Section 1

INTRODUCTION

1.0 General — The IQ-1000 II™ is a self-contained, door-mounted, motor protection device which may be applied to 50 Hz or 60 Hz 3-phase motor starters or switchgear, including low-, medium-, and high-voltage equipment.

The IQ-1000 II monitors 3-phase AC motor currents to develop an accurate thermal model of motor heating. A separate RTD Module option allows the IQ-1000 II to combine the monitored motor stator temperature with the motor current information. The resulting combination of data allows the IQ-1000 II to develop a more detailed picture of the motor's temperature, thereby maximizing motor utilization.

The IQ-1000 II operates by monitoring motor current, and takes the motor off-line when it detects a problem such as an overcurrent or overtemperature condition. If an operating parameter exceeds its setpoint value, the IQ-1000 II initiates a trip condition.

1.1 Contents/Use of Manual — This manual contains the following sections:

A — **IQ-1000 TO IQ-1000 II Upgrade.**

1 — **Introduction.**

2 — **Hardware Description.** Itemizes the hardware features and lists the specifications of the IQ-1000 II.

3 — **Functional Theory.** Describes how the hardware and software function together to control, monitor, and protect the motor.

4 — **Operator Panel.** Describes the uses of the Operator Panel. Various operations such as loading setpoints or examining metered data are described.

5 — **Installation.** Outlines the installation procedures to be followed by a plant electrician or wiring crew when installing the IQ-1000 II.

6 — **Startup.** Lists step-by-step procedures to follow when first applying power to the IQ-1000 II.

7 — **Application Considerations.** Intended as an aid to the application engineer considering how and when to apply the various features of the IQ-1000 II. Hardware characteristics as well as set point and control background information are included.

8 — **Programming the IQ-1000 II And Set Point Description.** Lists the various application considerations associated with each of the functions of the IQ-1000 II. Available setpoint ranges or settings are detailed.

9 — **Troubleshooting.** Provides background information on how to use the Operator Panel to recognize malfunctions. Also, a specific troubleshooting approach is listed.

The manual is broad enough in scope for new employee familiarization, refresher training sessions, and ongoing maintenance, installation, troubleshooting and unit replacement (if necessary) of the IQ-1000 II.

This manual contains information of specific importance for the user application engineer who is planning the motor control system and who is determining the setpoint values for the IQ-1000 II.

It is strongly advised that the application engineer carefully read Sections 2 thru 8 before beginning the application's Wiring Plan Drawings and Set Point Record Sheet. Installation teams should carefully read all of Section 5, Installation, and all previous sections, before starting final installation. Maintenance personnel should be familiar with Sections 2 thru 9 before attempting to service the IQ-1000 II.

1.2 Product Overview — The IQ-1000 II offers 52 operating setpoints, each referred to as a function. The setpoints associated with these functions are individually entered through the Operator Panel located on the front of the IQ-1000 II.

The functions consist of the following types of entries:

- **Alarm Relay condition settings.** An Alarm Relay closes when various conditions, such as motor currents or temperatures, exceed the selected setpoints. The alarm serves as an early warning. The motor's operation is not affected.
- **Trip Relay condition settings.** A Trip Relay closes (or opens) when various conditions, such as motor current or temperature, exceed separately selected setpoints. Action of the Trip Relay is user-selectable.
- **Auxiliary Trip Relay condition setting.** The auxiliary Trip Relay changes state when a user-selected condition, such as Instantaneous Overcurrent, exceeds a separately selected setpoint. Action of the Auxiliary Trip Relay is user-selectable.
- **Specific application-related information.** Entries such as the ratio of the current transformers or the incoming AC line frequency are required by the IQ-1000 II to properly monitor the motor.

Together, the functions tailor the IQ-1000 II for each specific application. After entry is completed, the setpoint values can be examined or modified. The actual values are stored in a non-volatile memory requiring no backup batteries or special

Table 1.A

COMMUNICATIONS OPTIONS

IMPACC, a Westinghouse Local Area Network, can be used to communicate with one or multiple IMPACC-compatible devices. These devices include the following: IQ-500, IQ-1000, IQ-1000 II, IQ Data Plus, IQ Data Plus II, IQ Data, IQ Generator, Digitrip, Addressable Relay II Advantage Motor Starters and IQ Energy Sentinels. Up to 1000 devices can be connected on a network via shielded twisted pair wire. Four different communication levels are available and are described below:	
IMPACC Series I	Standardized software package that runs on a 100% IBM-compatible computer. The software is packaged with a computer interface card (CONI). Series I offers the following features: System Monitoring, Data Logging, Event Logging, Remote On/Off Control, Dialup Capabilities and Gateway Interface.
IMPACC Series II	Customer-written software for special applications. Custom software is required in situations where (1) Westinghouse software does not provide feature(s) desired by customer or (2) Customer wants to communicate to a non-IBM compatible computer or a Programmable Controller. A MINT translator module converts device-messages into 10-byte ASCII RS-232 signal. An RS-232 Protocol Manual is included with each MINT.
IMPACC Series III	Standardized software package that runs on most 100% IBM-compatible computers. Series III requires a CONI or a MINT to operate. Series III runs in the Microsoft Windows environment and includes the following features: System Monitoring, Data Trending, Event Logging, Spreadsheet-compatible Trend and Log files, Remote On/Off Control, Gateway Interface, Device/System Alarming, Analog Alarming, Security (password protection) and Enhanced Graphics.
IMPACC Driver Software (Third Party Vendors)	Data acquisition software written by third party vendors. Software drivers are available to gather data from systems such as IMPACC, Programmable Controllers and/or Energy Management Systems. The IMPACC Driver for ICONICS' Genesis (real-time graphics interface program) offers the following features: System Monitoring, Data Trending, Event Logging, Remote On/Off Control, Device/System Alarming, Customized Graphics and Communications to other Genesis-compatible systems (PLC's, Energy Management Systems). Other third party graphics interface programs include Wonderware's InTouch, Intellution's® FIX DMACS™ and Expert Edge's ROCKY®.

power supplies. In instances where a particular function is not required, it can usually be bypassed by entering a specific disable value.

1.3 Options — Options associated with the IQ-1000 II consist of external hardware. The following options are available:

- **RTD Module Option**. The RTD Module option is required when resistance temperature devices (RTD) are used to monitor motor winding, load and/or motor bearing temperatures. An auxiliary RTD connection is provided on the RTD Module for monitoring one additional location (such as motor case temperature).
- **Communications Options**. The Communications Options, listed in Table 1.A, provide motor data/status to a remote device such as a computer.
- **IQ DC Power Supply** — The IQ DC Power supply is required only when 40 VDC to 250 VDC control power is available.

1.4 External Hardware — The following items are required in addition to the IQ-1000 II.

- **Current transformers**. Current transformers are used by the IQ-1000 II to obtain load current information. Current transformers with 5 amp secondaries and ratios ranging from 10:5 to 4000:5 can be used.
- **Ground fault transformer**. A ground fault transformer with a 50:5 ratio can be used with the IQ-1000 II in grounded system applications to provide ground fault protection.

1.5 Protection Features — A list of protection features with the IEEE device numbers is contained in Table 1.B.

1.6 Level of Repair — This manual is written with the assumption that only unit-level troubleshooting will be performed. If the cause of a malfunction is traced to the IQ-1000 II unit, it should be replaced with a spare. The malfunctioning IQ-1000 II should then be returned to Westinghouse for factory repairs.

Table 1.B

IQ-1000 II PROTECTION FEATURES

Feature	IEEE Device Number
Locked-rotor current	Device 51
Ultimate trip current	Device 51
Maximum allowable stall time	
I^2T alarm level	Device 74
Instantaneous overcurrent –Programmable trip level and start delay	Device 50
Zero sequence ground fault trip –Programmable trip level, start delay and run delay	Device 50G/51G
Motor overtemp trip and alarm (Universal RTD Module with 11 RTD inputs available as an option)	
–Six stator windings	Device 49
–Two motor bearings	Device 38
–Two load bearings	Device 38
–One auxiliary	
Jam trip and alarm –Separate trip and alarm levels, programmable start and run delays	
Underload trip and alarm –Separate trip and alarm levels, programmable start and run delays	Device 37
Phase loss and phase unbalance trip and alarm –programmable alarm and run delay	Device 46
Number of motor "starts" allowed per time period –programmable starts and time period	Device 66
Anti-backspin time delay –programmable timer	
Transition trip for reduced voltage starters	
Incomplete sequence delay –programmable timer	Device 2/19
Phase reversal for non-reversing starters	Device 46
Trip mode –Mode 1: Trip relay energizes on trip condition -Mode 2: Trip relay energizes on powerup and deenergizes on trip condition or loss of power	
Selection of trip, reset, differential trip or motor stop on remote input	
Frequency selection –50 or 60 Hz	
Selection of auto or manual reset for I^2T trip	

1.7 Factory Correspondence — All correspondence with Westinghouse, whether verbal or written, should include the "software version" number. This number appears in the display window when the Program mode is first entered, or the program menu is first initiated (this is item 0 in Table 8.B). The software version number is used by Westinghouse to identify the specific IQ-1000 II type being discussed.

Section 2

HARDWARE DESCRIPTION

2.0 General — This section will familiarize the reader with the IQ-1000 II hardware, its nomenclature, and lists the specifications of the unit.

2.1 Hardware Description — The hardware description is divided into the following areas:

- Operator Panel (Par. 2.1.1)
- Rear access area (Par. 2.1.2)
- Options (Par. 2.1.3)
- Specifications (Par. 2.2)

2.1.1 Operator Panel — The Operator Panel, which is normally accessible from the outside of the enclosure door, provides a means to:

- Monitor the actual metered values on the Display Window. (Figure 2.1 shows the Operator Panel.)
- Enter or modify the IQ-1000 II's setpoint values or settings.
- Step through the program or run-monitor menus while running.
- Determine that a trip or alarm condition exists by means of two distinct LEDs.

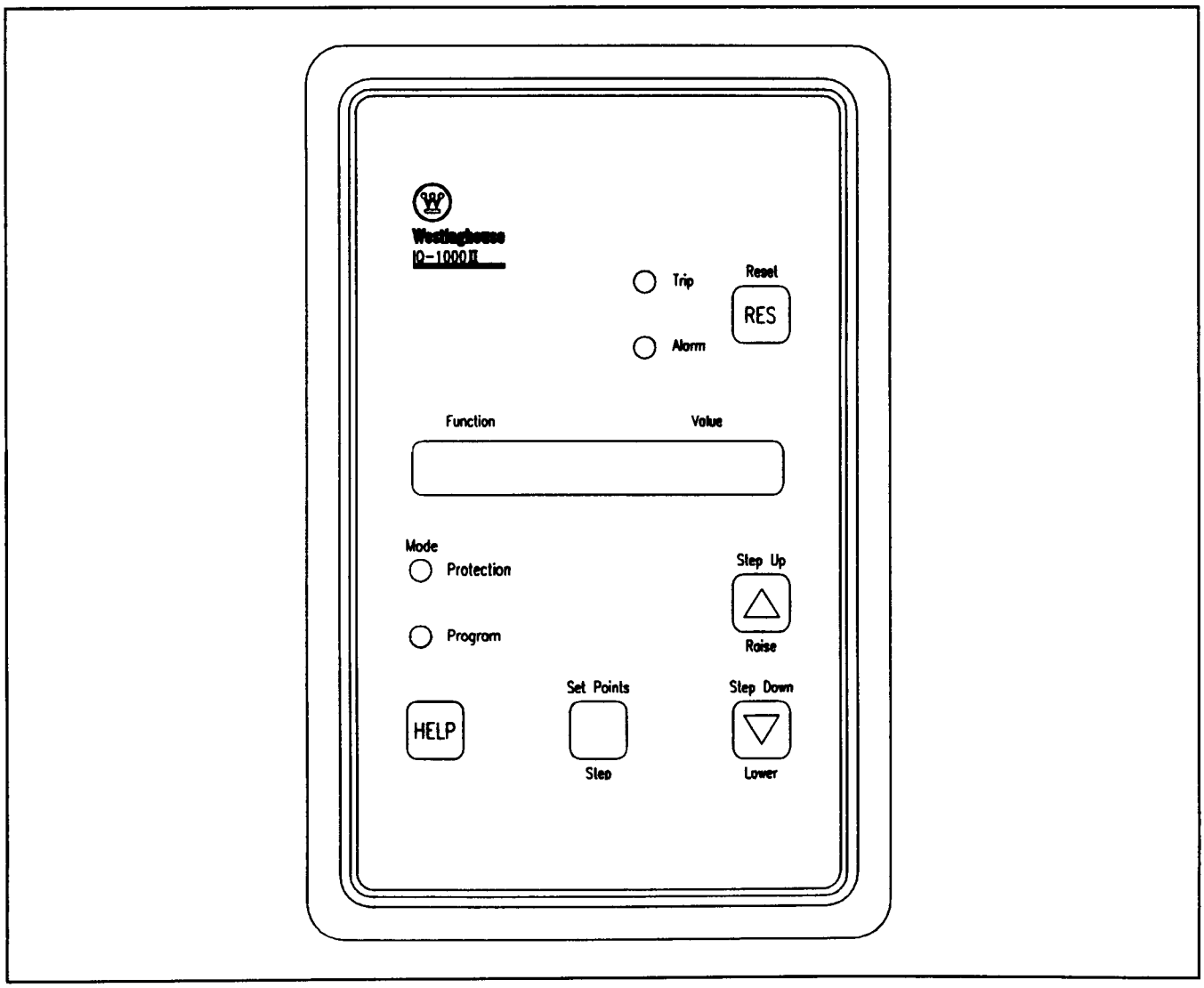

Figure 2.1 — Operator Panel

- Determine the cause of a trip or alarm condition by means of the Display Window. (A description of each trip and alarm condition is given in Section 8.)
- Attempt to reset the unit after a trip or alarm condition has occurred by means of a Reset pushbutton.

The use of the Operator Panel is detailed in Section 4.

2.1.2 Rear Access Area — The rear of the IQ-1000 II is normally accessible from the rear of the mounting cabinet's door (see Figure 2.2). All wiring connections to the unit are made on the back of the IQ-1000 II, as follows:

- Terminals 24 and 25 provide a 4-20 mA output signal.
- Terminals 1, 2, and 3 provide access to the Transition Relay's contacts.
- Terminals 4 and 7 receive the incoming AC control voltage.
- Terminal 5 is the chassis ground. A direct connection must be made between terminal 5 and the main ground bus to ensure proper operation.
- Terminal 6 can be jumpered to terminal 9 in order to provide the common (AC neutral) for terminals 8 and 10.
- Terminal 8 is used with the remote trip/reset function. It is the high side of a user-supplied 120 VAC signal input.
- Terminal 9 is the AC neutral, or common, wire associated with terminals 8 and 10.
- Terminal 10 is used with the incomplete sequence report-back function. It is the high side of a user-supplied input signal.
- Terminals 11 thru 23 provide access to the Trip, Auxiliary Trip and Alarm Relays' contacts, as well as the wiring to the RTD Module option. (The Auxiliary Trip Relay is programmable to change state when a specific user-selected trip condition is detected.)
- The fiber optic connector may be used to connect the optional RTD Module to the IQ-1000 II.
- The Communications Port is used with the optional PONI communications card mounted on the back of the IQ-1000 II.
- The CT terminals connect with the three required, user-provided, external current transformers and, if used, an optional user-provided zero sequence ground fault transformer.

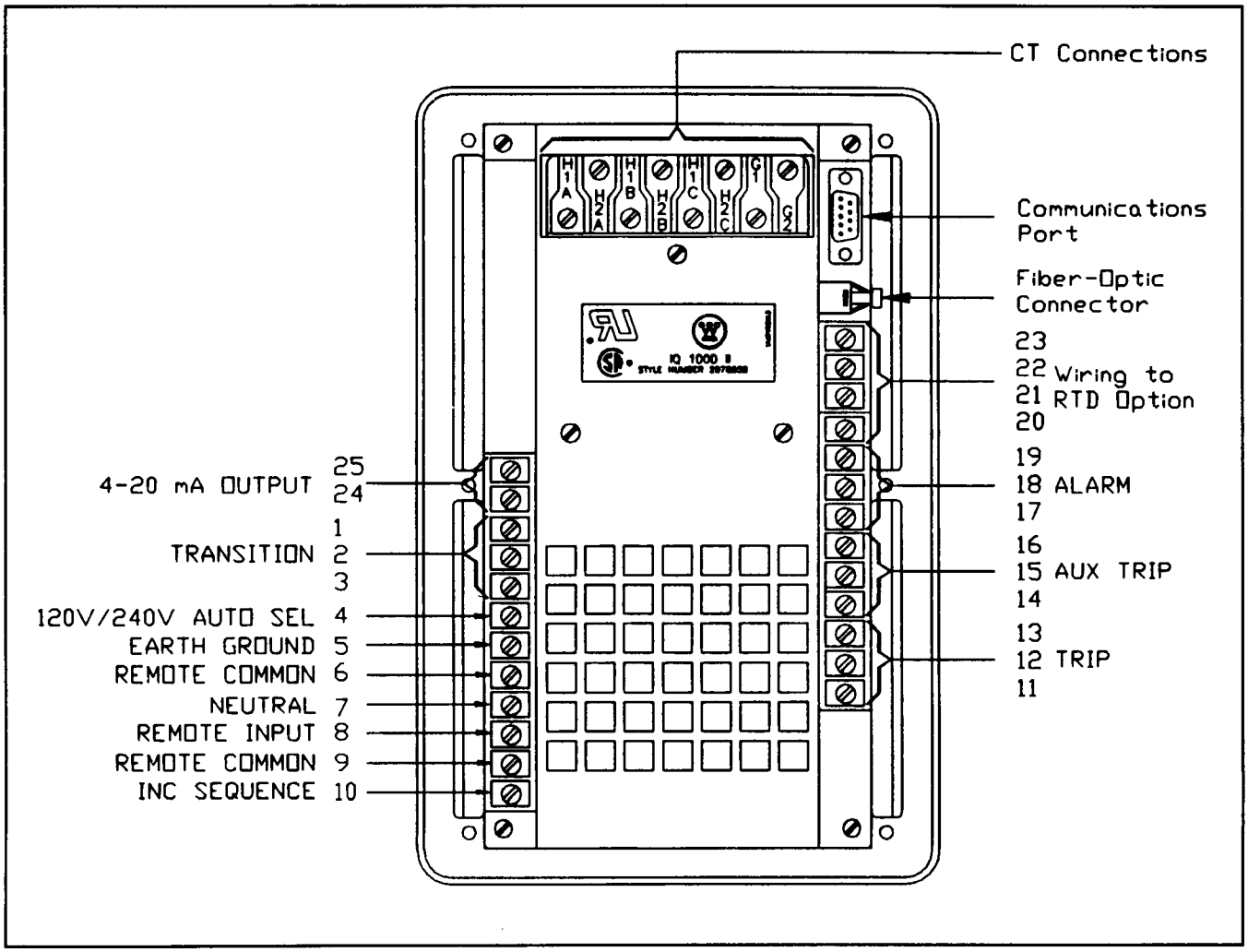

Figure 2.2 — Rear Panel

2.1.3 Options — Two options are available with the IQ-1000 II:

- RTD Module Option (Par. 2.1.3.1)
- Communications Option (Par. 2.1.3.2)
- IQ DC Power Supply (Par. 2.1.3.3)

2.1.3.1 RTD Module Option — The Universal RTD Module is a separately purchased optional device (see Figure 2.3) which interfaces with the motor RTDs and the IQ-1000 II. The RTD inputs connect to the terminal blocks of the RTD Module as described in Paragraph 5.1.2 and the RTD itself connnects to the IQ-1000 II through the fiber optic connector and/or the communications port.

2.1.3.2 Communications Option — The Product Operated Network Interface (PONI) is a small printed circuit communications device that is mounted onto the back of the IQ-1000 II and connects the IQ-1000 II to the IMPACC local area network (see Table 1.A). The PONI is a separately purchased option (see Figure 2.4).

2.1.3.3 IQ DC Power Supply Option — The IQ DC Power Supply is a separately purchased option that is required only when 40 to 250 VDC is available as a control power source for the IQ-1000 II.

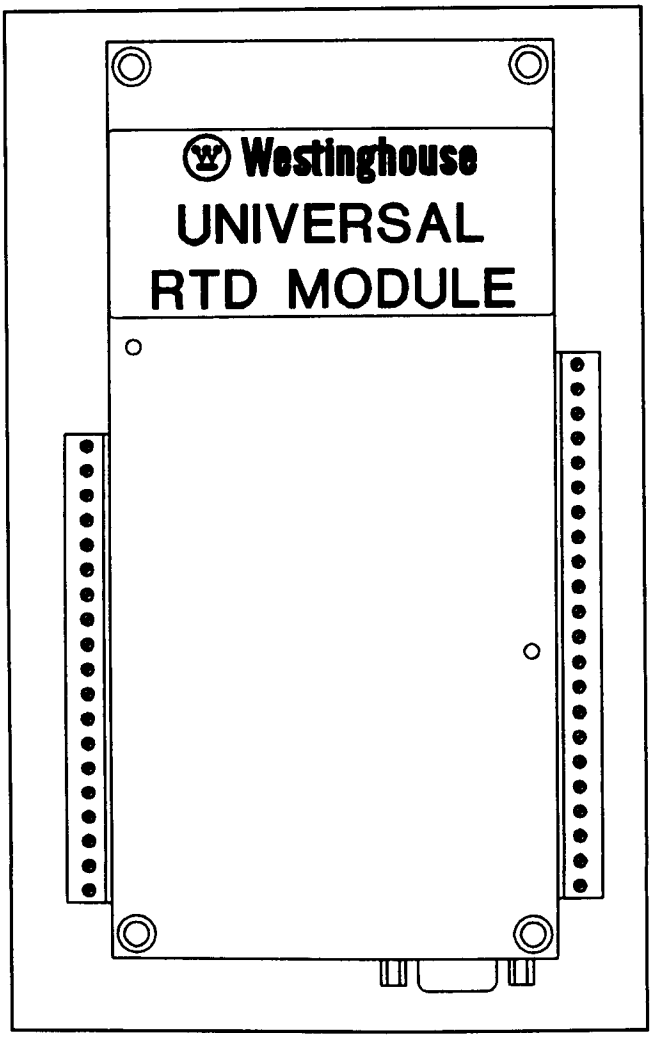

Figure 2.3 — Universal RTD Module

2.2 Specifications — The specifications for the IQ-1000 II are listed in Table 2.A.

Table 2.A

SPECIFICATIONS

Input Supply Requirements:	120 or 240 VAC (+15%, –30%)
Frequency:	50 or 60 Hz (software selectable)
Power	IQ-1000 II = 12 VA RTD Module Option = 6 VA PONI Card = 1 VA
Romote Input Rating:	2.0 VA at 120 VAC
Output Contact Rating:	10 A at 240 VAC Resistive 10 A at 30 VDC Resistive
±4-20 mA Output Rating:	Maximum load resistance = 1 K Ohm
Current Transformer Burden:	0.003 VA
Operating Temperature:	0° to 70°C (32° to 158°F)
Storage Temperature:	–20° to 85°C (–4° to 185°F)
Humidity:	0 to 95% (noncondensing)
IQ-1000 II Dimensions:	Height = 10.25 in. (26.04 cm) Width = 6.72 in. (17.0 cm) Depth = 3.20 in. (8.13 cm) 4.89 in. (12.42 cm) with PONI 5.55 in. (14.10 cm) with RTD Module 6.75 in. (17.15 cm) with RTD Module and PONI
Shipping Weight:	7 lbs (15.4 kg)

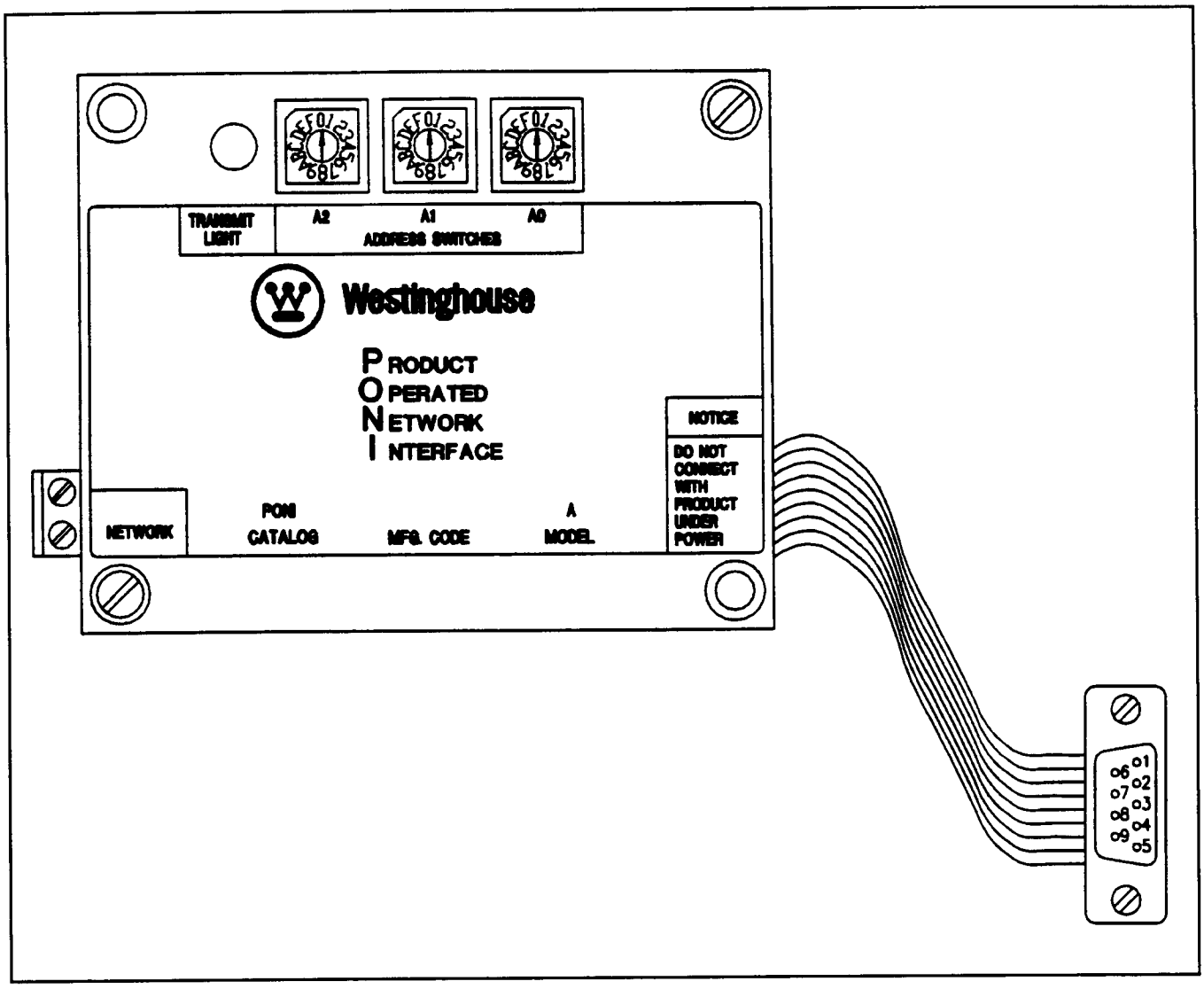

Figure 2.4 — PONI Communications Card Option