-IP for an IP multicast group using the IGMP protocol filter IP multicast packets at wire speed.

Management and advanced configuration are performed via Telnet.

## Application

Figure D-1 shows a typical application of the ASM-31 modem equipped with the IR-IP interface module.



Figure D-1. Typical Application of the ASM-31 Unit with IR-IP

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## D.2 Technical Specifications

<b>Router</b>	<i>LAN IP Net</i>	Up to 256 hosts on LAN IP net
	<i>Filtering and Forwarding</i>	35 kbps / 30 kbps
	<i>Buffer</i>	256 frames (maximum size – 1534 bytes)
	<i>Delay</i>	1 frame
<b>LAN</b>	<i>Standard</i>	Conforms to IEEE 802.3/Ethernet v2
	<i>Data Rate</i>	10 Mbps (20 Mbps 10BaseT in full duplex topology)
	<i>Connector</i>	10BaseT (UTP): Shielded RJ-45
<b>WAN</b>	<i>Protocols</i>	<ul style="list-style-type: none"> <li>• PPP (PAP/CHAP)</li> <li>• Frame Relay (RFC 1490)</li> <li>• HDLC</li> </ul>

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## D.3 Physical Description

Figure D-2 shows the rear panel of ASM-31 with the IR-IP interface module.

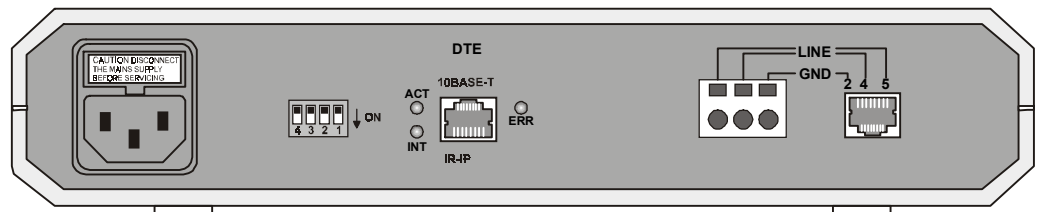


Figure D-2. Rear Panel of ASM-31 with the IR-IP Module

## IR-IP LEDs

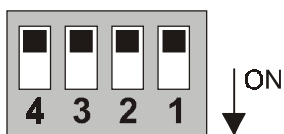
IR-IP contains three LEDs, which indicate the module activity. *Table D-1* lists the LEDs functions.

*Table D-1. IR-IP LEDs Functions*

Name	Type	Function
INT	Green LED	ON – LAN integrity is established.
ACT	Yellow LED	Blinks – Transmit/receive activity is detected on the Ethernet link.
ERR	Red LED	ON – Buffer overflow occurred (during normal operation). During power-up, provides additional indications, described below.

## IR-IP DIP Switch

IR-IP interface module contains a four-section DIP switch, as seen in *Figure D-3*. *Table D-2* lists the DIP switch functions.



*Figure D-3. IR-IP DIP Switch*

*Table D-2. IR-IP DIP Switch Functions*

No	Function	Values	Default Setting
1	Enables IR-IP to learn its IP	<b>ON</b> – IP address learning is enabled <b>OFF</b> – IP address learning is disabled	OFF
2	Selects the WAN protocol	<b>ON</b> – PPP protocol <b>OFF</b> – Frame Relay protocol	OFF
3	Selects the LAN mode	<b>ON</b> – Full duplex operation <b>OFF</b> – Half duplex operation	OFF
4	Controls the remote WAN test loopback, which returns packets received from the WAN back toward the WAN	<b>ON</b> – The test loopback is activated <b>OFF</b> – The test loopback is disabled	OFF

Table D-3 provides the pinout of the IR-IP RJ-45 connector.

Table D-3. RJ-45 Pinout

Pin	Name	Function
1	TD (+)	Transmit data positive
2	TD (-)	Transmit data negative
3	RD (+)	Receive data positive
6	RD (-)	Receive data negative

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## D.4 Preliminary Configuration of ASM-31 with IR-IP

Before starting configuration of the IR-IP interface module, make sure to set the following jumpers of the local and remote units as detailed below:

- RLB jumper (JP14) – DIS
- LLB jumper (JP15) – DIS
- Section 6 (DCD) of the SW6 DIP switch – ON
- Section 7 (DSR) of the SW6 DIP switch – ON.

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## D.5 IR-IP Management Subsystem, General

### Introduction

The IR-IP interface module management subsystem supports the following functions:

- Preliminary configuration
- Configuration of management access parameters
- Advanced configuration of IR-IP parameters
- Collection and display of statistical performance data
- Maintenance functions, which include:
  - Software downloading
  - Resetting of various subsystems
  - Display of error log
  - Ping utility, for checking IP connectivity.

The management subsystem of the IR-IP interface module is a separate, independent entity, and therefore it cannot be managed through the ASM-31 management subsystem.



The communication with the IR-IP management subsystem is made through the local LAN interface connector of the IR-IP module, designated 10BASE-T, using the Telnet protocol. Passwords can be used to prevent unauthorized access.

## Accessing the IR-IP Management Subsystem

The IR-IP interface module must be configured in accordance with the specific requirements of the user's application before it can be used in the user's network. As a result, it is not possible to supply default parameters to enable IR-IP to start service without any preliminary configuration.

Therefore, to enable the user to establish Telnet communication and configure IR-IP, IR-IP is delivered with a factory-default set of parameters. The factory-default parameters are automatically used:

- Before the IP router is configured by the user, e.g., when a new ASM-31 with IR-IP interface module is put into operation
- After the user's configuration parameters have been erased.

When the factory-default parameters are used, the ERR indicator located on the ASM-31 rear panel, near the IR-IP Ethernet interface connector flashes rapidly (about three times per second). The flashing of the ERR indicator also serves as a warning to the user that the IR-IP WAN interface does not send, nor does it receive packets, and therefore IR-IP can be accessed only from the LAN.

After configuring IR-IP, it starts normal operation and routes the traffic in accordance with the user-selected configuration parameters.

To change the parameters of an already-configured IR-IP, establish communication from a Telnet host using the assigned IP address.

## Default IP Communication Parameters

The factory-default IP communication parameters of the interface module are:

- The default IP address of the IR-IP Ethernet port is 192.168.205.1, and the default IP subnet mask is 255.255.255.252.
- The port will accept IP communication only from the IP address 192.168.205.2. Therefore, as long as the factory defaults are in effect, you must assign this address to the Telnet host used to configure IR-IP.

Using the IP learning mechanism, as explained below you can change the default parameters.

---

**Note** *In the default configuration, the IR-IP WAN interface is disabled. In order to enable the WAN interface, you have to modify the Ethernet port address or the IP subnet mask.*

---

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## D.6 Performing Preliminary Configuration

### General

The software necessary for performing all the management and configuration functions is stored in the IR-IP interface module, and therefore you only need a regular Telnet host to perform all the activities described in this appendix.

A Telnet host is any computer, e.g., an IBM PC or compatible that fulfills the following minimum requirements:

- A standard 10BaseT Ethernet interface
- A TCP/IP protocol stack, and therefore is capable of supporting IP communication through the Ethernet interface
- Telnet client software
- A ping utility.

### Outline of Preliminary Configuration

- **To perform the preliminary configuration procedure:**
  1. Connect the Telnet host to the IR-IP interface module.
  2. Configure the Telnet host to enable communication with the IR-IP interface module using the default IP parameters.
  3. Establish communication with IR-IP and assign the prescribed IP address to its LAN interface.
  4. Establish again communication with IR-IP and continue the preliminary configuration in accordance with the *Quick Setup Menu* section below.

### Connecting the Telnet Host

Before starting the management and configuration activities, it is necessary to establish IP communication between your Telnet host and the IR-IP interface module. For this purpose, it is necessary to provide a communication path.

Because of the method used to assign an IP address to IR-IP Ethernet port, it is recommended to connect the Telnet host directly to the IP router 10BASE-T connector. This is made by connecting an Ethernet cross cable between the Ethernet connector of the Telnet host and the IP router connector.

However, you may also connect through a common LAN: in this case, connect your Telnet host and IR-IP to Ethernet hub ports using straight cables.

### Preliminary Telnet Host Configuration

You can use the IP learning mechanism to configure the IP communication parameters of the IR-IP LAN interface. In this case, skip to the *Assigning the Router LAN Interface Address* section below.

If you prefer to use the factory-default parameters to establish IP communication between your Telnet host and IR-IP, configure the Telnet host as follows:

1. Temporarily configure the host IP address as 192.168.205.2.
2. The initial destination IP address to be used by the host is 192.168.205.1.

---

**Note** *The first step in the preliminary configuration process is to assign the desired IP address to the LAN interface of the IR-IP interface module. After an IP address is assigned and saved, you must change the destination IP address of the Telnet host to the new address, otherwise it is not possible to continue the configuration process. At the same time, you can also change the temporary IP address assigned to the host (192.168.205.2) back to its permanent address.*

---

## Assigning the Router LAN Interface Address

The IP address of the IR-IP LAN interface must be configured as part of the preliminary configuration process. To simplify this process, IR-IP includes a simple and convenient IP address learning mechanism.

The IP address can be configured and changed at any time, even after the complete IR-IP configuration process has been performed, because it does not affect other configuration parameters. Moreover, the IP subnet mask is automatically adapted to the new IP address.

### IP Learning Mechanism

To simplify the configuration process, IR-IP has a special mechanism for configuring the IP address of its LAN interface. Setting section 1, called IP address learning, of the IR-IP DIP switch (*Figure D-3*) to ON enables this mechanism.

The IP learning mechanism enables IR-IP to learn its LAN interface IP address by receiving frames sent by a **ping** utility to the prescribed LAN IP address.

**Note** *To use the IP learning mechanism, you do not need to know the current address of IR-IP LAN interface, but only the prescribed IP address.*

---

The IP address is actually retrieved from the ARP frames sent during ping to locate the **ping** destination, not from the **ping** frames.

To ensure that the process is correctly performed, it is recommended to check the contents of the ARP table before starting the **ping** utility, to make sure that it does not contain the address to be assigned to the IP router LAN interface.

➤ **To view and edit the ARP table contents:**

If the Telnet host you are using runs under Microsoft Inc. Windows™ 95, 98 or NT, use the following procedure to view and edit the ARP table contents:

1. Display the table using the **arp -a** command.
2. If the table includes the intended IP address, remove it from the table using the **arp -d** command.

If for some reason the IP learning process does not succeed, before repeating it make sure to remove the IP address from the table.

### Assigning a LAN IP Address to a New IR-IP

The following procedure enables you to configure the LAN IP address of a new IR-IP router, i.e., a router using the default parameters (see the *Accessing the IR-IP Management Subsystem* section above).

If ASM-31 is already operating, skip Step 2 in the following procedure.

► **To configure the IP router LAN address:**

1. Make sure the preparations described above have been completed, including the configuration of the *ping* utility.
2. Turn ASM-31 on and monitor the IP router indicators:
  - The INT indicator turns on
  - The ERR indicator lights steadily for approx. 15 seconds, and then starts flashing at a rapid rate (about three times per second).

If the ERR indicator turns off, skip to the *What to Do If ...* section below.

3. Set section 1 of IR-IP DIP switch to ON.

The ERR indicator starts flashing faster (approximately four times a second).
4. Send a *ping* to the new address to be used by IR-IP. A confirmation should be received after the third *ping*: after the confirmation, the flashing will slow down to approximately twice a second.

If your host does not begin to receive *ping* replies after three unsuccessful attempts, skip to the *What to Do If ...* section below.

5. Return section 1 of the IR-IP DIP switch to the OFF position.

The ERR indicator must turn off.

At this stage, the communication with IR-IP router is lost, because its IP address has been changed. Therefore, you must reconfigure the destination IP address of the Telnet host. If you wish, you may also change the temporary IP address assigned to the host (192.168.205.2) back to its permanent address.

After changing the destination IP address of the Telnet host, it is recommended to turn ASM-31 off for a few seconds and then back on, before continuing the configuration of the IP router in accordance with the *Quick Setup Menu* section below. At this time, in Step 2 the ERR indicator turns off after the 15-second interval.

### Changing the LAN IP Address of a Configured IR-IP

The LAN IP address of an already-configured IR-IP can be changed while it operates, this means it is not necessary to turn ASM-31 off before starting the configuration procedure. Note however that the IP traffic flow through IR-IP will be disrupted until the other stations in the IP network learn the new address.

To change the LAN IP address of an already-configured IR-IP, use the procedure described above for a new IR-IP with the following differences:

1. Configure the destination address of the **ping** utility to the new LAN interface IP address. It is not necessary to change the Telnet host source address.
2. When ready, set section 1 of the IR-IP DIP switch to ON.  
The ERR indicator starts flashing faster (approximately four times a second).
3. Perform Steps 4, 5 of the procedure used for a new IR-IP.

### What to Do If ...

- **The INT indicator does not light immediately after ASM-31 is turned on**

The IR-IP interface module does not receive power from the ASM-31 power supply. Service is required.

- **The ERR indicator does not light immediately after ASM-31 is turned on**

IR-IP is faulty and must be replaced.

- **After turn-on, the ERR indicator lights for 15 seconds and then turns off. ACT does not light, and there is no response from IR-IP**

No software loaded into IR-IP. Download software using the procedure described in the *New Software Download Menu* section below.

- **After turn-on, the ERR indicator lights for 15 seconds, and then turns off. ACT lights from time to time, but there is no response from IR-IP**

IR-IP has been configured. If you do not know the current IP address of the LAN interface, erase IR-IP router configuration using the procedure given in the *Erasing User's Configuration* section below.

- **No ping replies from IR-IP**

If your host does not begin to receive **ping** replies after three unsuccessful attempts, check the physical connection path between the Telnet host Ethernet interface and the IR-IP 10BASE-T connector.

- **The IP learning process is not successful**

Check that the prescribed IP address does not appear in the ARP table.

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## D.7 IR-IP Management Utility

### General Operating Procedures

The IR-IP interface module is managed via a simple, menu-driven utility that uses a basic terminal user interface. A typical screen is shown in *Figure D-4*.

As seen in *Figure D-4*, each screen has a header that identifies the device being configured and its logical name, assigned by the user, followed by the running software revision and date. The bottom line of the screen displays prompts that guide you in the execution of the various activities.

Use the following general procedures to perform the desired activity:

- To change a parameter or to select a menu item, type the corresponding line number.
- For a parameter, which has a discrete set of values, the parameter values are enclosed in brackets [ ]. To select a new value, press the spacebar to scroll among the available values until the desired value is displayed, and then press <Enter> to select the displayed value.
- To enter a value which requires free text entry, type in the desired string and then press <Enter>. Use backspace to erase the current string.
- After all the parameters have been selected, a prompt appears, requesting that you confirm the changes.

**Note** For proper display of the screens, you must:

- Select a fixed-pitch system font for the display. Use your operating system documentation to find how to select a proper font.
- Configure the Telnet utility to use VT-100 terminal emulation.

## Starting a Management Utility

The management utility is started automatically when Telnet communication is established. If password protection is enabled (see the *Management Access Menu* section below), you will be prompted to enter the Telnet password. The opening screen, which appears after the Telnet session activation, is the IR-IP Main menu (see *Figure D-4*).

```
IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

1. Quick Setup
2. Management Access
3. Advanced Setup
4. Device Control
5. View
6. Diagnostic Tool (PING terminal)

Press one of the numbers to select or ESC:
```

*Figure D-4. IR-IP Main Menu*

To end the utility, press <Esc> when the Main menu is displayed. This will also end the Telnet session.

## Menu Structure of Management Utility

*Figure D-5* shows the menu structure of the IR-IP management utility.

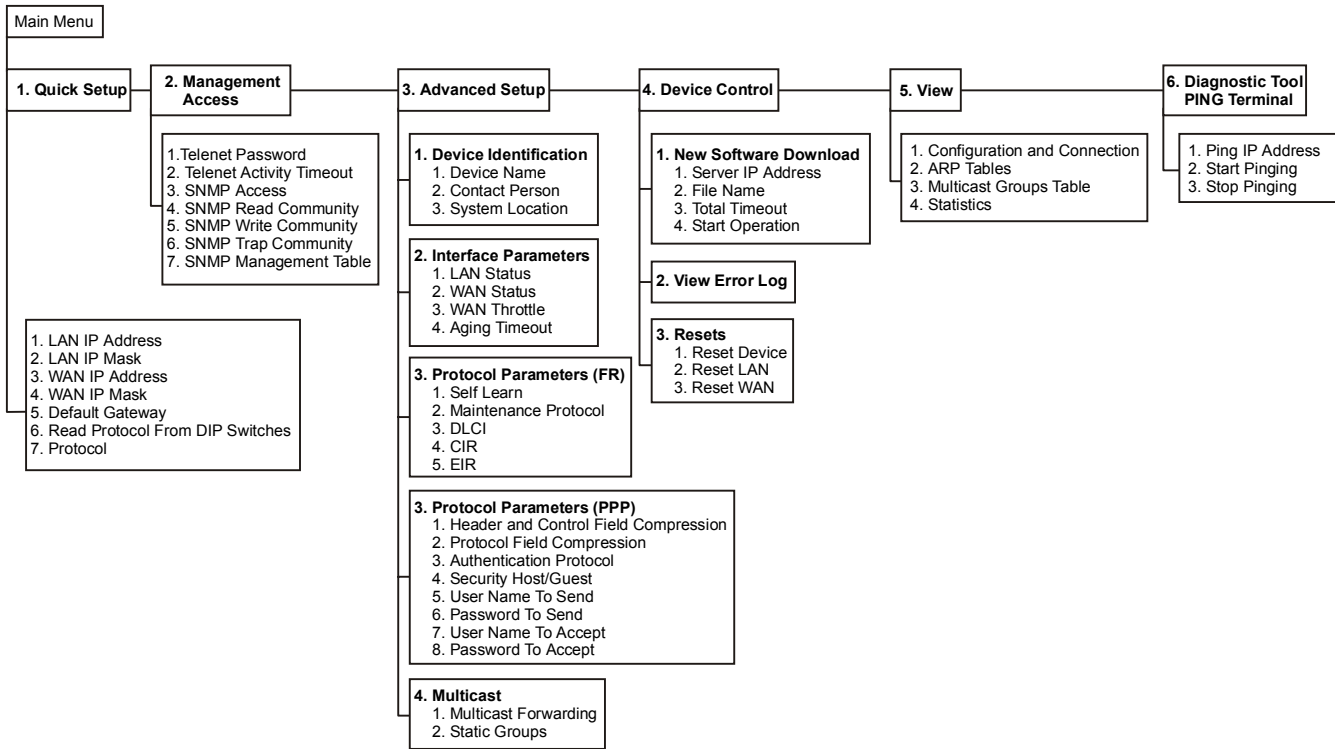


Figure D-5. Management Utility, Menu Structure

## D.8 Quick Setup Menu

The Quick Setup menu is used to select the main parameters' values that must be defined before you start using IR-IP.

Use the Advanced Setup menu (see the *Advanced Setup Menu* section below) to specify values for other IR-IP configuration parameters not included in this menu.

- **To access the Quick Setup menu:**
  - From the Main menu, type 1.

The Quick Setup menu appears (Figure D-6).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)
Quick Setup
=====
1. LAN IP Address                    :192.168.100.001
2. LAN IP Mask                       :255.255.255.000
3. WAN IP Address (empty for unnumbered) :.....
4. WAN IP Mask (empty for unnumbered)  :.....
5. Default Gateway (empty - WAN interface) :.....
6. Read Protocol From DIP Switches    : [ Yes ]
7. Protocol                          : [ Frame Relay ]

Press one of the numbers to select or ESC:
    
```

Figure D-6. Quick Setup Menu

## LAN IP Address

Used to enter the IP address for the IP router LAN interface. This is the address to which nodes connected to the local LAN send packets addressed to the WAN.

## LAN IP Mask

Used to enter the IP subnet mask. The IP router supports a maximum of 254 hosts on the LAN, therefore you must use Class C subnet masks. The basic subnet IP mask for Class C addresses, which supports the maximum possible number of hosts, 254, is 255.255.255.0. To help you understand the selection of IP subnet masks, *Figure D-7* provides a configuration example for a LAN with 6 nodes: the IP subnet mask for a 6-node IP network is 255.255.255.248.

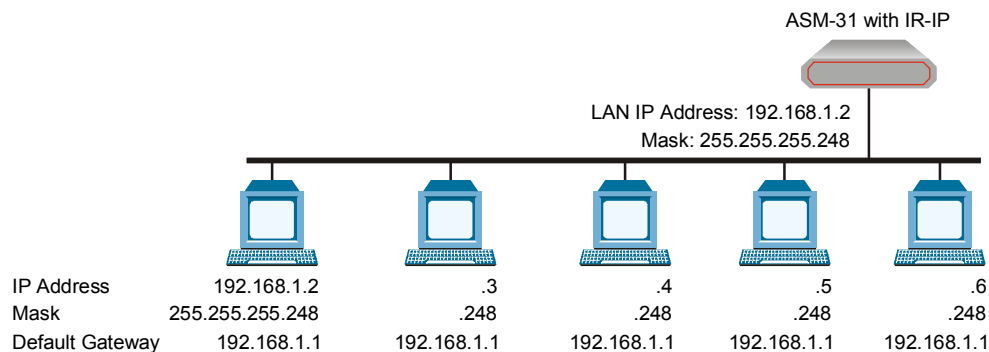


Figure D-7. Selecting the IP Subnet Mask

## WAN IP Address

Used to enter the IP address for the IR-IP WAN interface, i.e., the IP address to be used by IP hosts on the WAN to reach this IR-IP interface module.

If the WAN IP Address field remain blank, IR-IP operates in the Unnumbered Router Mode.

## WAN IP Mask

Used to enter the IP subnet mask for the WAN interface.

## Default Gateway

### Operation without Default Gateway

The IP interface module is intended to enable the extension of LANs through the ASM-31 link. Therefore, its default routing operation is different from the default routing operation of standard IP routers:

- IR-IP forwards packets with destinations not located on the local LAN through the WAN interface
- Packets received from the WAN interface and destined to hosts located on the local LAN are forwarded to the LAN; other packets are discarded.

The default operation is used when the Default Gateway field is blank.



## Operation with Default Gateway

You can instruct IR-IP to send packets with destinations not located on the local LAN to a specific router, which is called the **default gateway**. The default gateway must be connected to the local LAN.

To use this option, enter the IP address of another router attached to the local LAN in the Default Gateway field.

### Note

---

*It is very important to obtain the correct parameters from the system administrator or ISP. The most common problem when establishing an IP connection is incorrect configuration of IP parameters and default gateway. Do not try to guess these parameters.*

---

## Read Protocol from DIP Switches

Selecting YES for this parameter forces IR-IP router card to use the WAN protocol selected by section 2 of its DIP switch: PPP or Frame Relay.

If you want to be able to select the WAN protocol by means of the Protocol field (parameter 7) of the Quick Setup menu, select NO.

## Protocol

Used to select the WAN protocol to be used by the IP router card: PPP, HDLC or Frame Relay.

This parameter is available only if the Read Protocol from DIP Switches parameter is set to NO.

---

---

## D.9 Management Access Menu

The Management Access menu is used to enable the use of passwords to protect the access to IR-IP management utility, and control the inactivity time-out interval.

When password protection is enabled, a Telnet management session can start only after the correct password is entered.

### ► To access the Management Access menu:

- From the Main menu, type **2**.

The Management Access menu appears (*Figure D-8*).

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
=====
  1. Telnet Password                :.....
  2. Telnet Inactivity Timeout (min) :300..
  3. SNMP Access                    :Disabled
  4. SNMP Read Community            :public....
  5. SNMP Write Community          :public....
  6. SNMP Trap Community           :public....
  7. SNMP Management Table         :>>>

Press one of the numbers to select or ESC:

```

Figure D-8. Management Access Menu

**Note** Since the IP router card does not support SNMP management, the SNMP Read Community, SNMP Write Community, SNMP Trap Community, and SNMP Management Table parameters are not used.

## Telnet Password

By default, management access to IR-IP via Telnet is unrestricted. To restrict access, enter a Telnet password by selecting **1** in the Management Access menu. The password can include up to 10 characters, and is case-sensitive. The next time a Telnet session is opened, a password must be entered to enable you to access the IR-IP menus.

At any time, only one Telnet connection to IR-IP is permitted. Any attempt to open an additional connection while the current session is open is rejected.

## Telnet Inactivity Timeout

This parameter specifies the time a Telnet session is kept open when there is no keyboard activity. When the specified time-out expires, the Telnet session is closed and another user can access IR-IP.

---

## D.10 Advanced Setup Menu

The Advanced Setup menu is used to select the desired group of IR-IP configuration parameters.

The parameters accessed through Advanced Setup menu supplement the parameters available on the Quick Setup screen, by providing control over all the other IR-IP parameters.

► **To access the Advanced Setup menu:**

- From the Main menu, press **3**.

The Advanced Setup menu appears (*Figure D-9*).

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
=====
  1. Device identification
  2. Interface Parameters
  3. Protocol Parameters
  4. Multicast IP

Press one of the numbers to select or ESC:
    
```

Figure D-9. Advanced Setup Menu

### Device Identification Menu

The Device Identification menu is used to define and store in the IR-IP logistic information: the logical name of IR-IP, information on the contact person and device location.

- **To access the Device Identification menu:**
  - From the Advanced Setup menu, type **1**.

The Device Identification menu appears (Figure D-10).

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
.....
  Device identification
=====
  1. Device Name           :IR-IP..
  2. Contact Person       :Name of contact Person
  3. System Location      :The location of this device

Press one of the numbers to select or ESC:
    
```

Figure D-10. Device Identification Menu

#### Device Name

Select this parameter to assign an arbitrary name to IR-IP for identification by the system manager (up to eight characters). The assigned name is displayed in the screen header.

#### Contact Person

Select this parameter to enter the name of the person to be contacted with matters pertaining to this equipment unit.

#### System Location

Select this parameter to enter the physical location of the device.

## Interface Parameters Menu

The Interface Parameters menu is used to control the operation of IR-IP interfaces.

► **To access the Interface Parameters menu:**

- From the Advanced Setup menu, type **2**.

The Interface Parameters menu appears (*Figure D-11*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)
Quick Setup
Management Access
Advanced Setup
.....
    Device identification
    Interface Parameters
=====
    1. LAN Status                      : [ Open  ]
    2. WAN Status                      : [ Open  ]
    3. WAN Throttle                   : [ Full  ]
    4. Aging Timeout (min)            : 5.
Press one of the numbers to select or ESC:

```

*Figure D-11. Interface Parameters Menu*

### LAN Status

Used to enable/disable the flow of packets through LAN interface:

- **Open** – The flow of packets is enabled.
- **Closed** – The flow of packets is disabled. As a result, IR-IP does not accept, nor sends packets to the LAN, but its WAN interface may still be active, and can interact with other IP hosts on the WAN.

### WAN Status

Used to enable/disable the flow of packets through the WAN interface:

- **Open** – The flow of packets is enabled.
- **Closed** – The flow of packets through the WAN interface is disabled. As a result, IR-IP does not accept from, nor sends packets to the WAN. However, the LAN interface of the IP router is still active.

### WAN Throttle

This parameter specifies the maximum data rate at which frames are sent to the WAN (i.e., to the ASM-31 line). Since ASM-31 operates only at the rates of up to 128 kbps, the only relevant parameters for the WAN throttle are 64 kbps and 128 kbps.

### Aging Timeout

Used to specify the time after which inactive LAN stations are removed from the IR-IP ARP table.

A station is defined as inactive when no IP traffic is received from it by the IR-IP LAN interface.

## WAN Protocol Parameters – Frame Relay Protocol Menu

The Frame Relay Protocol Parameters menu is used to configure the parameters Frame Relay WAN for protocol (the WAN protocol is selected by means of the *Quick Setup Menu*) in *Figure D-6*.

➤ **To access the Protocol Parameters menu:**

- From the Advanced Setup menu, type **3**.

### Self Learn

Used to specify whether the Frame Relay DLCI and maintenance protocol is learned automatically (ENABLED), or is manually entered (DISABLED).

### Maintenance Protocol

When the Self Learn parameter is DISABLED, use this parameter to specify the desired maintenance protocol.

### DLCI

When the Self Learn parameter is DISABLED, use this parameter to specify the DLCI used for exchanging maintenance protocol messages.

### CIR

Used to specify the maximum amount of data, in bits, which the Frame Relay network guarantees to transfer during the measurement interval (the measurement interval is usually one second).

The value of this parameter is obtained from your Frame Relay service provider.

### EIR

Used to specify the maximum amount of data, in bits, that the Frame Relay network will attempt to deliver during the measurement interval. The value of this parameter is obtained from the Frame Relay service provider.

A typical Frame Relay Protocol Parameters menu is shown in *Figure D-12*.

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
.....
    Device identification
    Interface Parameters
    Protocol Parameters
=====
    1. Self Learn                      : [ Enabled ]
    2. Maintenance Protocol            : [ ANSI T1.617 ANNEX D ]
    3. DLCI (0-None)                   : 0..
    4. CIR                              : 0.....
    5. EIR                              : 64000...

Press one of the numbers to select or ESC:
    
```

Figure D-12. Frame Relay Protocol Parameters Menu

## WAN Protocol Parameters – PPP Protocol Menu

The PPP Protocol Parameters menu is used to configure the parameters PPP WAN for protocol (the WAN protocol is selected by means of the (the WAN protocol is selected by means of the *Quick Setup Menu*) in *Figure D-6*).

► **To access the Protocol Parameters menu:**

- From the Advanced Setup menu, type **3**.

### Header and Control Field Compression

Used to control the use of header and control field compression type according to RFC 1661. It is strongly recommended that this compression be used for troubleshooting only.

### Protocol Field Compression

Used to control the use of protocol field compression type according to RFC 1661. It is strongly recommended that this compression be used for troubleshooting only.

### Authentication Protocol

Used to select the authentication protocol used by an IP router configured as host to validate incoming connections.

### Security Host/Guest

This option can be used to configure the IP router either as a guest unit, to be authenticated by another router, or as a host unit, that authenticates other routers.

### User Name To Send

The name by which an IP router card configured as guest identifies itself.

### Password To Send

The password by which an IP router card configured as guest identifies itself.

### User Name To Accept

The user name to be accepted by an IP router configured as host, when an incoming connection request is received.

### Password To Accept

The user password to be accepted by an IP router configured as host, when an incoming connection request is received.

A typical PPP Protocol Parameters menu is shown in *Figure D-13*.

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
.....
    Device identification
    Interface Parameters
    Protocol Parameters
=====
    1. Header and Control Field Compression      : [ No  ]
    2. Protocol Field Compression:              : [ No  ]
    3. Authentication Protocol                  : [ NONE/NONE  ]
    4. Security Host / Guest                   : [ Guest  ]
    5. User Name To Send                       : .....
    6. Password To Send                       : .....
    7. User Name To Accept                     : .....
    8. Password To Accept                     : .....

Press one of the numbers to select or ESC:
    
```

Figure D-13. PPP Protocol Parameters Menu

### Multicast IP Menu

The Multicast IP menu is used to specify the IP multicast frame forwarding parameters, and to access the static multicast groups' table.

➤ **To access the Multicast IP menu:**

- From the Advanced Setup menu, press **4**.

The Multicast IP menu appears (Figure D-14).

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
.....
    Device identification
    Interface Parameters
    Protocol Parameters
    Multicast IP
=====
    1. Multicast forwarding                    : [ Disable ]
    2. Static groups                          : >>>

Press one of the numbers to select or ESC:
    
```

Figure D-14. Multicast IP Menu

### Multicast Forwarding

Used to control the forwarding of IP multicast frames. The following selections are available:

- **DISABLED** – Disables multicast forwarding in both directions.
- **LAN to WAN** – Enables forwarding of IP multicast frames addressed to groups appearing in the Static Multicast Groups table, from the LAN to the WAN.
- **WAN to LAN** – Enables forwarding of IP multicast frames addressed to groups appearing in the Static Multicast Groups table, from the WAN to the LAN.
- **BIDIRECTIONAL** – Enables forwarding of IP multicast frames addressed to groups appearing in the Static Multicast Groups table, in both directions.
- **WAN to LAN + IGMP** – Enables forwarding of IP multicast frames addressed to groups appearing in the Static Multicast Groups table, from the WAN to the LAN. In addition, more groups can be added dynamically (the additional can be viewed using the View menu – *Figure D-19*).
- **TRANSPARENT** – All the IP multicast frames are forwarded, irrespective of the Static Multicast Groups table.

### Static Groups

Select this parameter to access the static multicast groups table. The table is used to specify the IP addresses for up to 10 IP multicast groups. You can add, change, or delete each entry in the table (see the prompt line).

- **To access the Static Groups menu:**
  - From the Multicast IP menu, type **2**.

The following screen appears:

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

                                Static Multicast Groups Table
                                -----
Group IP Address
1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....
9. ....
10. ....

Press 'A'-add, 'E'-edit, 'D'-delete, 'C'-clear all, 'ESC'-exit:
    
```

*Figure D-15. Static Multicast Groups Table*



## D.11 Device Control Menu

The Device Control menu is used to download software from TFTP servers and perform interface and device resets.

► **To access the Device Control menu:**

- From the Main menu, type **4**.

The Device Control menu appears (*Figure D-16*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)
Quick Setup
Management Access
Advanced Setup
Device Control
-----
      1. New Software Download
      2. View error LOG
      3. Resets
Press one of the numbers to select or ESC:
    
```

*Figure D-16. Device Control Menu*

## New Software Download Menu

IR-IP operates as a TFTP client, and therefore it is possible to update its software by downloading new software from another computer that operates as a TFTP server.

The New Software Download menu is used to specify the software downloading parameters.

► **To access the New Software Download menu:**

- From the Device Control submenu, type **1**.

New Software Download menu appears (*Figure D-17*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)
Quick Setup
Management Access
Advanced Setup
Device Control
.....
      New Software Download
=====
      1. Server IP Address           :.....
      2. File Name                   :.....
      3. Total Timeout (sec)        :..
      4. Start operation             :>>>
Press one of the numbers to select or ESC:
    
```

*Figure D-17. New Software Download Menu*

### Server IP Address

Used to enter the IP address of the TFTP server.

### File Name

Used to enter the name and path of the file to be transferred from the TFTP server.

### Total Timeout

Used to enter the time IP router should wait for an acknowledgment from the TFTP server, for example 60 seconds.

### Start Operation

After selecting all the necessary parameters, type **4** on the New Software Download screen and then press <Enter> to start the downloading.

You can follow the progress of the downloading process (indicated by arrows).

Upon completion of the download process, the unit performs a reset. The Telnet connection is lost and must be restarted if required.

## View Error Log Screen

This item of the Device Control submenu is used to view the error log file. This file logs errors detected in IR-IP for debug and technical support purposes.

## Resets Menu

The Resets menu allows you to perform reset of IR-IP, or its interfaces. This operation can be used to restore normal operation after service is disrupted by an abnormal condition. Any data stored in the IR-IP buffers is discarded, and the flow of traffic is temporarily interrupted.

### ► To access the Resets menu:

- From the Device Control menu, type **3**.

The following screen appears:

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
Device Control
.....
    New Software Download
    View error LOG
    Resets
=====
    1. Reset Device
    2. Reset LAN
    3. Reset WAN
Press one of the numbers to select or ESC:

```

Figure D-18. Resets Menu

### Reset Device

➤ **To restart IR-IP:**

- From the Resets menu, type **1**.

You will be prompted to confirm the reset operation.

---

**Note** *Resetting the device will restart the IR-IP interface module, and therefore traffic flow is temporarily interrupted, and the Telnet connection is lost.*

---

### Reset LAN

➤ **To reset the LAN interface:**

- From the Resets menu, type **2**.

You will be prompted to confirm the reset operation.

---

**Note** *This operation restarts the IR-IP LAN controller. To continue your Telnet session, press any key within 15 seconds following the confirmation of the reset operation.*

---

### Reset WAN

➤ **To reset the WAN interface:**

- From the Resets menu, type **3**.

You will be prompted to confirm the reset operation.

---

**Note** *Resetting the WAN interface causes the WAN controller to be restarted. This results in renegotiation of the WAN protocol parameters. To continue your Telnet session, press any key within 15 seconds following the confirmation of the reset operation.*

---

---

---

## D.12 View Menu

The View menu is used to view the IR-IP configuration data, and display information on its ARP tables, multicast Groups tables and statistics.

➤ **To access the View menu:**

- From the Main menu, type **5**.

The View menu appears (*Figure D-19*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
Device Control
View
-----
1. Configuration and Connection
2. ARP Tables
3. Multicast Groups Table
4. Statistics

Press one of the numbers to select or ESC:

```

Figure D-19. View Menu

## Configuration and Connection

This screen is used to view the configuration parameters of IR-IP. In addition, you can also view the current status of the LAN and WAN interface.

► **To access the Configuration and Connection screen:**

- From the View menu, type 1.

The View Configuration screen appears (Figure D-20).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

                                VIEW CONFIGURATION
                                -----
BOOT Version      :1.06 18.03.1999
Device Name       :IP router card
System Location   :The location of this device
Contact Person    :Name of contact Person

MAC Address       : 00-20-D2-16-3F-9B
Default Gateway   : WAN

Intrf Type   Baud (Kbps)  Prot   IP Address      IP Mask          Status
-----
LAN   UTP      -----   Ethr   192.168.205.005  255.255.255.000  Connected
WAN   V.110                    FR     Not Conn.

Press any key to continue:

```

Figure D-20. View Configuration Screen

## ARP Tables

This screen is used to display the IR-IP ARP table. This table shows the IP address assigned to each station on the LAN (the stations are identified by their MAC addresses).

➤ **To access the ARP Tables screen:**

- From the View menu, type **2**.

The ARP Tables screen appears (*Figure D-21*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

                                ARP Table
                                -----
IP Address          MAC Address          IP Address          MAC Address
192.168.205.003    00-40-33-20-C8-3C

Press any key for exit
    
```

*Figure D-21. ARP Tables Screen*

## Multicast Groups Table Screen

This screen is used to display information about the multicast group IP addresses and their status.

➤ **To access the Multicast Groups Table screen:**

- In the View menu, type **3**.

The Multicast Groups Table screen appears (*Figure D-22*).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

Multicast Groups Table
-----
Group IP Address Status          Group IP Address Status

Press any key for exit
    
```

*Figure D-22. Multicast Groups Table Screen*

## Statistics Screen

The Statistics screen is used to display statistical information on the traffic between the networks connected by IR-IP. The data displayed on this screen enables you to evaluate the IR-IP performance. Two different Statistics screens are used, one for the LAN side and the other for the WAN side.

➤ **To access the Statistics menu:**

- In the View menu, type **4**.

The LAN and WAN Statistics screens appear (*Figure D-23* and *Figure D-24*).

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

                SYSTEM STATISTICS
                -----
Counter Name          Val      Counter Name          Val
LAN in Octets        83504  LAN IP Header Errors    0
LAN Unicast Frames In      1    LAN IP Address Errors   0
LAN Non-Unicast Frames In  9    LAN Alignment Errors    0
LAN Out Octets        83504  LAN CRC Errors          0
LAN Unicast Frames Out   3560  LAN Single Collisions   0
LAN Non-Unicast Frames Out 0    LAN Multiple Collisions 0
LAN to WAN Frames Passed 1698  LAN Late Collisions     0
LAN IP Datagram Received 2638  LAN Excessive Collisions 0
LAN to CPU Frames Discarded 0    LAN Frames Too Long Errors 0
LAN to WAN Frames Discarded 0    LAN RX FIFO Overrun Error 0
LAN Out Errors         0    LAN SQE Transmitted     0
LAN RX Frames Errors   0    LAN Deferred Frames     1
LAN MAC Receive Errors  0    LAN Carrier Sense Lost  0
LAN MAC TX Errors      0    LAN FIFO Underrun       0

N - Next Screen. ESC - Back To Previous Menu.
R - Refresh Page. C - Clear The Counters Of This Page.

```

Figure D-23. LAN Statistics Screen

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

                SYSTEM STATISTICS
                -----
Counter Name          Val      Counter Name          Val
WAN in Octets        83504  WAN Alignment Errors    0
WAN Out Octets       1950  WAN Aborted Frames     0
WAN Out Frames       1723  WAN Short Frames       0
WAN to LAN Frames Transfer 1698  WAN RX FIFO Overrun Error 0
WAN IP Datagram Received 1723  WAN to CPU Frames Errors 0
WAN to CPU Discarded  0    WAN Frame Too Long Errors 0
WAN to LAN Discarded  0    WAN IP Header Errors    0
WAN Out Errors       0    WAN IP Address Errors   0
WAN CRC Errors       0

PPP Address Error     0
PPP Control Error     0
DLCI Unrecognized Error 0
Frame Relay Forward Conge 0
Frame Relay Backward Conge 0

P - Previous Screen. ESC - Back To Previous Menu.
R - Refresh Page. C - Clear The Counters Of This Page.

```

Figure D-24. WAN Statistics Screen

## D.13 Diagnostic Tool (PING Terminal) Menu

This section provides information on the diagnostic tool provided with IR-IP (the *ping* utility).

► **To access the Diagnostic Tools menu:**

- In the Main menu, type **6**.

The Diagnostic Tools menu appears (Figure D-25).

```

IR_IP                               <IR-IP>                               S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
Device Control
View
Diagnostic Tools (PING terminal)
=====
  1. Ping IP Address                   :192.168.100.011
  2. Start Pinging                     :>>>
  3. Stop Pinging                      :>>>

Press one of the numbers to select or ESC:

```

Figure D-25. Diagnostic Tools Menu

### Using the Ping Function

The Ping option is used to confirm IP connectivity by *pinging* other IP hosts. Connectivity is confirmed by receiving a reply from the remote (pinged) IP host.

► **To ping a host:**

1. From the Diagnostic Tools menu, type **1** and enter the desired host IP address.
2. Press <Enter> to confirm the destination IP address.
3. To start pinging, type **2** on the Diagnostic Tools screen.

After pinging starts, you can monitor the *ping* status. A typical screen is shown in Figure D-26.

**Note** After pinging is started, it continues in the background even if you exit the Diagnostics Tools screen. In this case, a Ping Running message appears in the top upper left-hand corner of the screen.

4. To stop pinging, type **3** from the Diagnostic Tools menu.

A **Ping Stopped** message is displayed.

To clear the message and return to the Diagnostic Tools screen, press any key.

```

IR_IP                <IR-IP>                S/W Ver. 1.00 31/IR (date)

Quick Setup
Management Access
Advanced Setup
Device Control
View
Diagnostic Tools (PING terminal)
=====
  1. Ping IP Address                :192.168.100.011
  2. Start Pinging                  :>>>
  3. Stop Pinging                   :>>>

Pinging 192.168.212.001 Sent 27 Recvd 25  Lost 2  Resp.Time 60 ms

Press one of the numbers to select or ESC:

```

Figure D-26. Diagnostic Tools Menu after Receiving Pinging Response

---



---

## D.14 Erasing User's Configuration

The user-defined configuration parameters are stored in the IP router card flash memory. After the user-defined configuration parameters are erased, the IP router card automatically loads the factory-default parameters .

You may want to erase the current configuration parameters:

1. Before IR-IP is prepared for operation in a new application.
2. When you cannot configure IR-IP because its current LAN-interface IP address and/or the Telnet password, are not known.

► **To erase the user's configuration:**

1. Turn ASM-31 off.
2. Set all the four sections of the IR-IP DIP switch (*Figure D-3*) to ON.
3. Turn ASM-31 on and monitor the ERR indicator: it must turn on and light steadily.
4. While the ERR indicator is lit (within 15 seconds), set sections 1 and 2 of the DIP switch to OFF.

The IP router configuration is erased.

**Note**

---

*If you do not set sections 1 and 2 to OFF within 15 seconds of power-up, the IP router card ignores the setting of all the four sections to ON and starts normal operation. In this case, it is recommended to turn the ASM-31 off and then back on. To abort the whole operation, turn ASM-31 off, return all the four-switch section to the desired positions, and then turn the ASM-31 on again.*

---

5. Turn ASM-31 off, and the return all the four sections of the DIP switch to the desired positions.



---

---

## D.15 Erasing IR-IP Software

You may erase the IR-IP application software, without erasing the user-defined parameters.

After the application software is erased, IR-IP starts its TFTP server application, and waits for the downloading of software by a TFTP client connected to its LAN interface. The procedure to be used to download the application software in this case is also described below.

You may want to erase the application software if the downloading of new software using the Device Control menu (see *Figure D-16*) fails, and the IP router card does not function properly.

### Erasing Application Software

► **To erase the application software:**

1. Turn ASM-31 off.
2. Set all the four sections of IR-IP DIP switch to ON.
3. Turn the ASM-31 on and monitor the IR-IP ERR indicator: it must turn on and light steadily.
4. While the ERR indicator is lit (within 15 seconds), set sections 3 and 4 of the IR-IP DIP switch to OFF.

The IP router application software is erased.

**Note**

---

*If you do not set sections 3 and 4 to OFF within 15 seconds of power-up, IR-IP ignores the setting of all the four sections to ON and starts normal operation. In this case, it is recommended to turn ASM-31 off and then back on. Alternately, to abort the whole operation, turn ASM-31 off, return all the four switches to the desired positions, and then turn ASM-31 on again.*

---

5. Turn ASM-31 off, and the return all the four sections of the DIP switch to the desired positions.

### Downloading New Software

After erasing the application software, you can download new software from any computer that can serve as a TFTP client.

To enable the downloading, IR-IP automatically activates its TFTP server application with the following factory-default IP parameters:

- IP address: 192.168.205.1
- Subnet mask: 255.255.255.252.

Connect the computer serving as a TFTP client to the IR-IP 10BASE-T connector in the way as a Telnet host used for preliminary configuration (see the *Performing Preliminary Configuration* section). The computer IP parameters must be configured as follows:

- IP address 192.168.205.2
- Subnet mask 255.255.255.252
- Default gateway 192.168.205.1

► **To download new software:**

1. If necessary, turn ASM-31 off.
2. Set all the four sections of the IR-IP DIP switch to OFF.
3. Turn ASM-31 on and monitor the ERR indicator: it must start flashing.
4. Connect the computer to the IP router LAN interface and configure its IP parameters as explained above.
5. Run a standard TFTP client application on the Telnet host, and download the appropriate software file.

If the download is successful, IR-IP starts using the new software.

If the downloading fails, repeat the download process.

# Appendix E

---

## IR-G.703 Interface Module

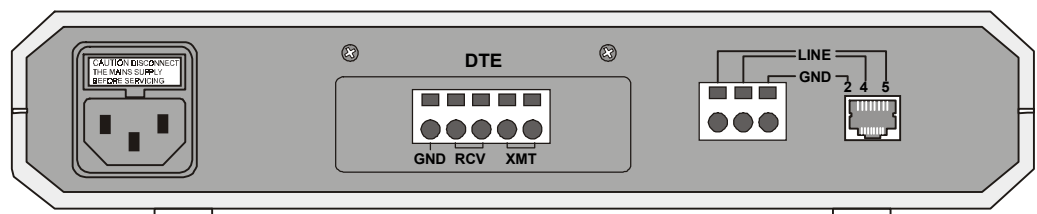
---

### E.1 General Description

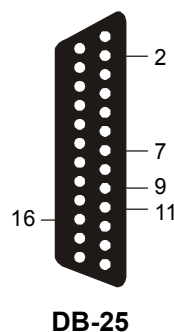
IR-G.703 is an interface module for RAD modems, converting G.703 64 kbps codirectional signals to TTL levels. The converted data is sent over the modem link using the modem modulation technique and converted back at the other end into G.703 64 kbps codirectional signals, or into any other digital interface signal possible. The module is available in the following two versions:

- Standalone version, which fits into a standalone modem and is available with two types of physical connections: a terminal block or an RJ-45 (see *Table E-1* for the RJ-45 connector pinout).
- Rack version, which is mounted on the ASM-31/R modem card and uses the modem edge connector for communication. The edge connector is wired, on the motherboard of the card cage, to the DB-25 connector on the back plane of the ASM-MN-214 card cage (see *Table E-1* for the DB-25 connector pinout).

*Figure E-1* illustrates the rear panel of the ASM-31 modem equipped with the IR-G.703 interface module. *Figure E-2* shows the DB-25 connector of the ASM-MN-214 rack, serving as DTE connector for ASM-31/R card version.



*Figure E-1. Rear Panel of ASM-31 with IR-703 Module*



*Figure E-2. IR-G.703 Connector for the ASM-31/R Card Version*

Table E-1. RJ-45 and DB-25 Connector Pinouts

Pin		Function
RJ-45	DB-25	
3	9	RCV (+)
6	11	RCV (-)
4	2	XMT (+)
5	16	XMT (-)
2	7	GND

## E.2 Selecting the IR-G.703 Timing

The IR-G.703 interface module can operate with EXT or INT/RCV timing to match the clock reference of the ASM-31 modem. The clock selection is made via the JP1 jumper located on the module board (see *Figure E-3*).

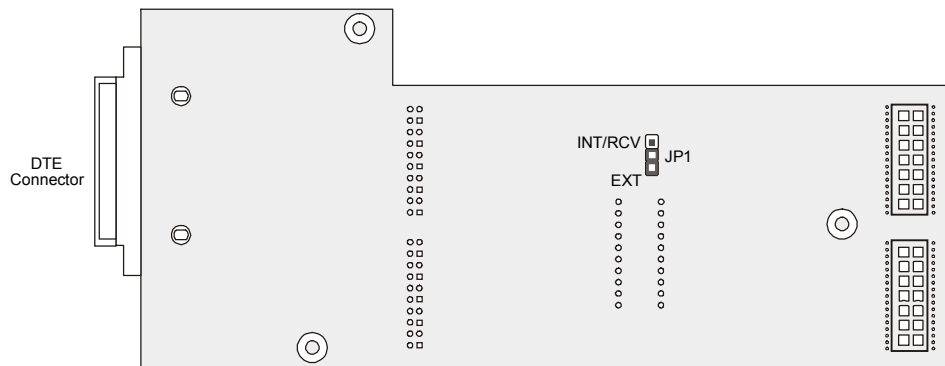


Figure E-3. JP1 Location on the IR-G.703 Board

### EXT Timing

The EXT clock is used in applications, where the system timing is provided by the G.703 network. The IR-G.703 module has an internal buffer to compensate for the phase delay introduced to the system by the line delay between the two modems. The buffer is an 8-bit FIFO connected as shown in *Figure E-4*.

You must configure the IR-G.703 module to the EXT clock if the ASM-31 modem is also set to the external timing.

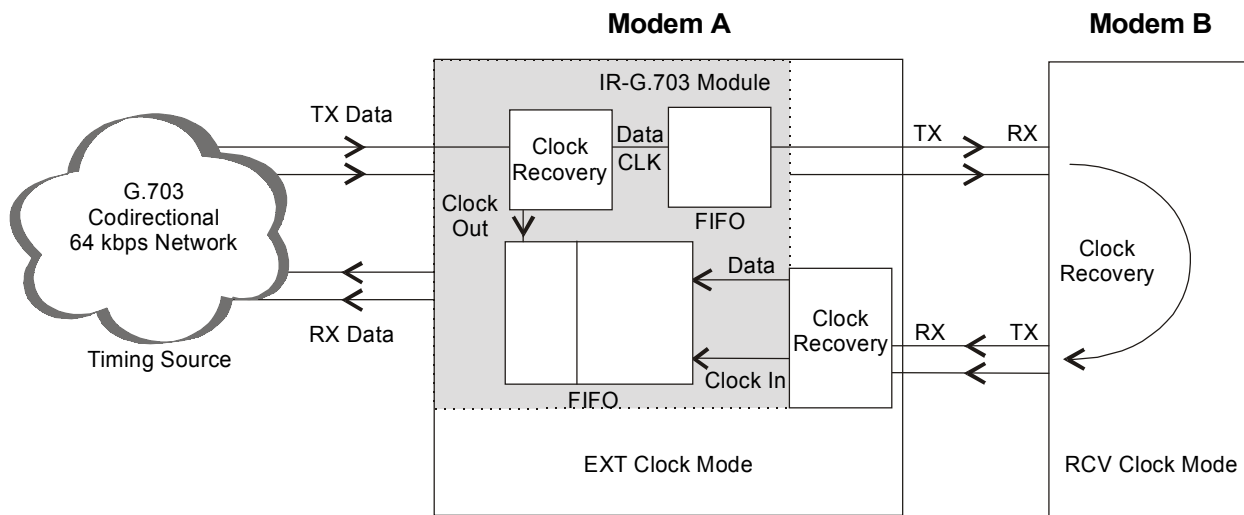


Figure E-4. IR-G.703 EXT Timing

### INT/RCV Timing

The INT/RCV clock is used in applications where the G.703 codirectional 64 kbps equipment connected to the modem recovers the clock signal from the modem. This mode is used mainly when the attached equipment has a G.703 codirectional interface, but is not able to produce clock signals. The module has an 8-bit FIFO buffer to compensate for the phase delay introduced by the G.703 device. Figure E-5 illustrates the buffer connection and the required application setup.

You must configure the IR-G.703 module to the INT/RCV clock if the ASM-31 modem is set to the internal or loopback timing.

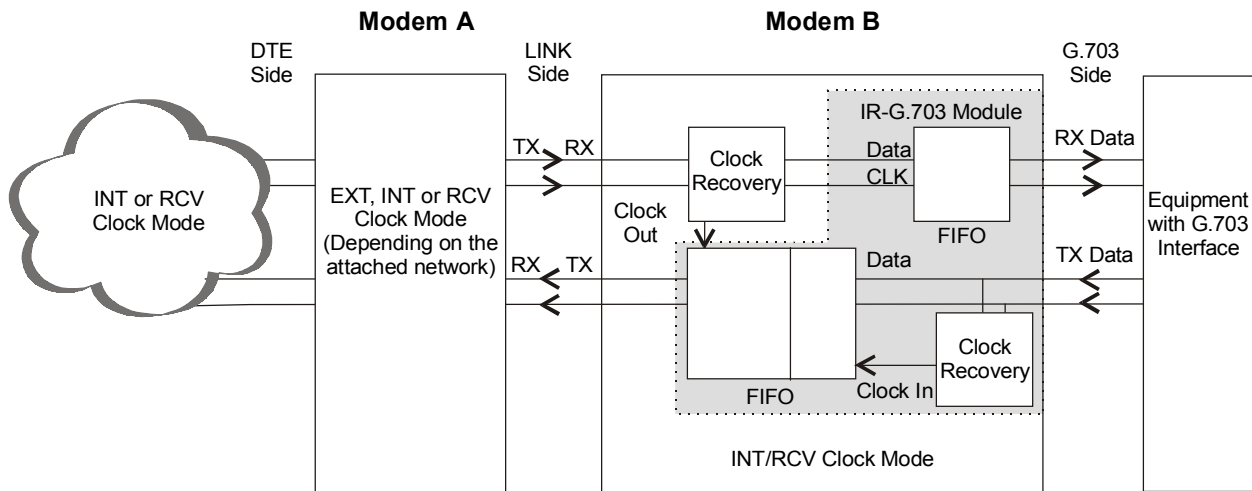


Figure E-5. IR-G.703 INT/RCV Timing



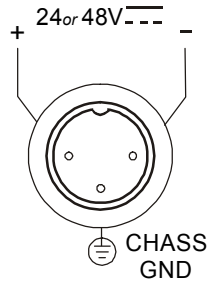
**RAD**

# SUPPLEMENT

## DC Power Supply Connection

Note: 1) Ignore this supplement if the unit operates on AC power.  
2) See supplement SUP-209 for Megaplex/MAXcess units.

The DC-powered unit comes with a standard 3-pin (male) connector located at unit rear (see figure at right). Supplied with the unit is a compatible (female) cable connector for attaching to your power supply cable.



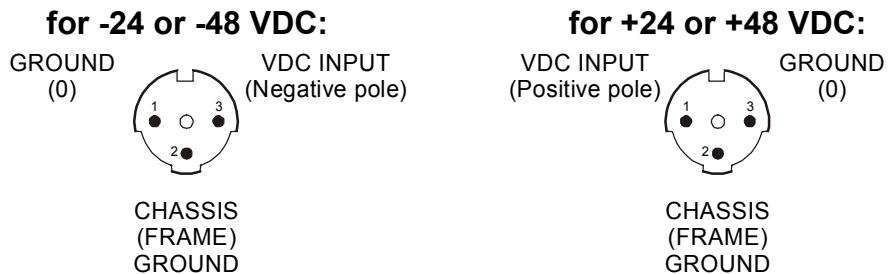
### DC Power Supply Wire Voltage Polarity

- If your power supply cable already has a compatible connector, just verify that the voltage polarity is as required.
- If not, connect the wires of your power supply cable to the supplied cable connector, according to the voltage polarity shown below. Note that the **solder side** of the connector is shown. Refer to the cable connector assembly figure below for assistance.



**Warning:** reversing the wire voltage polarity can cause serious damage to the unit!

### Cable Connector (Female) Voltage Polarity (solder side)



### Cable Connector Assembly

