1.0 INTRODUCTION

This manual describes the Remote Terminal Unit (RTU) Controller Panel. The RTU panels are field components of the MDI SAFEnet® Systems which are installed at the protected area or subscriber location. Each RTU provides the field interface to alarm detectors, control devices, card readers/access control devices, area arm/disarm devices, alarm displays, and local alarm devices, resulting in the monitoring, control, data gathering and initial processing of the essential system information which is then transmitted to the central site. The RTUs are intelligent devices capable of completely local processing and decision making while maintaining communication with the Central Computer System (File Server and PPU) over one of two separate, on-board communication channels. This manual describes how to plan, install, operate, and troubleshoot RTU system panels and components, and covers the RTU-100-x, RTU-190-x, and the RTU-200-x (x=types 0 - 4) units.

1.1 General Description

The RTU-100/190/200 is a microprocessor-based, intelligent controller consisting of a metal enclosure containing a processor board with semicustom firmware (programs contained in the processor EPROMs), local database memory, two (2) serial communications ports, alarm sensor input points, a power supply with battery backup option, as well as optional control relay output points, card reader interface modules, and a number of other types of special function modules.

The RTU is the field installed portion of the MDI SAFEnet System that monitors and controls external devices for security, access control, fire, and energy management. The RTUs can be configured to communicate with the SAFEnet System central site over a single communication channel, or a second backup communication channel can be implemented for secondary communication if the primary line should fail. FOUR methods of communication are available, allowing the RTU to satisfy most any central station or proprietary application. Communication options include differential RS-485 multidrop (DIFF), RS-232 (with model 180 processor board), dedicated 2- or 4-wire 3002 voice grade multiplex data line (MUX), and Dial lines.

For Access Control purposes, the RTU will support up to a maximum of eight (8) card readers and/or keypads and provides local database memory to support a minimum of 1000 cardholder records (expandable to 32,000 with Memory Expansion modules) as well as card access events, transaction queues, and other alarm and arming control information. The RTU panels interface to industry standard card readers as well as MDI's own ACT series of card readers and card reader interface units, and support Magnetic Stripe, Wiegand, Proximity, Bar Code and Barium Ferrite card technologies.

Each RTU is basically end-user, field configurable for a number of alarm/control configurations and options through the use of board jumpers, plug-in zone identification modules (ZIM), and configurable RTU parameter tables which are then automatically sensed by the system. This automatic sensing detects the mix of I/O modules and determines the number of inputs and outputs, alarm priorities, circuit requirements, and access control requirements.

The RTU-100/190/200 can be set up and configured for a wide range of customized system requirements using its Function Modules to interface to sensors, controls, and displays. The basic Function Modules include the following:

MODULE DESCRIPTION	MODULE ACRONYM
Remote Input Module, 8 zone	RIM-8
Remote Input Module, 16 zone	RIM-16
Zone Identification Module	ZIM
Zero Power Relay, Relay Output Module (ROM)	ZPR-8 (-01)
Zero Power Relay, Relay Output Addressable Module (ROAM)	ZPR-8A (-02)
Zero Power Relay, FIM	ZPR-8F (-03)
Remote Display Module	RDM-8R
Remote Display & Keypad Module	RDM-8KUD
Display Control Panel, Display Extension Panel	DCP-8, DCP-16, DEP
Remote Display Driver	RDD-2
Card Reader Interface Module	CIM-2
Card Reader Interface Expansion Module	CIM-EXP
Four Wire Interface Module	FIM
Passive Matrix Bridge	PMB
Versatile Communication Module,	VCM
Memory Expansion Module	MEX-8, MEX-16, MEX-32
DES Encryption Module	DES
Synchronous Adapter Module	SAM

See Appendix B for more function modules or contact MDI for a complete list of special options. These Function Modules are configured as dictated by the requirements of the installation.

The basic differences between the RTU-100, RTU-190 and RTU-200 are the physical size of the enclosure and the number of inputs, outputs and readers supported by each. The **RTU-100** will monitor up to a maximum of 32 zones of protection with up to 32 non-supervised, up to 32 2-wire supervised (with RIM-16's), or up to 16 4-wire supervised zones. The **RTU-190** can monitor up to a maximum of 48 non-supervised, up to 32 2-wire supervised (with RIM-16's) zones, or 24 4-wire supervised zones of protection. The **RTU-200** provides the capability for up to 64 zones of protection, monitoring up to 64 non-supervised zones or 32 supervised (2-wire or 4-wire) zones.

(Note that supervised monitoring techniques and some other monitoring/control functions require two zones.) Each RTU type will support up to eight (8) card readers/keypads with RIM-16 boards, however the RTU-100 will support only six (6) readers if using RIM-8 modules with FIM interface.

The Zone Identification Modules (ZIM) are used to "hardware program" each input zone. Through the use of the ZIMs, any zone may be configured to monitor a wide variety of protection devices, such as 2-wire and 4-wire fire, burglary/intrusion, hold-up/duress and multiple varieties of arming control. The ZIMs also specify whether or not the zone will initiate immediate or delayed local alarm bell outputs from the TELCO board, which are used to provide for a momentary chime annunciation, burglary/intrusion bell, holdup/duress output, and fire bell output. (See the ZIM planning forms, Table 2-1 and Table 2-2.)

In addition to the standard alarm monitoring capabilities, each RTU-100/190/200 monitors and reports supervisory conditions. The supervisory conditions, such as CABINET TAMPER, AC POWER, DC BATTERY, ALARM BELL RESET SWITCH STATUS, and COMMUNICATION STATUS, report the Fault conditions of the RTU electronics.

Zone status can be displayed with red LEDs on the front of the RTU enclosure by using the Remote Display Module (RDM-8R) display. The RDM-8KUD includes an LED display as well as an integrated keypad used to arm and disarm specific RTU zones and/or areas. If a display and/or keyboard is required someplace away from the RTU enclosure, the Remote Display Driver (RDD) module can be added. The RDD will drive either a Display Extension Panel (DEP) for an LED display only, or a Display Control Panel (DCP) for an LED display and an arm/disarm keypad. Remote Arming and Disarming can also be performed with an ACT-5 Arming Station connected on a dedicated RS-485 communication line.

1.2 Functional Descriptions

The following paragraphs will provide a basic description of the circuit boards and function modules typically used in the RTU-100/190/200 panels. This manual is based on the Model 175C RTU Processor Board, which is now used in all configurations with the exception of **RS-232** communication. RTU panels requiring RS-232 communication must be ordered with the Model 180 RTU Processor board. (Existing, previously installed RTU panels requiring a change to RS-232 communication may be upgraded with a Synchronous Adapter Module). Details on the Model 180 Processor Board is located in Appendix 'A' herein. Details on the old Model 175B Processor Board are available in Revision 8 of this manual.

1.2.1 RTU Model 175C Processor Board

The heart of the RTU-100/190/200 is typically the Model 175C Processor Board. The 175C board is a single microprocessor controlled board that performs or controls the following functions and/or features of the RTU panel:

- Operating system firmware and operational parameters in EPROM
- On-board RAM memory for I/O processing as well as local storage of access control database and parameters, arm/disarm user ID database, alarm and access control transaction queues and event information, and required operational parameters needed for local processing and I/O functions.
- Host Computer/PPU communication via two (2) communication channels.
- Differential RS-485 Communication formats.
- Dedicated 2- or 4- wire 3002 multiplex line communication formats.
- DTMF/Tone Dial line communication formats.
- Serial ports and communication handler for card readers & access control processing.
- Alarm input scanning, processing and reporting for alarm monitoring

The 175C board is powered from the TELCO board with +6 VDC, which is then regulated down to +5 VDC and distributed to itself and the rest of the RTU panel's function modules within the enclosure. The regulated +5 VDC output from the 175C board J3 connector (CIM/FIM access control connector) is isolated from the +5 VDC powering the 175C board so that a fault (e.g. short) on an external reader or module will not kill the 175C board's power.

1.2.2 RTU Model 175C Processor Board Interface

The 175C processor board interfaces to the RTU Function Modules within the enclosure via the plug-in connectors J1, J2, and J3. Cabling from these connectors is via 20-conductor ribbon cable. See Figures 1-1 and 1-2 for examples of typical RTU System Interconnect Drawings.

1.2.2.1 J1 Connector

The J1 connector of the 175C processor board is used for connections to the Remote Input Module (RIM) boards via a multiple-connector ribbon cable. This cable connection provides DC power from the 175C board to the RIM modules as well as interfacing input and output data signals for the monitor and control functions provided by the RIM modules. The J1 connection provides the alarm point input monitoring from the RIM and also provides control output signals to the ZPR relay modules which are connected to the RIM. The display and keypad functions are controlled through the RDM, RDD, DEP, and DCP modules which are also connected via the RIM modules and therefore interface via J1.

1.2.2.2 J2 Connector

The J2 Connector provides a ribbon cable connection to the TELCO board. This connection provides DC power from the TELCO board as well as the input/output signals for cabinet tamper and supervisory bell outputs/status. System communications from the Host PPU/Central System outside the RTU is handled via the TELCO board and interfaced to the 175C processor through the J2 connector.

1.2.2.3 J3 Connector

The J3 connector is used by the 175C processor board to interface to access control system components. This ribbon cable connection interfaces to the CIM or FIM function modules which are used to connect to MDI's ACT series of card access control devices or to other industry standard card readers and/or keypads.

Using a CIM module, up to two standard card readers, such as the Magstripe and Wiegand readers, interface directly to the RTU through the CIM-2 module. This number can be expanded to eight (8) readers with the use of the CIM-EXP which allows the connection of four (4) CIM modules to the RTU. The FIM function modules provide an RS-485 serial communication interface for up to eight ACT series readers and reader interface devices, such the ACT-4, ACT-5, ACT-D and ACT-E.

1.2.2.4 Other Processor Board Interfaces

Connectors J7, J8, J9 are single row, in-line connectors used for the direct, plug-in connection of daughter-type boards, such DES Encryption module and Memory Expansion modules.

The serial Synchronous Adapter Module, SAM, plugs into the U26 socket of the 175C.

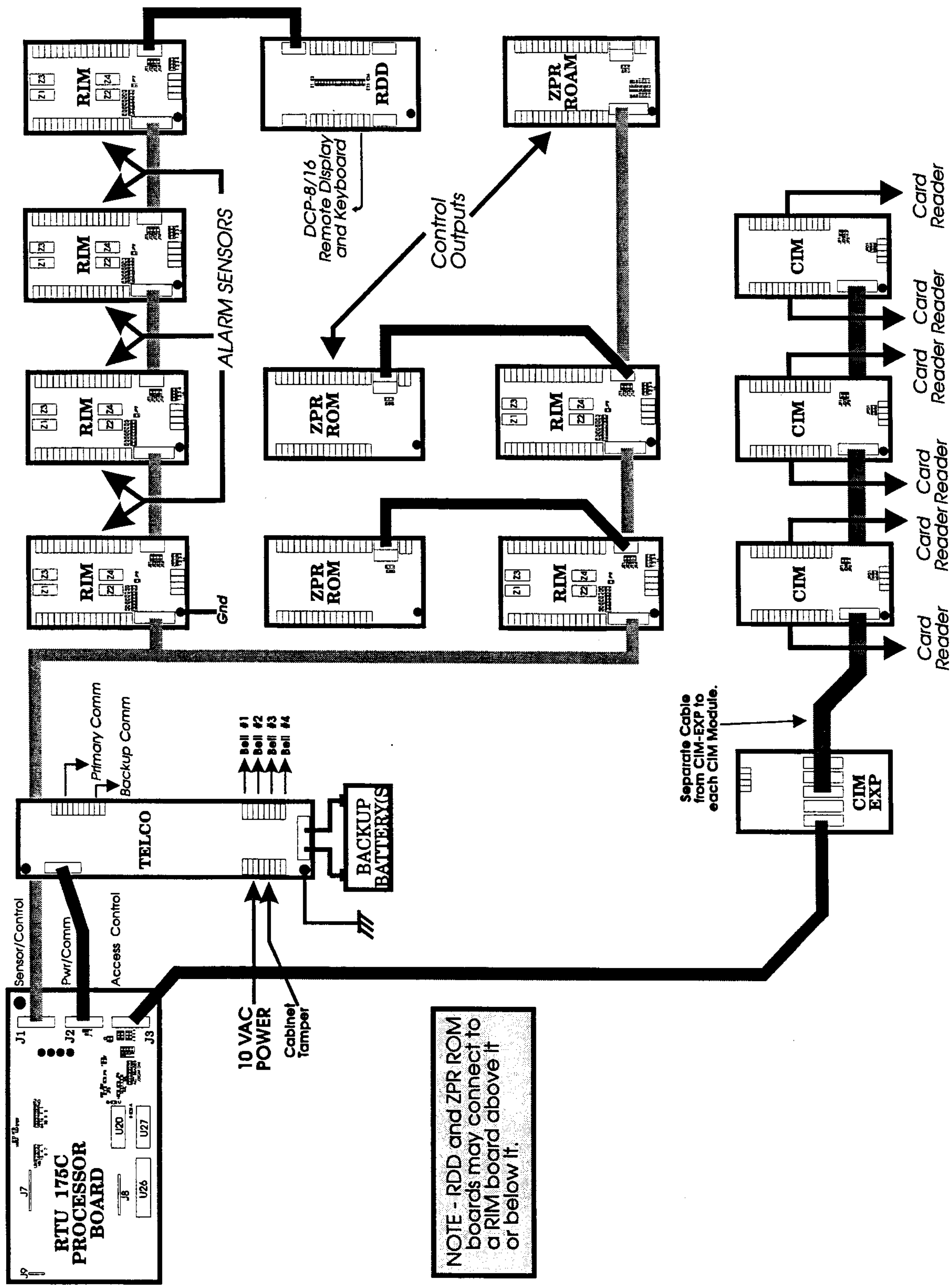


Figure 1-1. SAMPLE #1 RTU FUNCTION MODULE INTERCONNECT

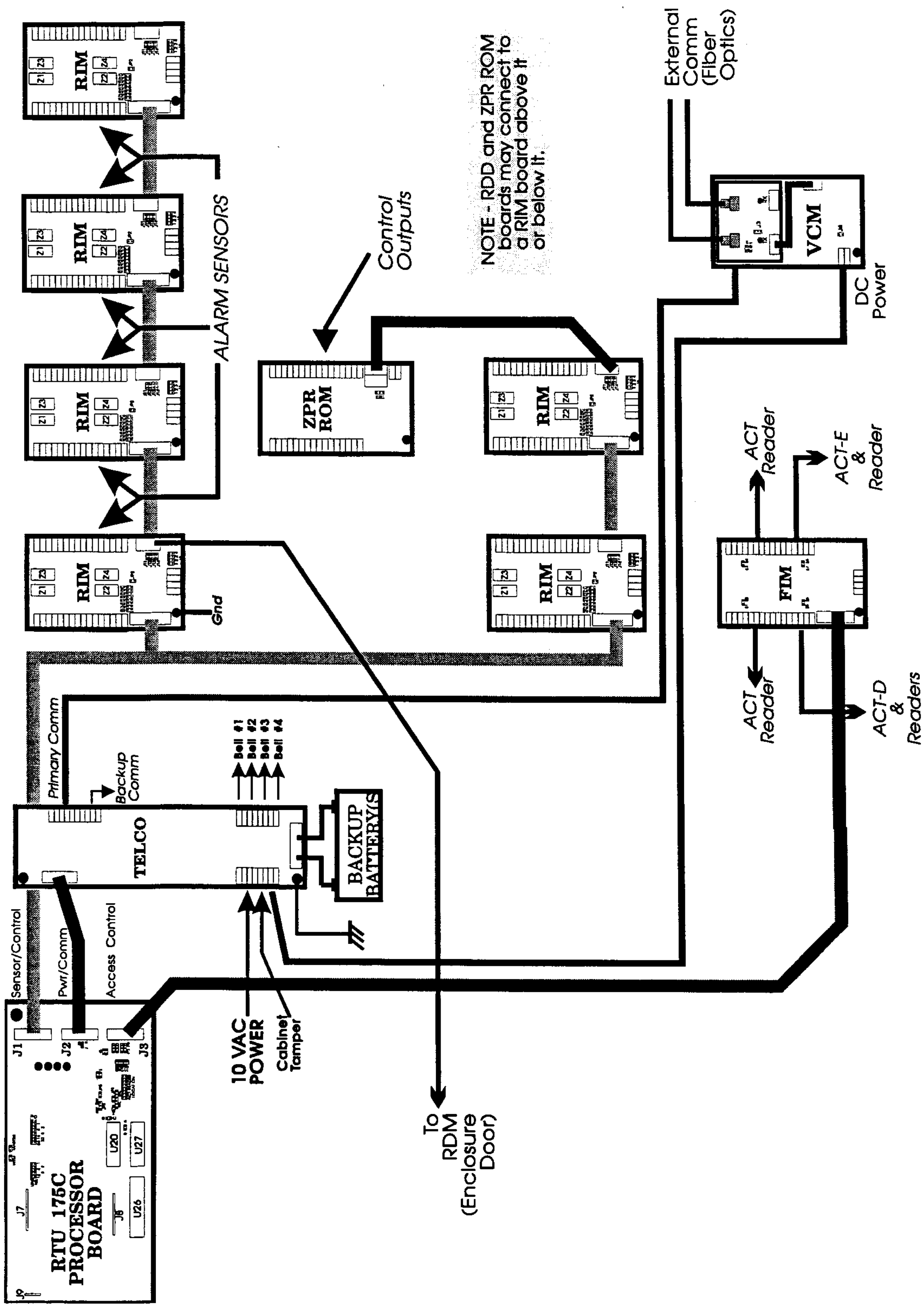


Figure 1-2. SAMPLE #2 RTU FUNCTION MODULE INTERCONNECT

1.2.3 Telephone Interface Board (TELCO), Communications and Power

The Telephone Interface Board (TELCO) is a standard part of every RTU panel, and provides DC power, cabinet tamper monitoring, alarm bell outputs, and system communications interface for the RTU-100/190/200. The TELCO board provides +6 VDC to the 175C Processor board and Function boards. Battery backup is available with a current sensing circuit in conjunction with a voltage regulator to control the battery charging. Cabinet tamper and alarm bell outputs/supervision have discrete dedicated signal lines connected to the TELCO board. There are several models of TELCO boards based on the type of communications selected by the user. The TELCO board includes two communications channels, a primary line and a secondary, or backup line. (i.e. if specified as MUX-DIAL, a MUX line is the primary with a DIAL line as the secondary, or backup line). The line types must be specified for each TELCO board.

There are 4 basic modes of communications supported by the RTU-100/190/200:

1. DIAL - basic dial-up telephone line communication, typically used for a more cost-effective backup line. Uses FSK, "full duplex" analog (voice grade line) and DTMF for "tone dialer". This is basically like plugging into a regular subscriber telephone line.

2. MUX (Multiplexed) - provides dedicated (leased line) 300 baud FSK for "full duplex" analog (voice grade line) communication. The MUX line mode can be configured as either a 2-Wire or 4-Wire interface, and can connect one RTU to a PPU line. The addition of a Passive Matrix Bridge (PMB) allows multiple RTUs to be connected to a single PPU MUX line.

3. DIFF (Differential) - provides four-wire RS-485 data line. DIFF allows direct multidrop RS-485 connection from multiple RTUs to a single PPU line at 1200 baud. Longer distance communications may be achieved through the use of VCM modules to provide a fiber optic interface. VCM modules are compatible with DIFF and RS-232 communication.

4. RS-232 - SUPPORTED ONLY WITH MODEL 180 PROCESSOR BOARD. Standard RS-232 used for a one-to-one connection from an RTU to the PPU. A Port Sharing Device (customer supplied) may be added here for multiple RTUs on a single communications channel of the PPU. MDI's newest X.3 protocol is supported with the RS-232 mode. The VCM module can also be used for RS-232 communications.

The +6 VDC output from the TELCO board requires special consideration due to its orientation with earth ground. This +6 VDC supply is actually a +3 VDC and -3 VDC with respect to earth ground. The regulated +5 VDC on the 175C processor board is similarly +2.5 VDC and -2.5 VDC with respect to earth ground. The main purpose of this orientation is to provide greater security against tampering with any of the RTU-100/190/200 subsystems, and to simplify RS-485 communications. **For this reason, customer supplied power supplies used for card readers must be floating supplies (with respect to earth ground).**

The RTU TELCO board can control up to four local bell outputs. Only one output will be energized at a time and will be disabled if a low battery condition is detected. All bell outputs provide a Power Limited 6 VDC at 500 mA, and may be reset either by a momentary closure of a reset switch across terminals TB1-4 and TB1-5, or by sending a Bell Reset command from the CPU. A Day/Night Acknowledge command from the Central Station will also reset the Bell Outputs. The outputs provided by the TELCO board are as follows:

1. CHIME: This output provides a steady activation in the event of RTU Communication Failure (Primary or Secondary line), and deactivates when communication is restored.

2. BURGLARY: This output provides a steady activation while in the "Secure" or "Area Open" mode. Only intrusion and protection alarms will sound the bell output. The bell will automatically silence after 15 minutes. (Used with "PI", "BI", and "ED" ZIMs.)

3. HOLDUP: This steady output is activated upon the sensing of "HOLDUP" or "DURESS" alarms. (Used with "HI" ZIMs) Holdup alarm does not display locally on an RDM-8 or DCP.

4. FIRE: The fire and burglary bell functions may share the same bell by strapping terminals 4 and 8 of TB2. The burglary bell is a steady activation while the fire bell will pulse. If the fire bell is not used, connect a 1K-ohm resistor across terminals 7 (+) and 8 (-) or a fault light will result on the RTU display. (Used with "FI" ZIMs).

TAMPER SWITCH. The cabinet tamper switch is factory connected to pins 3 & 5 of TB1. Additional switches to other cabinets can be added with series wiring.

1.2.4 RTU-100/190/200 Function Modules

The following paragraphs provide a basic description and operation of the commonly used function modules of the RTU-100/190/200.

1.2.4.1 Remote Input Module (RIM-8, RIM-16)

The Remote Input Module is the termination and interface board for alarm monitoring sensors. The RIM modules are available in two (2) versions; the RIM-8 and the RIM-16.

The RIM-8 board will monitor up to eight (8) 2-wire non-supervised, or four (4) 2- or 4-wire supervised alarm zones. Each RIM-8 can also be configured with the appropriate ZIMS to monitor and control two access control card readers, each with door contact monitoring and exit request control. Each RIM-8 occupies a data communication address set via jumpers on the board in conjunction with the Supervisory address of the Processor board.

The RIM-16 board has 16 actual zone inputs, however it supports ONLY 2-wire supervised alarm zone monitoring. This means that he RIM-16 provides monitoring for up to eight (8) fully-supervised alarm zones. For Access Control, a single RIM-16 can be configured with the appropriate ZIMs and jumper settings to support up to eight access control card readers, each with door contact monitoring and exit request control. The RIM-16 occupies two (2) communication addresses for alarm monitoring and/or control of up to four card readers. Four (4) communication addresses would be used if configured to control from five (5) to eight (8) card readers with the RIM-16. Addresses and options are set via on-board jumpers.

SPECIAL NOTE - The RIM-16 is compatible with the 175C or 180 Processors operating ONLY with Versions 2000, 3000, 3500, 4000, or 4500 Firmware. The RIM-16 cannot be used with the 700 or 900 versions of RTU firmware.

The RIM boards also provide the interface for Remote Display Modules (RDM-8R, RDM-8KUD), Remote Display Drivers (RDD), and Zero Power Relay Modules (ZPR-8).

1.2.4.2 Zone Identification Module (ZIM)

The Zone Identification Modules are small plug-in modules used to identify the connection and alarm monitoring characteristics of the corresponding zone inputs. The proper ZIMs are inserted into the appropriate socket locations on the RIM-8 or RIM-16 boards according to the alarm monitoring and/or access control requirements of the end user. Four (4) ZIMs are required per RIM-8 module (16-pin type), and eight (8) ZIMs are required for the RIM-16 (2-pin type). Through the use of the ZIMs, any input zone may be configured to monitor a wide variety of protection devices, including 2-wire and 4-wire fire sensors (4-wire supported with RIM-8 boards only), burglary/intrusion, holdup/duress, hazard, 24-hour protection, and access control doors, as well as two varieties of arming controls. The ZIM also programs if an alarm condition will initiate local alarm bell outputs on the TELCO board allowing door chime annunciation, burglary bell, holdup/duress output, and fire bell control. (See the ZIM Definition Charts, Table 2-3 and 2-4.)

1.2.4.3 Zero Power Relay (ZPR) Boards

The Zero Power Relay modules provides up to 8 dry contact relay outputs for control purposes. There are three (3) different version of the ZPR board each with slightly different usage and functionality; The ZPR-8 (a.k.a. ZPR-ROM or ZPR-01), the ZPR-8A (a.k.a. ZPR-ROAM or ZPR-03), and the ZPR-8F (a.k.a. ZPR-FIM or ZPR-03).

ZPR-8 Each ZPR-8 is a basic Relay Output Module (ROM) connected to, and addressed through a RIM board. The output relays of the ZPR-8 can be set to HOST CPU control (by commands), or linked to the alarm status of the associated RIM board.

ZPR-8A Each ZPR-8A is Relay Output Addressable Module (ROAM) which provides up to 8 relay outputs for HOST CPU control purposes. Each ZPR-8A module is connected directly to the 175C Processor Board and individually addressed similar to a RIM board, making each relay output completely controlled by commands from the Central System CPU.

ZPR-8F The ZPR-8F is a Relay Output Module used ONLY in conjunction with FIM Access Control where the end user desires the door strike to be controlled from the RTU and not from the ACT reader device located at the door. The ZPR-8F module is connected directly to the Processor board in the same manner as the ROAM, except, in this case, the ZPR has no address and the relays are not HOST CPU controllable. The relays of the ZPR-8F (FIM) will follow the strike relay of the correspondingly numbered ACT reader (ACT-4) or ACT interface (ACT-E, ACT-D) to provide door strike control from the RTU.

1.2.4.4 Remote Display Module (RDM-8R)

The Remote Display Module is an eight (8) zone LED status display board that mounts on the inside of the door of the RTU enclosure with the LEDs showing through holes in the door. The RDM is connected to a RIM board with a ribbon cable and displays the status, in real-time, of the corresponding alarm input points of the RIM. If an LED display is desired at a remote location external to the RTU, a Display Extender Panel (DEP) may be used. The DEP provides the same status display only functions of an RDM except it is interfaced to the RTU via a Remote Display Driver (RDD).

1.2.4.5 Remote Display Module with Digital Keypad (RDM-8KUD)

The RDM-8KUD is an LED status display with an integrated 12-digit keypad assembly used to control the Arm/Disarm (open/close) status of the RTU alarm zones. The RTU and Host CPU parameters must be set for Soft User ID control and the keypad is then used to enter a pre-configured User ID number in order to Open/Close a defined area or grouping of alarm inputs. The RDM-8KUD is connected to a RIM board with a ribbon cable and is mounted on the door of the RTU enclosure. That particular RIM must have an Arming Control ZIM installed in the first ZIM location (S2, N2, AN or AS). The LED status display will display the real-time status of the corresponding alarm points.

A single RDM-8KUD keypad can be used to arm/disarm the entire RTU unless multiple RDM-8KUDs and Arming Control ZIMs are used (maximum of 8).

1.2.4.6 Display Control Panel, Display Extension Panel (DCP-8, DCP-16, DEP)

The Display Control Panel (DCP) is an 8 or 16 alarm point display panel with an integrated keypad assembly, that can be installed at a remote location external to the RTU. The DCP unit provides for the capability to install an Arm/Disarm, soft user ID keypad at the protected area location, typically next to the door of the area. The DCP includes an 8 or 16 LED display panel to show the real-time status of the corresponding alarm points. A DCP-8 show the status for eight alarm points and a DCP-16 has LEDs for sixteen alarm points. The DCP interfaces to the RTU via the Remote Display Driver module and requires an Arming Control ZIM in the zone #1 location of the associated RIM.

If only an alarm status display is required at a remote location external to the RTU, a Display Extension Panel (DEP) can be installed. The DEP provides a simple LED alarm display for 8, 16, 24, or 32 alarm input zones. The DEP includes 32 LEDs arranged in four columns of eight (8) LEDs, and interfaces to the RTU via the RDD module.

1.2.4.7 Remote Display Driver (RDD)

The Remote Display Driver is designed to provide a link between the RTU and a Display Control Panel (DCP-8 or DCP-16), located at a remote location. The RDD can interface a maximum of two (2) RIM boards with up to two (2) DCP modules for a maximum of sixteen alarm zones. The RDD is mounted within the RTU and is connected to the RIM board with a ribbon cable. Several configuration options are available, such as two DCPs controlling one RIM, or one DCP controlling two RIMs, or many others. The RDD is also used to interface a DEP module back to the RTU.

1.2.4.8 Card reader Interface Module (CIM-2)

The Card reader Interface Module is the termination and interface module for the direct connection of two card readers to the RTU panel. The CIM board mounts within the RTU enclosure and connects directly to the 175C Processor board J3 connector if only one CIM is used. If more than two (2) card readers are required, up to four (4) CIM boards may installed and connected via a CIM Expander Module (CIM-EXP). The CIM boards will interface to Magnetic Stripe, Wiegand, Proximity Card Readers as well as the MDI ACT-3 units. ACT-3 units typically require the addition of a CIMIL or CIMIR module for proper connections.

> **CIMIL** - ACT-3 Left Interface Module. The CIMIL interfaces one ACT-3 card reader to the left side of a CIM-2 module.
>
> **CIMIR** - ACT-3 Right Interface Module. The CIMIR interfaces one ACT-3 card reader to the right side of a CIM-2 module.

1.2.4.9 Card reader Interface Module Expander (CIM-EXP)

The CIM Expander Module connects directly to an RTU 175C Processor board through the J3 connector and provides the connection for up to four CIM-2 modules. This allows for up to eight card readers or ACT-3 units to interface directly to the RTU panel with CIM-2 modules.

1.2.4.10 Four Wire Interface Module (FIM)

The FIM module is the termination and interface device for the MDI ACT Series of readers, such as the ACT-4 access control units, the ACT-5 Arming Control Stations, and the ACT-D and ACT-E card reader interface devices. The FIM board provides 2-wire RS-485 communication interface for up to 8 readers depending upon the configuration scheme. Connections are via two (2) identical terminal blocks, providing connections for 4 actual communications channels. Two (2) FIM boards would be used if the all eight readers were to be individually "home run" connected. The FIM connects directly to the 175C processor board (J3 connector). (Special versions of the FIM board are available for other non-standard types of card readers. Consult MDI Marketing Department.)

1.2.4.11 Passive Matrix Bridge (PMB)

The Passive Matrix Bridge is used to allow multiple RTU panels to be connected and interfaced to a single dedicated 3002 Multiplex line. The PMB takes a single 2-wire line and breaks it out to 4, 9, or 16 communication line connections (based on jumper settings), while maintaining the proper line impedance and power loss balance for all the line connections. The PMB supports 2-wire and 4-wire communication and provides a 600 ohm termination for unused ports as well. (2 PMB's required for 4-wire communicaiton lines.)

1.2.4.12 Versatile Communication Module (VCM)

The Versatile Communication Modules provide for integrated RTU communication conversion to Fiber Optic, Twisted Pair, or Coax communication lines. The VCMs are installed in the RTU enclosure and are available in RS-485 multi-drop, or RS-232 communication formats (not supported for 3002 multiplex line). Each RTU would require a transmit module and a receive module and are available to support 1300 nm Fiber Optics, 820 nm Fiber Optics, 93-Ohm Coax Cable, and standard Twisted Pair communication media. VCMs are also available with stand-alone enclosures, and in rack-mount versions, along with a 13-unit rack mount cage (with power supply) typically used at the Host CPU/PPU location.

1.2.4.13 Memory Expansion Modules (MEX-8, MEX-16, MEX-32)

The standard RTU 175C Processor includes onboard memory to store approximately 1000 Cardholder Records. This memory capacity can be expanded with the addition of one of the optional MEX boards. The MEX-8 expands the storage capacity to 8,000 card records, the MEX-16 expands to 16,000 records, and the MEX-32 to 32,000 records. The MEX boards are plug-in, daughter-type boards that plug into connectors J7, J8 and J9 of the Processor board. Note that the Processor board firmware parameters must also be set correctly to properly operate with the installed expanded memory.

1.2.4.14 DES Encryption Modules (DES)

In very high-security environments, it is sometimes desirable or necessary to utilize secured communication techniques. The RTU 175C Processor board is capable of encrypted communication compatible with DES Encryption standards through the addition of an optional DES Encryption Module. The DES board utilizes the U.S. Government approved encryption techniques in accordance with the National Bureau of Standards and FIPS 46-1 Data Encryption Standard. The encryption module is a plug-in module which attaches to the 175C Processor board and can be incorporated with one of the MEX boards (if expanded memory is required) or as encryption only. The System software and RTU firmware parameters must also be configured properly for encrypted communication.

1.2.4.15 Synchronous Adapter Module (SAM)

The Synchronous Adapter Module (SAM) is a plug-in, "piggy back" or daughter board that provides an RS-232 serial communication interface for the RTU 175C processor. The board is intended as an upgrade only to existing, previously installed RTUs and converts the existing primary communication port to standard RS-232 for interface to a DSU type modem/circuit. New RTUs requiring RS-232 communication should be ordered with the 180 Processor board.

1.3 SPECIFICATIONS

ENCLOSURE: 16 Gauge Cold Rolled Steel

RTU-100:	16.25 inches High,	12.90 inches Wide,	3.40 inches Deep
RTU-190:	22.90 inches High,	14.40 inches Wide,	3.40 inches Deep
RTU-200:	28.53 inches High,	20.74 inches Wide,	3.40 inches Deep

KNOCKOUTS:

RTU-100:	1/2 inch Conduit	(4 knockouts)
RTU-190:	1 inch Conduit	(8 knockouts)
RTU-200:	1 inch Conduit	(7 knockouts)

WEIGHT:

RTU-100:	13 lbs. typical
RTU-190:	29 lbs. typical
RTU-200:	32 lbs. typical

SOURCE POWER: 10 VAC, U.L. Listed 16 VA Class 2 Transformer. Current draw of 450 mA with maximum options (see appendix C for details)

BATTERY BACKUP: +6 VDC for a minimum of 24 Hours with up to 3 batteries

FUSING:

V+	1.0 amp
Bell Power	1.0 amp
120 to 10 VAC transformer	16 VA with one-shot thermal fuse

OPERATING TEMPERATURE: 0° to 140° F. (-18° to 60° C.)
95% Humidity, Non-condensing

CONTROL OUTPUT INTERFACES:

ZPR Relay Outputs	Contacts Rated 2 Amps @ 24 VDC .5 Amps @ 24 VAC

TELCO BOARD

ALARM BELL OUTPUTS: +6 VDC, at 500 mA
Only one of four outputs active at a time.
CIRCUITS ARE POWER LIMITED AT 500 mA.

READER INTERFACES/COMPATIBILITY:

Magnetic Stripe
Wiegand-Effect
Proximity (Hughes ID and Indala)
Bar Code
Barium Ferrite

INPUT ZONES:	RTU-100	8 to 32 non-supervised or supervised
	RTU-190	8 to 48 non-supervised, 32 supervised
	RTU-200	8 to 64 non-supervised, 32 supervised

COMMUNICATIONS INTERFACES:

TYPE	DESCRIPTION	DATA RATE
DIAL	Voice Grade DTMF Phone Line	300 Baud
MUX	Dedicated 2- or 4-wire 3002 Leased Line	300 Baud
DIFF	4-Wire RS-485	1200 Baud
RS-232	Standard EIA RS-232	9600 Baud

TAMPER SWITCH: Mounted in enclosure to protect against unauthorized opening of RTU-100/190/200 enclosure.

2.0 SYSTEM PLANNING

2.1 GENERAL

The MDI SAFEnet System is a system designed and developed for the monitoring and/or control of SECURITY, FIRE, and ENERGY. It is very important to plan the configuration of the system installation in advance so that the proper and most efficient RTU configuration is ordered and made available based on the site requirements. This can be done by, first, determining the overall site and system requirements, such as number and type of alarm sensors, number and type of access control card readers, and of course the locations of each. The proper RTU and hardware requirements and configurations can then be determined and planned based on these numbers and locations. The MDI Planning Forms and Configuration Sheets can then be used to determine and layout the exact RTU configurations, ZIM requirements, RTU addressing and data communication line requirements. Proper planning can save a lot of time and money, as well as serving to provide the most efficient and most effective system installation.

2.2 SITE REQUIREMENTS

The first step in planning the system is to determine the overall site requirements for an effective and proper installation. These items can range from determining the locations for the mounting of RTUs to planning the communication line and cabling/conduit routing. Once these basic requirements are determined, a good Site Survey can be performed to determine more precise system requirements and configuration parameters needed to accomplish the desired goal. The data from the site survey is then utilized to determine the exact number of RTUs and RIM modules, relay modules, access control equipment, etc., and lay it all out in the most effective and efficient configuration.

2.2.1 System Requirements

There are basic installation guidelines and requirements of the RTU-100, RTU-190 and RTU-200 which must be determined and reviewed prior to planning the actual system component planning.

1. *Wall Mounting Requirements and Dimensions* - The RTU 100/190/200 enclosures are typically wall mounted using toggle, lag, machine, or carriage bolts, depending on the type of wall being mounted to, with conduit attached for the cable installation. Determination of wall space availability must be made for mounting of RTU enclosures as well the type of wall material to be mounted on. RTU enclosure dimensions are shown in the specifications in paragraph 1.3 on page 15, and in Figure 3-2 on Section 3 of this manual.

2. *Ground* - The RTUs require a good quality earth ground, such as a cold water pipe, for the system to function properly. Determination must be made if such a ground is available at the desired locations.

3. *AC Power* - The RTUs operate with source power from a U.L. listed 10 VAC, 16 VA class 2 transformer. This transformer must be plugged into an unswitched, dedicated AC outlet located within 10 feet of the installed RTU's location. The outlet must be tamper resistant.

4. *Communication Lines* - The RTU 100/190/200 is capable of communication to the Host CPU/PPU location via 4-wire RS-485, EIA standard RS-232 (with Model 180 Processor board), dedicated 2- or 4-wire 3002 voice grade multiplex line, or standard DTMF, switched telephone line service for backup lines. For 3002 Multiplex lines, the RTU receives data on a 1070/1270 Hz tone pair at -5 to -30 dbm level (-18 nominal) and transmits on a 2025/2225 Hz tone pair at -3 to 0 dbm level. RS-485 is standard 4-wire EIA RS-485 standards. For dial backup lines, a standard telephone modular jack or line connection must be provided. Determine the type of data lines which are to be used and if they already exist or will require installation.

5. *Local Alarm Devices* - Determination must be made if local alarms, bells, sirens, horns or lights are to be activated/controlled by the RTU and where they will be located.

6. *Protection Devices* - Determination must be made as to the type of devices to be monitored and reported, such as fire alarms, smoke detectors, sprinkler/water flow, intrusion devices (magnetic switches, glass break detectors, motion detectors, etc.), holdup/duress buttons, etc., and their mounting requirements.

7. *Card Access Control Devices* - If Card Access Control is to be installed, determination must be made as to the type of card readers and card technology to be used, as well as the types of door strikes/locks, exit devices, and other such associated devices. Installation and mounting requirements must be obtained.

8. *Control Devices* - It must be decided if any external equipment or devices are to be controlled by the system with relay outputs, such as HVAC systems, lighting, elevator control, electric door locks, alarm horns or annunciators, etc., and installation requirements determined.

9. *Cable and/or Conduit Requirements* - Exact cable type, size and quantity/length must be determined based on the type of devices to installed and the location of the cabling. Any other associated cable installation materials would also need to determined.

10. *Operating Environment* - Ensure that the proposed location of the RTU conforms to the requirements for the RTU, which is 0° to 140° F, Humidity 95% non-condensing.

2.2.2 Site Survey

Once the basic requirements of the system are determined, a comprehensive Site Survey should be performed to determine the exact monitoring and control system requirements and locations. Examine each area where an RTU-100/190/200 would be located as well identifying each location that an alarm sensor, control device and access control devices will be required.

1. Locate and identify each specific location that will require an alarm sensor, specifying the type of sensor and type of monitoring to be used (2-wire or 4-wire supervised or 2-wire non-supervised). Identify the type of alarm point as Fire, Holdup/Duress, Burglary/Intrusion, Protection, Hazard, Access Control, Open/Close Control, etc.

2. Locate and identify output control devices which will be controlled by the system, such local alarm horns at emergency exit doors, electric door locks, elevator control equipment, lighting to be controlled, energy management controls, etc. Identify each location and how it needs to be controlled.

3. Locate and identify each door or entrance requiring Access Control, specifying the type of reader (with or without keypad), the door monitoring requirements, exit request device requirements, etc. Be sure to allocate two (2) alarm input points for each card reader. Access card readers are interfaced to the system through FIM or CIM modules, depending on the type of reader and the desired communication technique.

4. Identify any areas requiring Open/Close (Arm/Disarm) arming control and how it is to be controlled, i.e., from a digital keypad or a switch contact closure. Specify if the keypad is to be located at the RTU or remotely installed at the area to be controlled. The RDM-8KUD module is used at the RTU, and the DCP modules provides an LED display plus a keypad for Arm/Disarm control at the remote location. An ACT-5 unit can also be used for Arm/Disarm at the remote location.

5. Determine if any of the alarm bell outputs from the TELCO board are to be used and connected at any location of an RTU. If so, specify any installation requirements.

6. Although not part of the RTU installation, a very critical part of the overall system installation and planning is to also determine the requirements for File Server and Operator Workstation Computers, identifying where the File Server is to be installed as well as the quantity, location and operational requirements of Operator Workstations, where the system will be monitored and controlled from, etc.

2.3 RTU CONFIGURATION PLANNING

The RTU-100/190/200 panels are subsystems of the MDI SAFEnet System, performing the alarm sensor monitoring, change of state processing and reporting functions of the system, as well as Access Control processing and control output commands. In order for the RTU to properly monitor and annunciate the alarm conditions, it must be properly configured as to the personality and characteristics of each alarm input. Each alarm sensor must recognized by the RTU processor in order to correctly report an abnormal condition. This alarm point configuration is done via the Zone Identification Modules (ZIM), which are installed in the RIM boards. There must be a ZIM associated with each alarm input being used.

After performing a good Site Survey, an accurate count of alarm sensor devices should now be known. With this information, the actual number of alarm input zones can now be determined, keeping in mind that some types of alarm devices or alarm monitoring requires two (2) zones and others only one (1) zone. Once the total number of alarm input zones is determined, the total number of RIMs (and any other modules) can be determined, which then basically determines the number RTU panels required.

Each RTU in the SAFEnet System has its own unique set of addresses. Each of these addresses refer to a RIM. Each RIM-8 has 8 zones and one address, and each RIM-16 has 16 zones (8 supervised zones) and two (2) or four (4) address allocations. The number of monitoring zones needed determines the number of RIMs required. The number of RIMs (and/or other Function Modules) will determine how many RTUs are required. The basic planning steps required to determine the RTU hardware configuration areas follows:

1. Based on the data gathered on the Site Survey, use the ZIM Planning Forms, Table 2-1 and Table 2-2, to determine the total number of alarm input zones required to monitor the alarm sensor devices which are to be installed. Refer to the ZIM Definition Charts, Table 2-3 and Table 2-4, for descriptions of each ZIM

2 With the "Total Zones" count determined from the ZIM Planning Forms, use the Equipment Requirement Chart, Table 2-5 on page 28, to determine the number of ZIMs and RIMS required. This will help determine the RTU size.

3. Use the RTU Module Placement Forms on pages 34-36 to determine the layout and module placement of the function modules required for each RTU panel. Make as many copies of this form as are necessary for the number of RTU panels required. Figures 2-1 and 2-2 to show the available function module positions for each RTU type. Also refer to Tables 2-6, 2-7 and 2-8 for details as to which function modules are to be installed in what mounting location within the RTU.

4. Assign the alarm input zones to the RIM modules. Be sure to use logical groupings based on physical location, especially if Arm/Disarm (open/close) control is to be used. Use the "RTU Zone Work Sheets" on pages 38 and 39 to annotate each ZIM type and assign each zone a logical text description. Make as many copies of these work sheets as is necessary. It is IMPORTANT to note that the Arm/Disarm function ZIM should ALWAYS be in the zone #1 position of the first RIM (unless multiple arm/disarm keypads are used), and that ACCESS CONTROL function ZIMs must ALWAYS be in the zone 5&6 and zone 7&8 positions on RIM-8 boards. Access Control ZIM locations on RIM-16 boards are determined by how many readers/keypads are to be controlled by that RIM-16 board.

5. Use Table 2-9, "RTU COMMUNICATION LINKS", on page 40, to determine the communication line types and designation to use for each RTU to be ordered.

2.3.1 ZIM Planning and Configuration

Each sensor and control location has to be recognized by the RTU 175C Processor board and specified with a zone type. The ZIM modules basically "hardware program" the alarm point zones so that the processor can monitor, analyze and process them correctly. Use the ZIM Planning Guide, paragraph 2.3.1.1, and the ZIM Planning Forms, Table 2-1 and Table 2-2, to calculate the number of alarm zones required by the system.

2.3.1.1 ZIM Planning Guide

With the data from your Site Survey, identify what functions are required by your system then use the ZIM Planning Forms, Table 2-1 and/or Table 2-2, to specify what ZIM types are required. Items 1 through 12 below describe the application of columns 1 through 12 on the ZIM Planning Form. Note that 2-wire and 4-wire supervised alarm points (TW/_ and FW/_ respectively), Access Control (AC/_) monitoring, as well as all monitoring zones on a RIM-16 require two zones.

1. *ALARM POINT ZONE TYPE*

   Specifies the type (category), or alarm condition to be reported for the alarm zone.

2. *ZIM TYPE*

   For supervised alarm zones, the first two characters specify the type of wiring supervision (e.g. TW/__, FW/__), with the detected circuit faults reporting on the odd numbered zone of zone pair configured by that ZIM socket. The second two characters specify the alarm zone type, with the alarm conditions to be reported on zone 2 of the zone pair of that ZIM socket. RIM-16 zones are all 2-wire supervised zones and have no special supervision designation.

   For non-supervised alarm zones (RIM-8 only), the first two characters specify the zone type for alarm zone 1 of that zone pair socket, and the second two characters specify the zone type for alarm zone 2 of that zone pair (e.g. PI/PI).

3. *ALARM REPORTING PRIORITY*

For 2-wire and 4-wire supervised (class A and B) circuits, the first number represents the reporting priority of the circuit faults (on the odd numbered zones), where 0 = secfault and 1 = firefault. The second number represents the priority given to the alarm point reporting (even numbered zone) where 0 is the lowest priority (no alarm), and 7 is the highest priority. Fire alarms are given priority 7. RIM-16 zones are all 2-wire supervised.

For non-supervised circuits/zones, the column shows the single zone priority level for that type of alarm zone, keeping in mind that a ZIM specifies, or programs, two zones (e.g. PI/PI, HI/HI, etc.). Again, the RIM-16 does not support non-supervised alarm zones.

4. *LOCAL BELL OUTPUT TYPE AND NUMBER*

Four bell outputs exist on the TELCO Board. How the bell outputs will operate is determined by the ZIM type. Bells are either unassigned (silent), delayed, or instant. The number following the specified output types indicates which bell output of the TELCO board (1-4) will be activated, where 1 = Chime, 2 = Burglar, 3 = Holdup, and 4 = Fire.

5,6,7. *ZONE CLASS*

CLASS A, 4-Wire Supervised zone wiring. Consists of two closed loops. If a wire is cut (open) or grounded, a line (circuit) fault is detected and reported. A short between the two loops will cause an alarm condition. An alarm condition is still detectable with either of the loops in a fault condition.

CLASS B, 2-Wire Supervised zone wiring. On the RIM-8, this wiring consists of a single loop with a 1-Kohm end-of-line resistor. If a wire is cut (open) or grounded, a line (circuit) fault is detected and reported. A short across the loop will cause an alarm condition. An alarm condition is not detectable if a circuit fault condition exists.

On the RIM-16, this wiring consists of multiple resistors in a single loop, with different resistance levels used to measure different conditions on the loop. Open, short, or ground will cause a Fault condition, while other levels are reported as alarms.

CLASS AB 2-Wire unsupervised zone wiring. Consists of a single loop with a 1-Kohm end-of-line resistor. If a wire is cut, grounded, or shorted, an alarm is detected and reported.

8. *WIRING ILLUSTRATIONS*

Illustrations and descriptions of the zone wiring and hookup requirements are shown on the specified pages of this manual.

9, 10,11. *ZONES USED, NUMBER OF POINTS, TOTAL ZONES*

These columns are used to calculate the total number of alarm input zones that will be required, based on the number of sensors and supervision requirements. The first column shows how many actual alarm input zones are used for each type of ZIM assignment. Each ZIM will program, or condition 2 non-supervised input zones, or 1 supervised alarm zone. This number is multiplied by the actual count of that type of alarm point required for the site, based on the Site Survey, with the result in the next column being the total number of input zones required for each type of alarm point. Adding up column 11 gives you the overall total number of input zones required. With the total number of zones determined, the required quantity of RIM modules and RTU-100/190/200s can be calculated.

12. *NOTES*

This column references notes and comments listed on page 26 which serve to provide further information or clarifications on compatibility or configuration issues.

1	2	3	4		5	6	7	8	9		10		11	12
ALARM ZONE TYPE	ZIM TYPE	FAULT TYPE/ PRIORITY LEVEL	LOCAL BELL OUTPUT. TYPE	NO.	CLASS A 4-WIRE	CLASS B 2-WIRE	CLASS AB 2-WIRE	WIRING ILLUSTRATION	ZONES USED	X	NUMBER OF POINTS	=	TOTAL ZONES	NOTES
FIRE	FW/FD	1/7	DELAYED	4	X				2	X		=		
	FW/FI	1/7	INSTANT	4	X				2	X		=		
	TW/FD	1/7	DELAYED	4		X		PAGE 77, 78	2	X		=		5
	TW/FI	1/7	INSTANT	4		X			2	X		=		
	TS/FI	1/7	INSTANT	4		X			2	X		=		
DURESS & HOLDUP	FW/HI	0/6	INSTANT	3	X				2	X		=		
	FW/HS	0/6	SILENT		X				2	X		=		
	TW/HI	0/6	INSTANT	3		X			2	X		=		
	TW/HS	0/6	SILENT			X		PAGE 77, 78	2	X		=		5
	TS/HI	0/6	INSTANT	3		X			2	X		=		
	HI	-/6	INSTANT	3			X		1	X		=		
	HS	-/6	SILENT				X		1	X		=		
INTRUSION & BURGLARY	FW/ED	0/5	DELAYED	2	X				2	X		=		
	FW/BI	0/5	INSTANT	2	X				2	X		=		
	TW/ED	0/5	DELAYED	2		X			2	X		=		
	TW/BI	0/5	INSTANT	2		X			2	X		=		1,
	TS/ED	0/5	DELAYED	2		X		PAGE 77, 78	2	X		=		5
	TS/BI	0/5	INSTANT	2		X			2	X		=		
	ED	-/5	DELAYED	2			X		1	X		=		
	BI	-/5	INSTANT	2			X		1	X		=		
24 HOUR PROTECTION	FW/PI	0/4	INSTANT	2	X				2	X		=		
	FW/PS	0/4	SILENT		X				2	X		=		
	TW/PI	0/4	INSTANT	2		X			2	X		=		
	TW/PS	0/4	SILENT			X		PAGE 77, 78	2	X		=		5
	TS/PI	0/4	INSTANT	2		X			2	X		=		
	PI	-/4	INSTANT	2			X		1	X		=		
	PS	-/4	SILENT				X		1	X		=		
HAZARD	FW/MS	0/3	SILENT		X				2	X		=		
	TW/MS	0/3	SILENT			X		PAGE 77, 78	2	X		=		5
	TS/MS	0/3	SILENT			X			2	X		=		
	MS	-/3	SILENT				X		1	X		=		
ACCESS CONTROL	AC/DR	-/4	NONE			X			2	X		=		
	AC/BI	-/5	INSTANT	2		X		PAGE 103, 104, 105	2	X		=		
	AC/DR-SR	-/4	NONE			X			2	X		=		
	AC/BI-SR	-/5	INSTANT	2		X			2	X		=		
ARMING CONTROL (Arm/Disarm)	TW/S1	0/2	NONE			X			2	X		=		
	N1	-/2	NONE				X	PAGE 80, 88	1	X		=		2,
	S2	-/2	NONE						1	X		=		4
	N2	-/2	NONE				X		1	X		=		
	S5	-/2	NONE						2	X		=		
SPARE	SP	-/0	NONE						1	X		=		3

Table 2-1. ZIM PLANNING FORM (RIM-8 Module)

1	2	3	4		5	6	7	8	9		10		11	12
					CLASS									
ALARM ZONE TYPE	**ZIM TYPE**	**FAULT TYPE/ PRIORITY LEVEL**	**LOCAL BELL OUTPUT.** TYPE	NO.	**A 4-WIRE**	**B 2-WIRE**	**AB 2-WIRE**	**WIRING ILLUSTRATION**	**ZONES USED**	X	**NUMBER OF POINTS**	=	**TOTAL ZONES**	**NOTES**
FIRE	FB	1/7	INSTANT	4		X		PAGE 83	2	X		=		
	FR	1/7	DELAYED	4		X			2	X		=		
DURESS & HOLDUP	DB	0/6	INSTANT	3		X		PAGE 83	2	X		=		
	DS	0/6	SILENT			X			2	X		=		
INTRUSION & BURGLARY	II	0/5	INSTANT	2		X		PAGE 83	2	X		=		
	IE	0/5	DELAYED	2		X			2	X		=		
	MI	0/5	INSTANT	2		X			2	X		=		
24 HOUR PROTECTION	PB	0/4	INSTANT	2		X		PAGE 83	2	X		=		
	PN	0/4	SILENT			X			2	X		=		
HAZARD	HB	0/3	DELAYED	2		X		PAGE 83	2	X		=		
	HS	0/3	SILENT			X			2	X		=		
ACCESS CONTROL	CP	-/4	NONE			X		PAGE 104	2	X		=		
	CI	-/5	INSTANT	2		X			2	X		=		
ARMING CONTROL (Arm/Disarm)	AN	0/2	NONE			X		PAGE 84, 85, 88	2	X		=		
	AS	0/2	NONE			X			2	X		=		
SPARE	SP	-/0	NONE						2	X		=		3

Table 2-2. ZIM PLANNING FORM (RIM-16 Module)

ZIM PLANNING FORM NOTES:

1. The "BI" or "ED" are typically used with N1, S2, and N2 "ARM/DISARM" control ZIMs. BI ZIMS may also be used as regular Intrusion alarm (BI/BI).

2. ARM/DISARM (OPEN/CLOSE) Control ZIMs:

   a. TW/S1 is used with a simple keyswitch, toggle switch, or local keypad with hardwired ID code for Arm/Disarm control and is wired with a 1-Kohm end-of-line resistor for line supervision, connected to the center L & L connectors. Open/Close transactions are reported to the Host, with an open circuit detected and reported as a circuit fault (SFAULT), a short circuit detected and processed as the "OPEN" command, and returning to the 1K position performs the "CLOSE" command. The SFAULT condition will automatically perform the "CLOSE" if not already closed.
   b. S1 is no longer supported in the current release firmware and replaced by the N1.
   c. S2 is used with remote keypad units (i.e. DCP, RDM-8K) and software controlled User ID to Arm and Disarm an area or group of alarm zones, with supervised reporting of open/close transactions.
   d. S5 is used in conjunction the MDI ACT-5 Arming Station to Arm/Disarm an area. A jumper must be connected across RIM terminals L and H for both input zones of the RIM to indicate to the RTU 175C Processor that an ACT-5 is present.
   e. N1 is used with a simple keyswitch, toggle switch, or local keypad with hardwired ID code to Arm and Disarm an area or group of alarm zones, with supervised reporting of "open/close" transactions. (Non-reporting N1 no longer supported)
   f. N2 is used with remote keypad units (i.e. DCP, RDM-8K) and software controlled User ID to Arm and Disarm an area or group of alarm zones, with supervised reporting of open/close transactions.

   The TW/S1, S2, S5, N1, and N2 all are used to "Disable" the alarm monitoring function of Intrusion/Burglar alarm zones (BI and ED ZIMs) typically during the time that that area is occupied with people, or when the area is OPEN. Alarm monitoring would be "Enabled" again when the area is again empty and ready to be CLOSED.

3. An unassigned or unused zone may have a spare (SP) type ZIM. However, a zone that is unused may also have a normal ZIM assignment with a 1Kohm resistor across the appropriate RIM terminals, which will "safe" out that zone. (e.g. Instead of specifying a PI/SP ZIM, get a PI/PI, install a 1Kohm resistor, and keep your option open for future expansion.) See section 3.6.1.3 or 3.6.2.3 for specifics on installing this 1K ohm resistor.

4. Use with version 700/900 or higher RTU firmware (TW/S1 or N1/XX).

5. The TS/xx ZIM provides 2-wire Supervised alarm zone monitoring with 1K, 2K, and 4K resistor arrangement required (See page 77). The 1K = EOL, the 2K is across the alarm sensor, and the 4K is for a separate Tamper Circuit. Tamper is reported separately, on the odd numbered zone, as a HAZARD Alarm.

ID	ZIM TYPE	DETAILS
AC/BI	Access Control W/Door Monitoring (Intrusion Alarm).	Must be on zone 5/6 or 7/8 only.
AC/BI-SR	Access Control with 1K/2K/4K Door Monitoring at RIM	Must be on zone 5/6 or 7/8 only. (Intrusion Alarm)
AC/DR	Access Control W/Door Monitoring (Protection Alarm).	Must be on zone 5/6 or 7/8 only.
AC/DR-SR	Access Control with 1K/2K/4K Door Monitoring at RIM.	Must be on zone 5/6 or 7/8 only. (Protection Alarm)
BI	Burglar/Intrusion, Instant bell, Secure protection.	Alarm disabled when area is OPEN (disarmed).
ED	Entry delay, 60 Second delay, Secure protection.	Typically used with S2, N1, or N2 ZIMs.
FD	Fire, 60 Second bell delay, Pulsed bell output.	Use with FW or TW ZIMs only.
FI	Fire, Instant bell, Pulsed bell output.	Use with FW or TW ZIMs only.
FW	4-Wire, Class A, Supervised wiring.	Defines wiring configuration (FAULTS).
HI	Holdup/Duress, Instant bell output.	No RDM alarm indications on LEDs.
HS	Holdup/Duress, Silent, No local output.	No RDM alarm indications on LEDs.
MS	Hazard, Silent, No local output.	Use for leak detection, etc.
N1	Open/Close, supervised, local keypad or keyswitch.	Hardware keypad code or keyswitch.
N2	Open/Close, non-supervised, Soft User ID keypad .	Software control 5-digit keypad codes.
PI	Protection, Instant bell, 24 Hour protection.	XMITs PI Alarms in Access (open) or Secure (closed).
PS	Protection, Silent, No local output, 24 Hour	XMITs PI Alarms in Access (open) or Secure (closed).
S1	No Longer Supported.	Functions replaced by N1.
S2	Open/Close with Soft User ID (1 per address).	Software controlled 5-digit keypad codes.
S5	Open/Close with ACT-5 Arming Station.	ACT-5 interfaced via FIM board.
SP	Spare (E.O.L. Resistor installed in ZIM).	Use for unassigned/unused zones.
TS	2-Wire, Class B, Supervised Wiring (1K, 2K, 4K) w/Tamper	Defines wiring config. (Faults w/Tamper Circuit)
TW	2-Wire, Class B, Supervised Wiring (1K EOL).	Defines wiring configuration (Faults).

Table 2-3. ZIM DEFINITION CHART (RIM-8 Modules, 16-pin)

ID	ZIM TYPE	DETAILS
AN	Open/Close, non-supervised, keypad, keyswitch or Soft User ID.	No Reporting. Mode selected by Input Resistance.
AS	Open/Close, Supervised, keyswitch, Soft User ID, or ACT-5.	Reporting, Mode selected by Input Resistance.
CI	Access Control W/Door Monitoring as Intrusion Alarm.	1K, 2K, 4K, 8K supervised monitoring at RIM input.
CP	Access Control W/Door Monitoring as Protection Alarm.	1K, 2K, 4K, 8K supervised monitoring at RIM input.
DB	Duress/Holdup, Instant bell output.	No RDM alarm indications on LEDs.
DS	Duress/Holdup, Silent, No local output.	No RDM alarm indications on LEDs.
FR	Fire, 60 Second bell delay, Pulsed bell output.	Fire monitoring. Two-wire supervised only.
FB	Fire, Instant bell, Pulsed bell output.	Fire monitoring. Two-wire supervised only.
HS	Hazard, Silent, No local output.	Use for leak, spill, gas leak detection, etc.
HB	Hazard, delayed bell output, bell #2,.	Use for leak, spill, gas leak detection, etc.
II	Intrusion/Burglary, Instant bell, Secure protection.	Alarm disabled when area is OPEN (disarmed).
IE	Intrusion W/Entry delay, 60 Second delay, Secure protection.	Typically used with AS or AN ZIMs.
MI	Intrusion W/Hardware Masking capability	4K (plus 1K E.O.L.) on input will Mask the Zone.
PB	Protection, Instant bell, 24 Hour protection.	Sends Alarm in Armed (open) or Disarmed (closed).
PN	Protection, Silent, No local output, 24 Hour protection	Sends Alarm in Armed (open) or Disarmed (closed).
SP	Spare (E.O.L. Resistor installed in ZIM).	Use for unassigned/unused zones.

Table 2-4. ZIM DEFINITION CHART (RIM-16 Modules, 2-pin)

*** NOTE *** - RIM-8 and RIM-16 Modules may NOT be mixed in the same RTU. RIM-16 modules are used with Firmware Version 2000 and above ONLY.

	RTU-100/190/200				RTU-190/200		RTU-200 Only	
# of Zones	1-8	9-16	17-24	25-32	33-40	41-48	49-56	57-64
# of RIM-8s	1/2*	2/4*	3/6*	4/8*	5	6	7	8
# of RIM-16s **	1	2	3	4	-	-	-	-
# of ZIMs ***	4/8	8/16	12/24	16/32	20	24	28	32
# of Batteries	1	1	2	2	2	3	3	3

* - RIM-8 zones can be non-supervised (1 input each) or supervised (2 inputs each).
** - RIM-16 zones are 2-wire supervised with each zone using two (2) inputs.
*** - Number of ZIMS are for RIM-8 or for RIM-16 (i.e. 1st #=RIM-8 / 2nd #=RIM-16)

Table 2-5. EQUIPMENT REQUIREMENT CHART

2.3.2 Function Modules Planning and Placement

The next task in system planning is to determine the hardware requirements, layout and configuration of each RTU panel. Based on the Site Survey and ZIM Planning Forms, a reasonably accurate count of alarm input zones per monitoring location should have now been calculated. From this information, the actual number and type of RTUs, as well as the number of RIMs per RTU, can be determined with the use of the above Table 2-5, "EQUIPMENT REQUIREMENT CHART".

In planning each individual RTU, functions such as card access control, remote status displays, Arm/Disarm control, relay output controls, and system data communications must now be considered, since these functions require modules and space in an RTU-100/190/200 enclosure. Figures 2-1 and 2-2, "RTU Function Module Positions" give an illustration of each type of RTU and the Function Module mounting positions that are available within each type. Table 2-6 (RTU-200), Table 2-7 (RTU-190) and Table 2-8 (RTU-200) each show a list of the typical function modules used and the positions where they should be installed. Using all of this information, each individual RTU can now be configured with the necessary modules using the "RTU MODULE PLACEMENT" forms on pages 34, 35 and 36.

Some things to remember in the configuration and placement of modules within the RTU:

- Alarm sensor input and relay output type function modules, such as the RIM-8/RIM-16 and the ZPR-8/ZPR-8A (ROM & ROAM) have up to 8 module spaces available (in an RTU-200) for each type. The ZPR-8 has a ribbon cable connection to a RIM and shares the RIM address. The ZPR-8A (ROAM) module is an individually addressable module independent of the RIM modules and connects back to the RTU 175C Processor Board in the same manner, and on the same cable as the RIM modules, and therefore would typically be mounted in one of the same locations that a RIM would be.

- The PMB-16 is normally mounted external to the RTU enclosure, but can be mounted within the enclosure if desired.

- The RDM-8R and RDM-8KUD mount on the inside of the RTU enclosure door. The RDD-2 uses a module location (M5 through M8) and interfaces to the DEP and DCP, which are external to the RTU enclosure at a remote location.

- The function modules used for card access control operation are the CIM-2, CIM-EXP, FIM, and ZPR-8F (FIM). One CIM-2 module can be used alone to support two (2) direct connect-type card readers, however if more than one CIM-2 module is required, a CIM Expander module (CIM-EXP) is required to support up to four (4) CIM-2 modules. The FIM board (up to 2) may be installed to support up to the maximum of 8 access control units on a serial RS-485 link. The control of the electric door locks/strikes at reader doors are controlled either from outputs on the CIM-2 board, or by the card reader (ACT units have strike relays), or through the addition of ZPR modules (such as ZPR-8F). The doors open/close status is monitored via zone inputs on the RIM or on the reader interface.

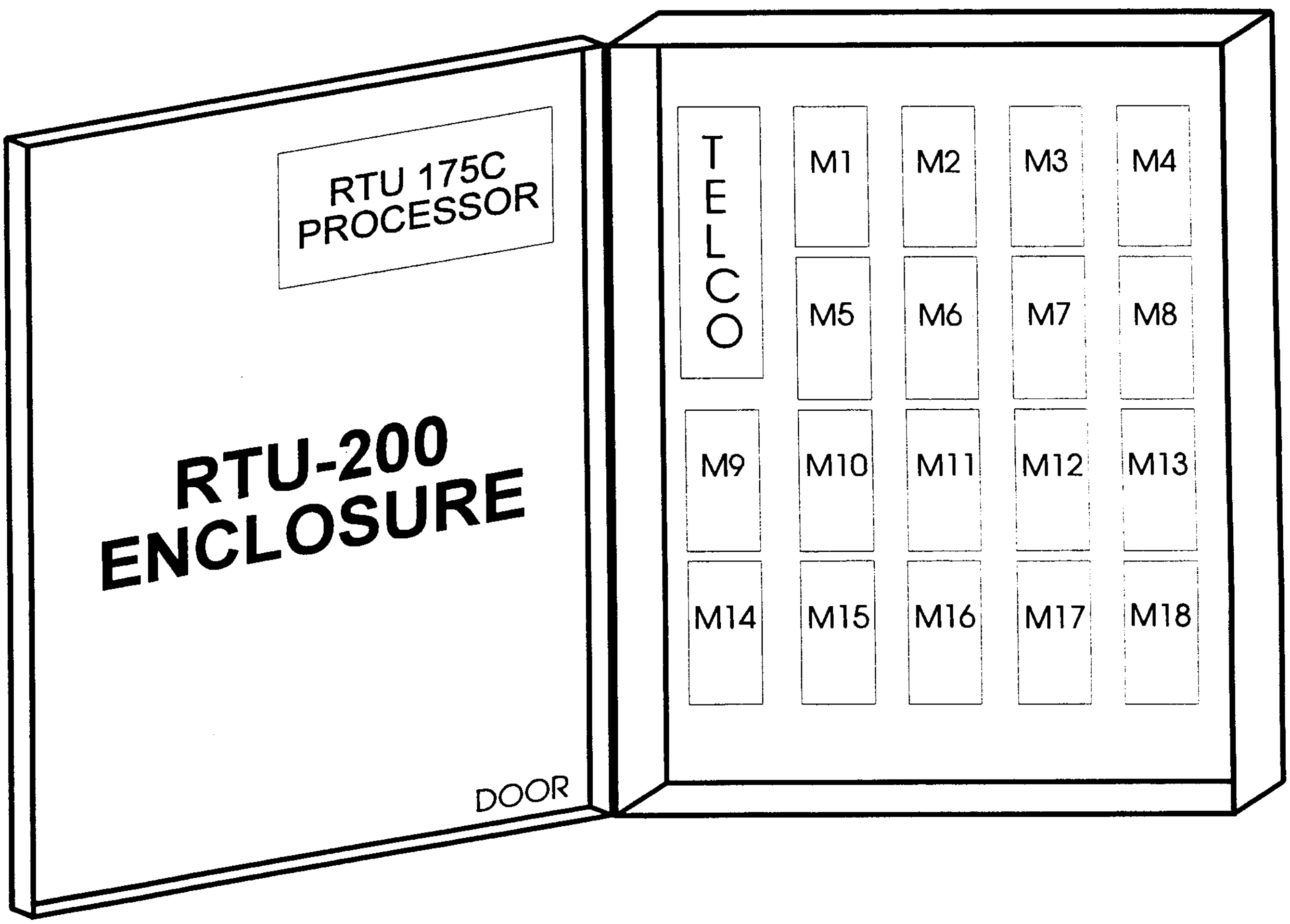


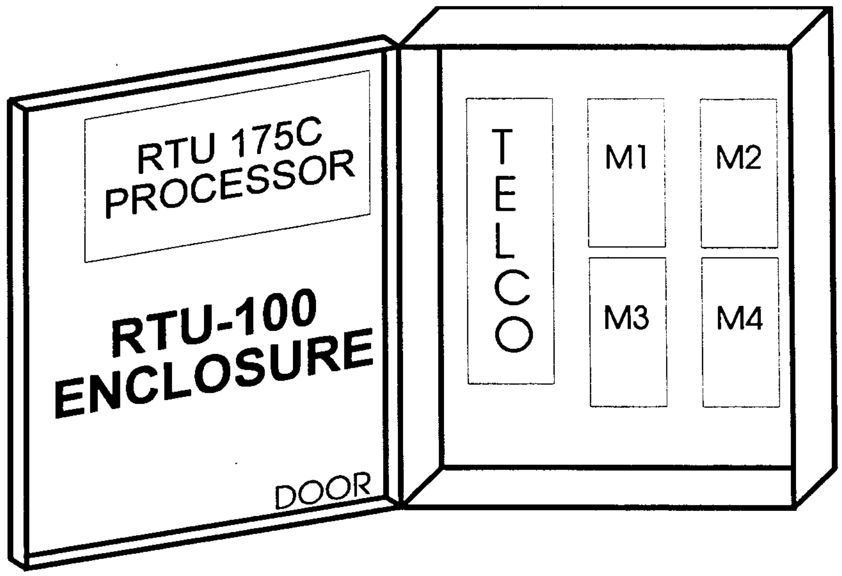
Figure 2-1. RTU-200 FUNCTION MODULE POSITIONS

MODULE NAME	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	MAXIMUM NUMBER OF MODULES	MODULES USED
RIM-8	■	■	■	■						■	■	■	■						8	
RIM-16	■	■	■	■						■	■	■	■						4	
ZPR-8 (ROM)					■	■	■	■							■	■	■	■	8	
ZPR-8A (ROAM)	■	■	■	■						■	■	■	■						8	
RDD-2					■	■	■	■											4	
CIM-2															■	■	■	■	4	
CIM-EXP														■					1	
FIM															■	■	■	■	4	
ZPR-8F (FIM)														■					1	
PMB									■					■					1	
VCM															■	■	■	■	2	

Table 2-6. RTU-200 FUNCTION MODULE PLANNING

NOTES:

1. ZPR-8 modules must each be connected to a RIM module.
2. RIM-8, RIM-16 and ZPR-8A modules use the same positions and, therefore, no more than a cumulative total of eight (8) of these modules may be used in an RTU-200. (Maximum of eight addresses per RTU.)
3. RIM-16 boards use two (2) adresses for alarm monitoring and should, therefore, always be counted as two boards. For access control of five (5) or more readers, the RIM-16 would use four (4) addresses.
4. RDD-2 modules must each be connected to a RIM module.
5. ZPR-8F is used only in conjunction with a FIM module.
6. RIM-8s and RIM-16s may not be mixed within the same RTU-200.
7. The PMB is typically mounted external to the RTU.


RTU 175C
PROCESSOR
RTU-100
ENCLOSURE
DOOR
TELCO
M1
M2
M3
M4

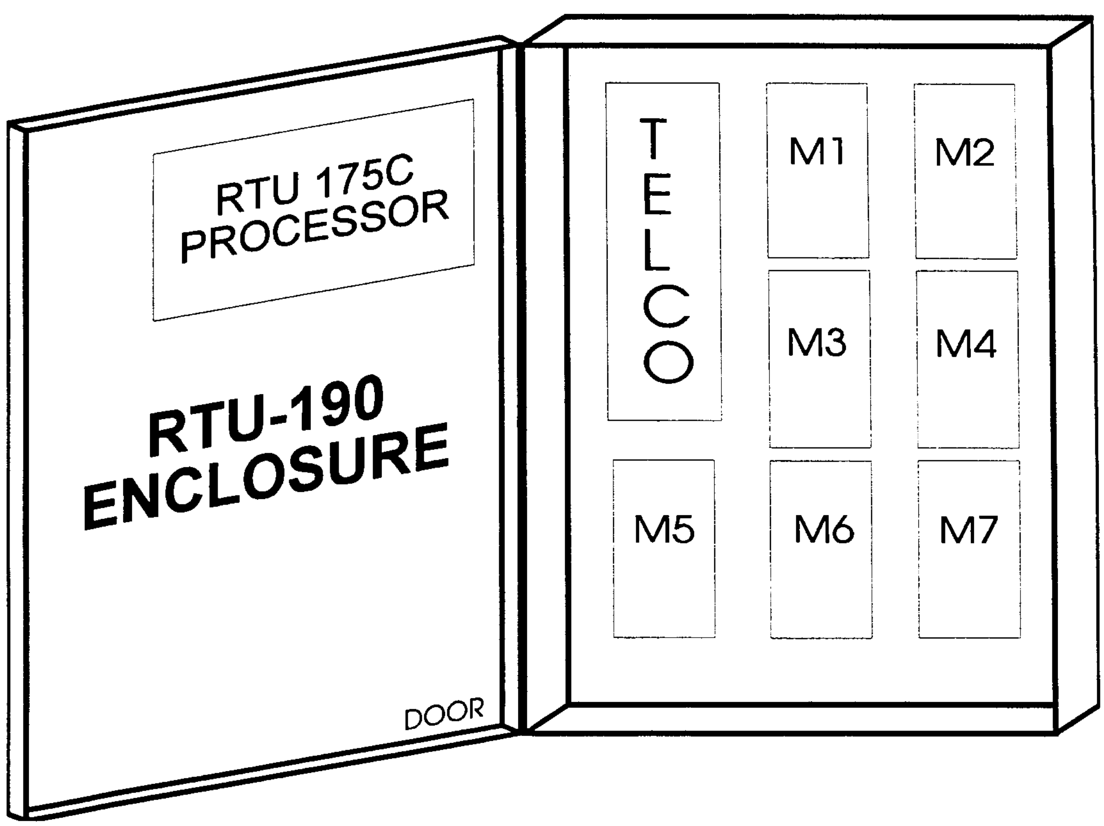

RTU 175C
PROCESSOR
RTU-190
ENCLOSURE
DOOR
TELCO
M1
M2
M3
M4
M5
M6
M7

Figure 2-2. RTU-100 & RTU-190 FUNCTION MODULE POSITIONS

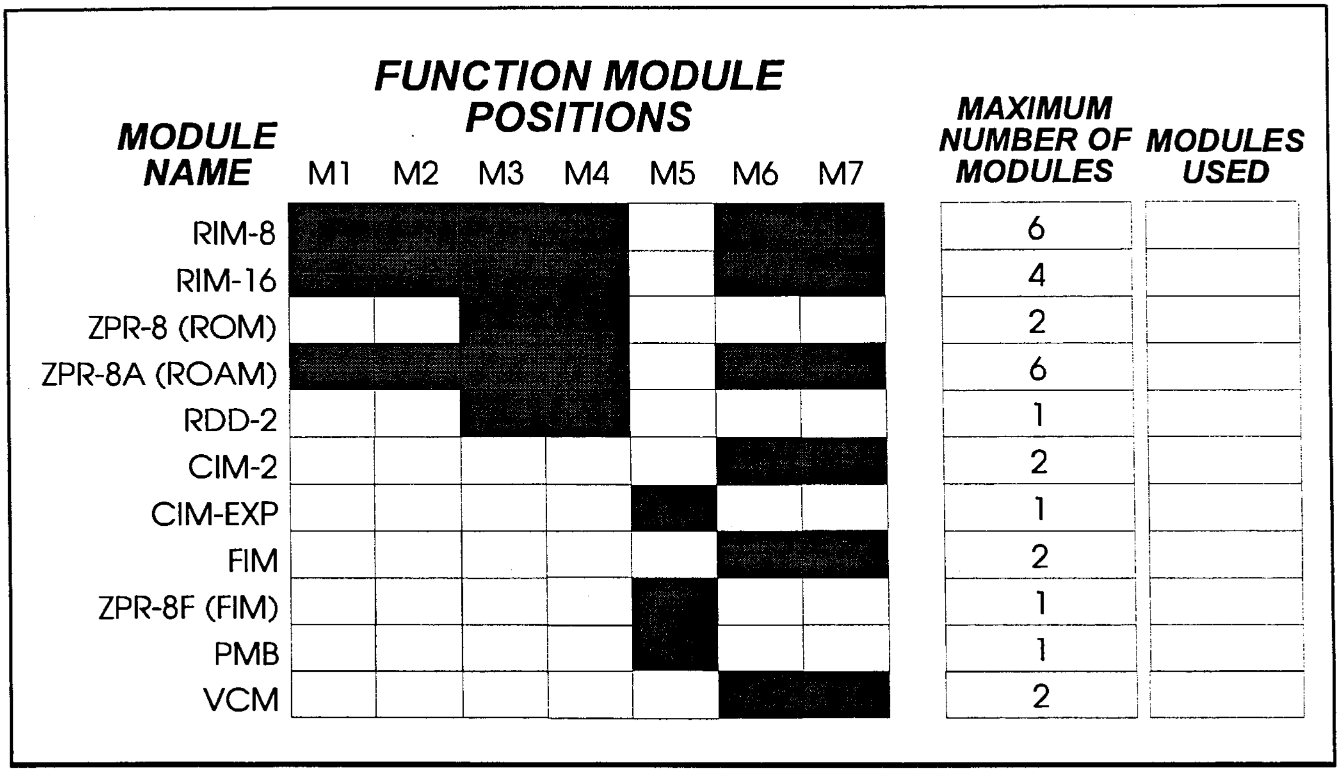


Table 2-7. RTU-190 FUNCTION MODULE PLANNING

NOTES:

1. ZPR-8 modules must each be connected to a RIM module.
2. RIM-8, RIM-16 and ZPR-8A modules use the same positions and, therefore, no more than a cumulative total of six (6) of these modules may be used in an RTU-190. (Maximum of eight addresses per RTU.)
3. RIM-16 boards use two (2) adresses for alarm monitoring and should, therefore, always be counted as two boards. For access control of five (5) or more readers, the RIM-16 would use four (4) addresses.
4. RDD-2 modules must each be connected to a RIM module.
5. ZPR-8F is used only in conjunction with a FIM module.
6. RIM-8s and RIM-16s may not be mixed within the same RTU-190.
7. The PMB is typically mounted external to the RTU.

MODULE NAME	M1	M2	M3	M4	MAXIMUM NUMBER OF MODULES	MODULES USED
	FUNCTION MODULE POSITIONS					
RIM-8					4	
RIM-16					4	
ZPR-8 (ROM)					2	
ZPR-8A (ROAM)					4	
RDD-2					1	
CIM-2					1	
FIM					2	
ZPR-8F (FIM)					1	
PMB					1	
VCM					2	

Table 2-8. RTU-100 FUNCTION MODULE PLANNING

NOTES:

1. ZPR-8 modules must each be connected to a RIM module.
2. RIM-8, RIM-16 and ZPR-8A modules use the same positions and, therefore, no more than a cumulative total of four (4) of these modules may be used in an RTU-100. (Maximum of eight addresses per RTU.)
3. RIM-16 boards use two (2) adresses for alarm monitoring and should, therefore, always be counted as two boards. For access control of five (5) or more readers, the RIM-16 would use four (4) addresses.
4. RDD-2 modules must each be connected to a RIM module.
5. ZPR-8F is used only in conjunction with a FIM module.
6. RIM-8s and RIM-16s may not be mixed within the same RTU-100.
7. The PMB is typically mounted external to the RTU.

PROCESSOR
Comm Type ____
Access Control ____
Reader Type ____
Line # ____
Dial Backup #'s ____
Des Encryp. ____
MEM Exp. ____

#2
Kypd User ____
Display ____

#1
Kypd User ____
Display ____

#4
Kypd User ____
Display ____

#3
Kypd User ____
Display ____

TELEPHONE INTERFACE BOARD
(TELCO)

NOTE:
Only 1 CIM per RTU-100

#1
RIM ____
ZPR-ROAM ____
ADDRESS ____

#2
RIM ____
ZPR-ROAM ____
ADDRESS ____

#3
RIM ____
ZPR-ROAM ____
ADDRESS ____
CIM #1 ____
FIM ____
ZPR-ROM ____
RDD ____
ZPR-FIM ____
PMB ____
VCM ____
OTHER ____

#4
RIM ____
ZPR-ROAM ____
ADDRESS ____
CIM #1 ____
FIM ____
ZPR-ROM ____
RDD ____
VCM ____
OTHER ____

RTU-100 Module Placement

RTU #: ____ of ____

Project: ____

Building: ____

Location: ____

*****MARK DESIRED BOARD TYPE*****

Battery #1 ____
Needed up to 125MA

Battery #2 ____
Needed up to 250MA

NOTE - MAKE ADDITIONAL COPIES AS NEEDED

RTU-190 Module Placement

PROCESSOR

Comm Type ____
Access Control ____
Reader Type ____
Line # ____
Dial Backup #'s ____
Des Encryp. ____
MEM Exp. ____

#2 Kypd User ____ Display ____	#1 Kypd User ____ Display ____
#4 Kypd User ____ Display ____	#3 Kypd User ____ Display ____
#6 Kypd User ____ Display ____	#5 Kypd User ____ Display ____

RTU #: ____ of ____

Project: ____

Building: ____

Location: ____

TELEPHONE INTERFACE BOARD (TELCO)

CIM-EXP ____
ZPR-FIM ____
PMB ____
OTHER ____

#1	#2
RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____

#3	#4
RIM ____ ZPR-ROAM ____ ADDRESS ____ ZPR-ROM ____ RDD ____	RIM ____ ZPR-ROAM ____ ADDRESS ____ ZPR-ROM ____ RDD ____

#5	#6
RIM ____ ZPR-ROAM ____ ADDRESS ____ CIM #1 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____	RIM ____ ZPR-ROAM ____ ADDRESS ____ CIM #2 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____

***** MARK DESIRED BOARD TYPE IN EACH LOCATION *****

Battery #1 ____ Needed up to 125MA	Battery #2 ____ Needed up to 250MA	Battery #3 ____ Needed up to 375MA

NOTE - MAKE ADDITIONAL COPIES AS NEEDED

PROCESSOR

Comm Type ____________
Access Control ____________
Reader Type ____________
Line # ____________
Dial Backup #'s ____________
Des Encryp. ____________
MEM Exp. ____________

#2 Kypd User ____ Display ____	#1 Kypd User ____ Display ____
#4 Kypd User ____ Display ____	#3 Kypd User ____ Display ____
#6 Kypd User ____ Display ____	#5 Kypd User ____ Display ____
#8 Kypd User ____ Display ____	#7 Kypd User ____ Display ____

RTU-200 Module Placement

RTU #: ______ of ______

Project: ____________

Building: ____________

Location: ____________

	#1	#2	#3	#4
TELEPHONE INTERFACE BOARD (TELCO)	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____
	ZPR-ROM ____ RDD ____ OTHER ____	ZPR-ROM ____ RDD ____ OTHER ____	ZPR-ROM ____ RDD ____ OTHER ____	ZPR-ROM ____ RDD ____ OTHER ____

	#5	#6	#7	#8
ZPR ____ RDD ____ OTHER ____	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____	RIM ____ ZPR-ROAM ____ ADDRESS ____
CIM-EXP ____ ZPR-FIM ____ PMB ____ OTHER ____	CIM #1 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____	CIM #2 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____	CIM #3 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____	CIM #4 ____ FIM ____ ZPR-ROM ____ VCM ____ OTHER ____

***** MARK DESIRED BOARD TYPE IN EACH LOCATION *****

Battery #1 ____ Needed up to 125MA	Battery #2 ____ Needed up to 250MA	Battery #3 ____ Needed up to 375MA

NOTE - MAKE ADDITIONAL COPIES AS NEEDED

2.4 ZONE ASSIGNMENTS & GROUPING

One of the final tasks in System Planning is the individual zone assignments to the RIM inputs within each RTU, along with the logical grouping of the alarm zones. Zone grouping can provide major benefits in the operation of the system by making the system much easier and more efficient to operate for the system operators. Proper zone grouping can make the system more readable. Alarms or faults can be easily isolated to their location. Part of this zone grouping is achieved by proper system addressing, in that, with some basic rules and guidelines, the system can be configured logically and efficiently to provide operational benefits now as well as making the system much easier and cost-effective to expand later.

Some of the basic guidelines to use for zone grouping are as follows:

1. Group zones so that alarms or faults can be easily isolated to specific areas (e.g. south end of warehouse, electronics lab, or quality control fileroom). Grouping in a logical manner provides for better viewing on SAFEnet system display when alarms and faults occur. This is also critical when using Arm/Disarm functions on an area. Try to leave space in the groups to allow for future expansion.

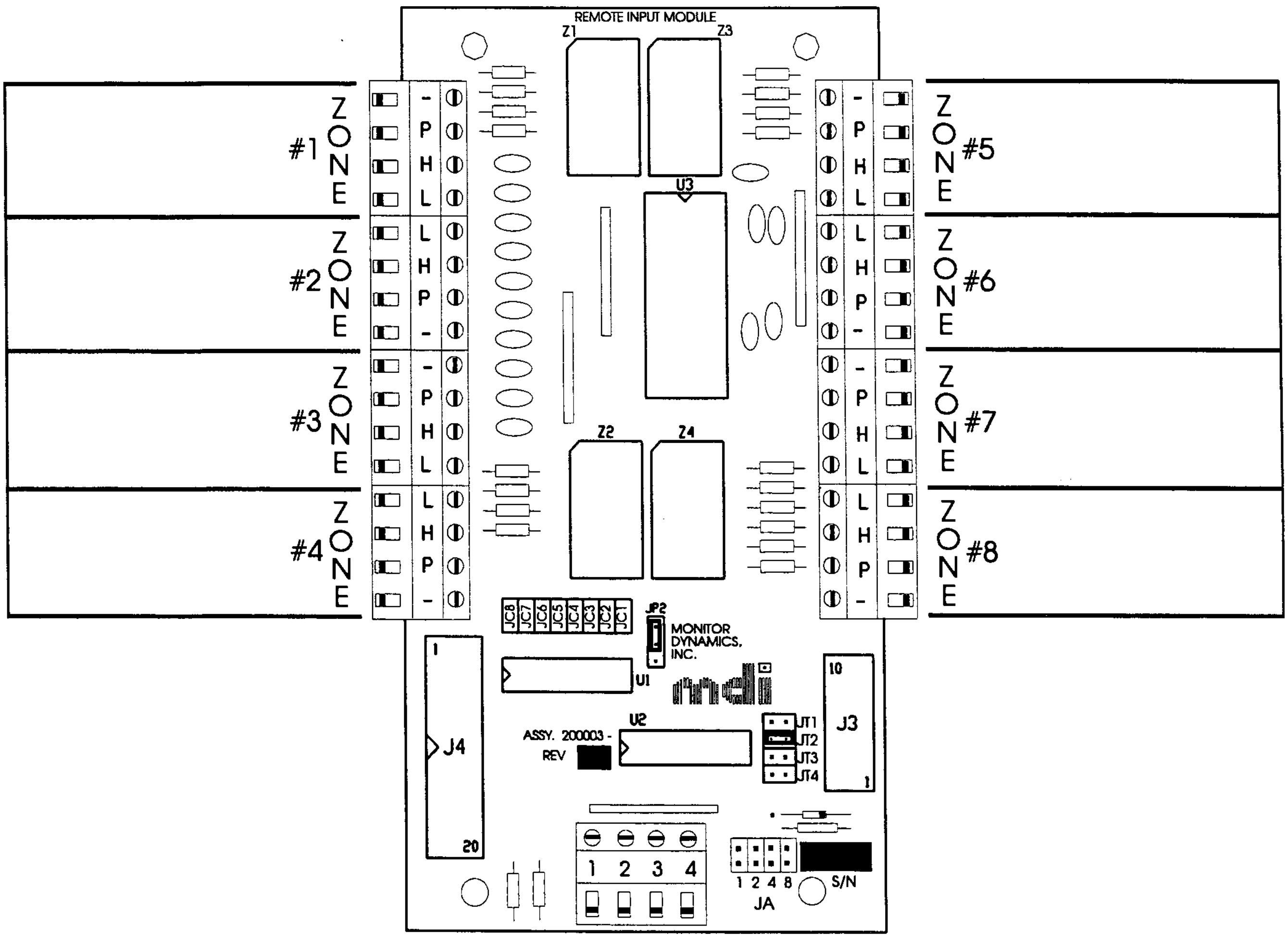
2. Group your zones simply based on the RTU and RIM addresses. If a certain room or area requires only 3 or 4 alarm points, put them on a single RIM and go on to the next RIM for the next room or area. Again, this is more critical when using Arm/Disarm functions, since this grouping actually becomes an "Account" group based on the position of the Arming control ZIM. The Arming Control ZIM will control all alarm zones that follow it until it sees the end of the RTU or another Arming Control ZIM.

3. Group zones in manageable address groups. Section 2.5 describes how addressing is done in the SAFEnet System. Remember that one or more individual addresses is assigned to each RIM and not to the zones. So each address represents eight actual input point numbers (8 non-supervised alarm zones, or 4 supervised alarm zones).

Use the "RTU ZONE WORK SHEETS" on pages 38 and 39 to assign and configure the zones, ZIMs, and zone descriptions for each RIM of each RTU. This information can then be used for data input in the Host Computer System Alarm Zone Description file.

RTU ZONE WORK SHEET
RIM-8

Project/Site Name____ Page ___ of ___



RTU Supervisory Address ________ RIM Address ________ RIM Position______

1. *Refer to RTU Placement Forms (pages 34-36) and enter address information and ZIM types in spaces provided above. Mark RIM address on JA jumpers.*
2. *In the spaces available for each zone, enter Zone Descriptions which can also be used in the Host CPU RTU/Zone definition file.*
3. *Ensure that Access Control ZIMS (AC/xx) are located in zones 5&6 and/or 7&8. Arming Control ZIMS must be located in zone 1.*
4. *All Jumper Settings above, except address jumpers JA, are shown in the Factory Default positions and normally do not require changing.*

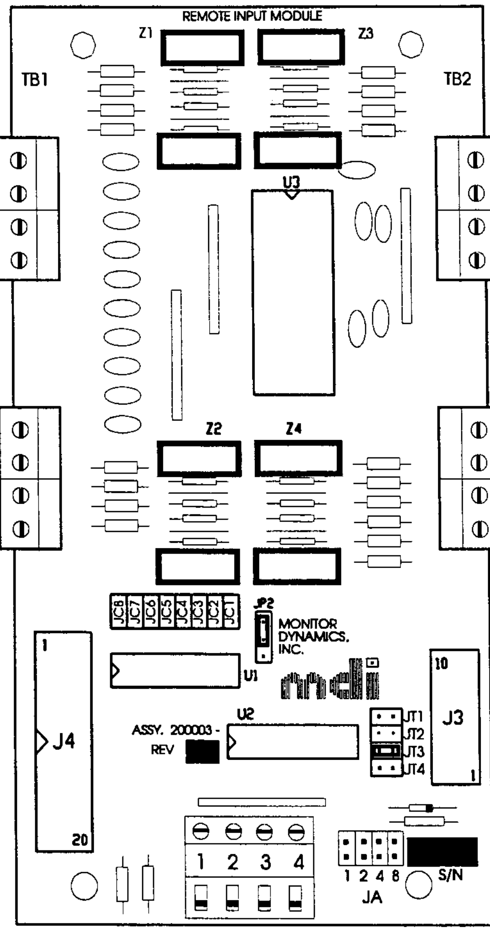
****** Photocopy this form as needed ******

RTU ZONE WORK SHEET
RIM-16

Project/Site Name______________________________ Page ___ of ___

Address _____

SUPERVISED ZONES
1 & 2
3 & 4
5 & 6
7 & 8



Address _____+1

SUPERVISED ZONES
1 & 2
3 & 4
5 & 6
7 & 8

All Jumpers shown as Factory Default and typically require no changes, except for Address Jumpers - JA

RTU Supervisory Address ________ RIM Address _____& _____ RIM Position______

** 1. ***THE RIM-16 SUPPORTS 2-WIRE SUPERVISED MONITORING ONLY!! EACH 2-PIN CONNECTOR EQUALS 2 ZONES (Fault & Alarm, or Reader & Door Loop).***

2. *Refer to RTU Module Placement Forms (pages 34-36) and enter address information (minimum of 2 addresses) and ZIM types in spaces provided above. Mark RIM address on JA jumpers.*

3. *In the spaces available for each zone, enter Zone Descriptions which can also be used in the Host CPU RTU/Zone definition file.*

4. *Arming Control ZIMS must be located in zone 1. Access Control ZIMs must be in the bottom 4 ZIM locations unless the RIM is operating as TYPE 5.*

****** Photocopy this form as needed ******

At this point, all of the hardware requirements for the RTU panels should now have been determined, laid out and configured according to the site installation requirements.

One last designation for each RTU is to specify the type of data communication to be used. This can be determined using Table 2-9 below. Each RTU contains a Primary and a Secondary (backup) communication line and is part of the designation, even if the backup line is not used.

RTU MODEL NUMBER	COMMUNICATIONS REQUIREMENT DESIGNATION	PRIMARY COMMUNICATION	SECONDARY COMMUNICATION
RTU-100	-0	MUX	MUX
RTU-100	-1	MUX	DIAL
RTU-100	-2	DIFF	DIFF
RTU-100	-3	DIFF	DIAL
RTU-100	-4	DIAL	DIAL
RTU-190	-0	MUX	MUX
RTU-190	-1	MUX	DIAL
RTU-190	-2	DIFF	DIFF
RTU-190	-3	DIFF	DIAL
RTU-190	-4	DIAL	DIAL
RTU-200	-0	MUX	MUX
RTU-200	-1	MUX	DIAL
RTU-200	-2	DIFF	DIFF
RTU-200	-3	DIFF	DIAL
RTU-200	-4	DIAL	DIAL

Table 2-9. RTU-100/190/200 COMMUNICATIONS LINK

NOTES:

1. Communication acronyms:

   MUX: 3002 Multiplex, 300 BAUD, FSK, 2-Wire or 4-Wire
   DIFF: Differential, RS-485 Multidrop, 1200 BAUD, Digital, 4-Wire
   DIAL: DTMF Dial, 300 BAUD, FSK, 2-Wire

2. Pulsed DIAL must be specified at the time of order.

3. Interface to a T1 network is available.

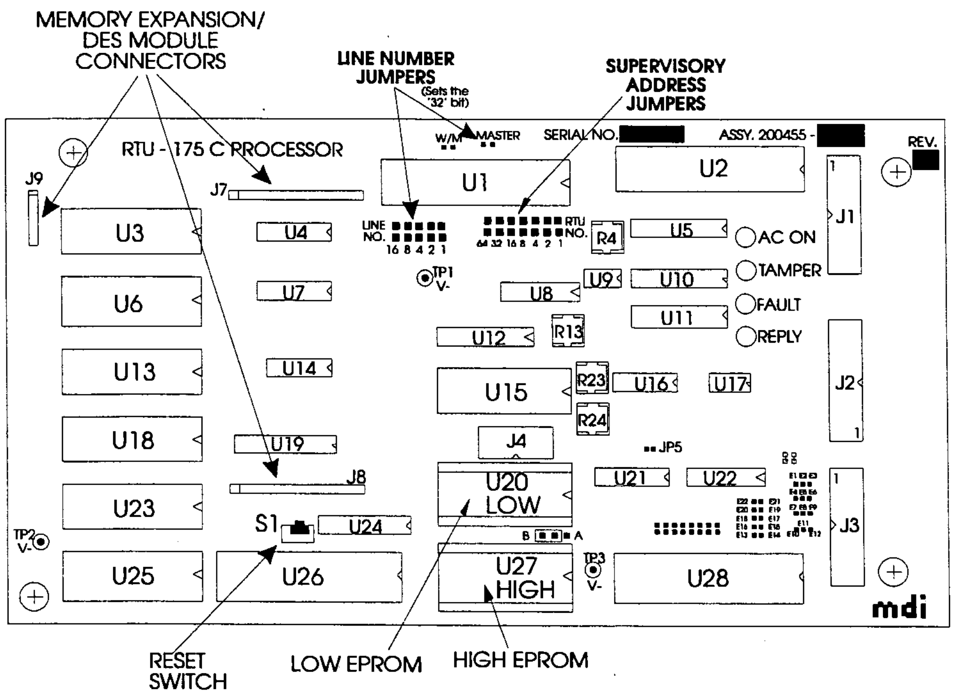
2.5 RTU-100/190/200 ADDRESSING

Each RTU-100/190/200 interfaces and communicates to the Central System CPU via the Pre-Processor Unit (PPU). The PPU contains and manages one or more communication lines used to send and receive data to and from the RTUs. There are two (2) types of PPUs, the PPU-50 and the PPU-100. The PPU-50 supports up to two (2) dedicated communication line cards, such as the MLC-3002 multiplex line card or the MLC-485 multidrop line card. The PPU-100 supports up to four (4) dedicated line cards and up to two (2) dial backup line cards. Each line of the PPU is given a line number which must be referenced when addressing the RTU. An overall system may have up to sixteen (16) PPUs, so a system could possibly have up to 64 dedicated communication lines (dial backup lines are not counted in this total).

Each line of a PPU will support up to 128 remote addresses with each address consisting of up to eight alarm zones. Therefore each line of a PPU will support up 1024 alarm points and/or control points. A PPU-100 with four (4) full lines will support up to 4096 alarm and/or control points. System wide, up to sixteen PPU-100s may be linked together in the same system in order to provide up to 64 dedicated communication lines. In this configuration, the system would support over 64,000 alarm and control supervised points.

Communication line and RTU addressing is broken down per PPU, PPU line card, RTU Supervisory Address, and RIM module address. Each RTU must be assigned a Supervisory Address, which is the starting address of that panel, as well as the address used for primary host communication and for reporting TAMPER, AC-FAIL, BATT-LOW, and RESET fault conditions within that RTU. The 175C Processor board in each RTU contains jumpers used to set the PPU line number and the supervisory address for that panel, shown in Figure 2-3. Table 2-11 shows the jumper settings on the processor board for setting the line number. Table 2-10 shows the settings for the supervisory address jumpers and the RIM module jumper JA (for setting RIM addresses).

The RTU supervisory address is actually the starting point for the address group for that RTU and should always be a multiple of 4 or 8. Any of the RTU types will support <u>up to eight (8) addresses</u> (RTU-100's support 8 addresses only with RIM-16 boards). The address of the first RIM board should always be the same as the supervisory address of the processor board. All RIM addresses must stay within that group of 4 or 8 allowable addresses and is totally based on the supervisory address setting. All addressing is actually based on Groups of 16 addresses with RIM addressing determined by where the supervisory address falls within each group of 16. Each RIM is addressed from 0-15, as set on jumper JA. (*RIM-16 boards must ALWAYS be addressed with an even number.*) So, if the supervisory address can be evenly divided by 16, the first RIM address is 0. If the supervisory address is not evenly divided by 16, the first RIM address is then set to whatever the remainder is after dividing by 16. For example, if the supervisory address is 24, 24 divided by 16 is 1 with a remainder of 8. The first RIM is then set to 8 and the rest of the RIMs are then set to 9, 10, 11, etc. If the supervisory address is 52, 52 divided by 16 is 3 with a remainder of 4. The first RIM would be set to 4, with the subsequent RIMS set to 5, 6, 7, etc. Remember that RIM-16's must be an EVEN numbered address. All addresses for each RTU panel MUST STAY within that group of 16 addresses, with a maximum of 8 addresses per RTU.



** PPU Line Number and RTU Supervisory Address are set by inserting jumpers in the appropriate locations based on Tables 2-10 and 2-11.

Figure 2-3. RTU 175C PROCESSOR BOARD JUMPERS

Keep in mind that the RTU-100/190/200 addressing described herein is specific to the Model 175C Processor Board. The jumper positions for this board are shown in Figure 2-3. Details on the RTU-175B Processor Board are available in Revision 8 of this manual. Configuration details on the RTU-180 Processor Board are located in Appendix 'A' of this manual.

Let's now create a sample system. Our system has 5 basic areas to be protected.

1. Using the planning steps in Section 2.3, you determine that ten RIMs will do the job for this first area. You decide to use two RTU-200s and put 7 RIMs in the first RTU-200. The second RTU-200 takes the other three RIMs and has five RIMs worth of future expansion. You want the extra room because you are going to be adding on to this building. The first RTU-200 gets jumpered with Supervisory Address 08. Notice that we have not used address 00 since this is PPU Supervisory address. This limits potential problems in the SAFEnet System trying to determine the difference between PPU 00 and RTU 00. So, we will skip the first eight addresses and start our addressing at 8. (You could start at address 4 if you had a small RTU.) This RTU-200 then gets RIM addresses 08 through 14. Address 08, shown in bold, large letters in the sample configuration display below, is both the RTU-200 Supervisory address AND the address of the first RIM. The other RIM addresses are 09 through 14, shown in bold letters below. The second RTU-200 is jumpered Supervisory address 16, with RIM addresses 16, 17, and 18.

2. The second area you must protect requires only three RIMs. You could save money and use an RTU-100 here. Jumper the RTU-100 supervisory address 24. Since the RTU-100 has room for four RIMs, there is only one spare left for future expansion.

3. The third area for protection requires eight RIMs. This exactly fills one RTU-200. Jumper the RTU-200 supervisory address 32. There is no room for expansion.

4. The fourth large area requires 22 RIMs. A minimum of three RTU-200s or 190s are required. The first RTU gets jumpered supervisory address 40. The second RTU gets jumpered supervisory address 48. The third RTU gets jumpered supervisory address 56.

5. The Fifth area requires ten RIMs. This area has wiring problems, and future expansion is expected. Splitting up the ten RIMs between four RTU-100s is one extra RTU-100, but the easier wiring and expected expansion in this area makes it worth it. The first RTU-100 gets supervisory address 64, the second RTU-100 gets 68, the third RTU-100 gets 72, and the fourth RTU-100 gets 76. Note that these address are allocated on increments of 4. This is done to keep RIM and RTU supervisory addresses organized.

As you can see, by logically allocating and grouping your zones and supervisory addresses, the system is much easier to plan and configure. Again, try to keep your supervisory addresses as multiples of 4 or 8 and always keep all addresses of an RTU within that group of 16 addresses.

For simplicity, this example is based on using RIM-8 modules with non-supervised zones, however if 2-wire supervision were required, RIM-16 modules could have been used. Each RIM-16 provides eight (8) supervised zones and uses two (2) addresses.

Keep in mind when making address assignments that the arrangement of RIM assignments is exactly what will display on the system's CRT screen during status reports. Columns of sixteen addresses appear in different colors, depending on their operational and monitoring status. A logically organized RIM assignment display will make the system much easier to monitor. One way is to keep all the supervisory addresses in common rows, such as multiples or 4 or 8. Also remember that for Access Control, the supervisory addresses MUST BE multiples of 4 or 8. Below is a sample system CRT screen display of RTU configuration.

GROUPS	0	1	2	3	4	5	6	7
	00	**16**	**32**	**48**	**64**	80	96	112
	01	**17**	**33**	**49**	**65**	81	97	113
	02	**18**	**34**	**50**	**66**	82	98	114
	03	19	**35**	**51**	**67**	83	99	115
	04	20	**36**	**52**	**68**	84	100	116
	05	21	**37**	**53**	**69**	85	101	117
	06	22	**38**	**54**	70	86	102	118
	07	23	**39**	**55**	71	87	103	119
	08	**24**	**40**	**56**	**72**	88	104	120
	09	**25**	**41**	**57**	**73**	89	105	121
	10	**26**	**42**	**58**	74	90	106	122
	11	27	**43**	**59**	75	91	107	123
	12	28	**44**	**60**	**76**	92	108	124
	13	29	**45**	**61**	**77**	93	109	125
	14	30	**46**	62	78	94	110	126
	15	31	**47**	63	79	95	111	127

ADDRESS CONFIGURATION and ASSIGNMENT NOTES:

1. It is recommended that you do not use address 00. Address 00 should only be used as the PPU-100 supervisory address.

2. Assign only supervisory addresses that are multiples of 4 or 8. All RIM addresses (except the first RIM) must be greater than their RTU's supervisory address. All RIM addresses must also be in the same GROUP (column) as the RTU supervisory address.

3. An RTU-190 and RTU-200 will support eight RIM addresses each. An RTU-100 can only hold four RIM modules, and therefore supports only four RIM addresses with RIM-8 boards, but can support eight addresses with four RIM-16 boards installed.

Table 2-10. RTU-100/190/200 Supervisory and RIM Addressing

ADDRS	GRP*	175C ADDRESS JUMPERS							RIM JA JUMPERS			
		64	32	16	8	4	2	1	8	4	2	1
000	0	-	-	-	-	-	-	-	-	-	-	-
001	0	-	-	-	-	-	-	X	-	-	-	X
002	0	-	-	-	-	-	X	-	-	-	X	-
003	0	-	-	-	-	-	X	X	-	-	X	X
004	0	-	-	-	-	X	-	-	-	X	-	-
005	0	-	-	-	-	X	-	X	-	X	-	X
006	0	-	-	-	-	X	X	-	-	X	X	-
007	0	-	-	-	-	X	X	X	-	X	X	X
008	0	-	-	-	X	-	-	-	X	-	-	-
009	0	-	-	-	X	-	-	X	X	-	-	X
010	0	-	-	-	X	-	X	-	X	-	X	-
011	0	-	-	-	X	-	X	X	X	-	X	X
012	0	-	-	-	X	X	-	-	X	X	-	-
013	0	-	-	-	X	X	-	X	X	X	-	X
014	0	-	-	-	X	X	X	-	X	X	X	-
015	0	-	-	-	X	X	X	X	X	X	X	X
016	1	-	-	X	-	-	-	-	-	-	-	-
017	1	-	-	X	-	-	-	X	-	-	-	X
018	1	-	-	X	-	-	-	-	-	-	X	-
019	1	-	-	X	-	-	-	X	-	-	X	X
020	1	-	-	X	-	-	-	-	-	X	-	-
021	1	-	-	X	-	-	-	X	-	X	-	X
022	1	-	-	X	-	-	-	-	-	X	X	-
023	1	-	-	X	-	-	-	X	-	X	X	X
024	1	-	-	X	X	-	-	-	X	-	-	-
025	1	-	-	X	X	-	-	X	X	-	-	X
026	1	-	-	X	X	-	-	-	X	-	X	-
027	1	-	-	X	X	-	-	X	X	-	X	X
028	1	-	-	X	X	-	-	-	X	X	-	-
029	1	-	-	X	X	-	-	X	X	X	-	X
030	1	-	-	X	X	-	-	-	X	X	X	-
031	1	-	-	X	X	-	-	X	X	X	X	X
032	2	-	X	-	-	-	-	-	-	-	-	-
033	2	-	X	-	-	-	-	X	-	-	-	X
034	2	-	X	-	-	-	-	-	-	-	X	-
035	2	-	X	-	-	-	-	X	-	-	X	X
036	2	-	X	-	-	-	-	-	-	X	-	-
037	2	-	X	-	-	-	-	X	-	X	-	X
038	2	-	X	-	-	-	-	-	-	X	X	-
039	2	-	X	-	-	-	-	X	-	X	X	X
040	2	-	X	-	X	-	-	-	X	-	-	-
041	2	-	X	-	X	-	-	X	X	-	-	X
042	2	-	X	-	X	-	-	-	X	-	X	-
043	2	-	X	-	X	-	X	X	X	-	X	X
044	2	-	X	-	X	X	-	-	X	X	-	-
045	2	-	X	-	X	X	-	X	X	X	-	X
046	2	-	X	-	X	X	X	-	X	X	X	-
047	2	-	X	-	X	X	X	X	X	X	X	X
048	3	-	X	X	-	-	-	-	-	-	-	-
049	3	-	X	X	-	-	-	X	-	-	-	X
050	3	-	X	X	-	-	X	-	-	-	X	-
051	3	-	X	X	-	-	X	X	-	-	X	X

Table 2-10. RTU Supervisory and RIM Addressing (Cont'd)

ADDRS	GRP*	175C ADDRESS JUMPERS							RIM JA JUMPERS			
		64	32	16	8	4	2	1	8	4	2	1
052	3	-	X	X	-	X	-	-	-	X	-	-
053	3	-	X	X	-	X	-	X	-	X	-	X
054	3	-	X	X	-	X	X	-	-	X	X	-
055	3	-	X	X	-	X	X	X	-	X	X	X
056	3	-	X	X	X	-	-	-	X	-	-	-
057	3	-	X	X	X	-	-	X	X	-	-	X
058	3	-	X	X	X	-	X	-	X	-	X	-
059	3	-	X	X	X	-	X	X	X	-	X	X
060	3	-	X	X	X	X	-	-	X	X	-	-
061	3	-	X	X	X	X	-	X	X	X	-	X
062	3	-	X	X	X	X	X	-	X	X	X	-
063	3	-	X	X	X	X	X	X	X	X	X	X
064	4	X	-	-	-	-	-	-	-	-	-	-
065	4	X	-	-	-	-	-	X	-	-	-	X
066	4	X	-	-	-	-	X	-	-	-	X	-
067	4	X	-	-	-	-	X	X	-	-	X	X
068	4	X	-	-	-	X	-	-	-	X	-	-
069	4	X	-	-	-	X	-	X	-	X	-	X
070	4	X	-	-	-	X	X	-	-	X	X	-
071	4	X	-	-	-	X	X	X	-	X	X	X
072	4	X	-	-	X	-	-	-	X	-	-	-
073	4	X	-	-	X	-	-	X	X	-	-	X
074	4	X	-	-	X	-	X	-	X	-	X	-
075	4	X	-	-	X	-	X	X	X	-	X	X
076	4	X	-	-	X	X	-	-	X	X	-	-
077	4	X	-	-	X	X	-	X	X	X	-	X
078	4	X	-	-	X	X	X	-	X	X	X	-
079	4	X	-	-	X	X	X	X	X	X	X	X
080	5	X	-	X	-	-	-	-	-	-	-	-
081	5	X	-	X	-	-	-	X	-	-	-	X
082	5	X	-	X	-	-	X	-	-	-	X	-
083	5	X	-	X	-	-	X	X	-	-	X	X
084	5	X	-	X	-	X	-	-	-	X	-	-
085	5	X	-	X	-	X	-	X	-	X	-	X
086	5	X	-	X	-	X	X	-	-	X	X	-
087	5	X	-	X	-	X	X	X	-	X	X	X
088	5	X	-	X	X	-	-	-	X	-	-	-
089	5	X	-	X	X	-	-	X	X	-	-	X
090	5	X	-	X	X	-	X	-	X	-	X	-
091	5	X	-	X	X	-	X	X	X	-	X	X
092	5	X	-	X	X	X	-	-	X	X	-	-
093	5	X	-	X	X	X	-	X	X	X	-	X
094	5	X	-	X	X	X	X	-	X	X	X	-
095	5	X	-	X	X	X	X	X	X	X	X	X
096	6	X	X	-	-	-	-	-	-	-	-	-
097	6	X	X	-	-	-	-	X	-	-	-	X
098	6	X	X	-	-	-	X	-	-	-	X	-
099	6	X	X	-	-	-	X	X	-	-	X	X
100	6	X	X	-	-	X	-	-	-	X	-	-
101	6	X	X	-	-	X	-	X	-	X	-	X
102	6	X	X	-	-	X	X	-	-	X	X	-
103	6	X	X	-	-	X	X	X	-	X	X	X
104	6	X	X	-	X	-	-	-	X	-	-	-

Table 2-10. RTU-Supervisory and RIM Addressing (Cont'd)

ADDRS	GRP*	175C ADDRESS JUMPERS							RIM JA JUMPERS			
		64	32	16	8	4	2	1	8	4	2	1
105	6	X	X	-	X	-	-	X	X	-	-	X
106	6	X	X	-	X	-	X	-	X	-	X	-
107	6	X	X	-	X	-	X	X	X	-	X	X
108	6	X	X	-	X	X	-	-	X	X	-	-
109	6	X	X	-	X	X	-	X	X	X	-	X
110	6	X	X	-	X	X	X	-	X	X	X	-
111	6	X	X	-	X	X	X	X	X	X	X	X
112	7	X	X	X	-	-	-	-	-	-	-	-
113	7	X	X	X	-	-	-	X	-	-	-	X
114	7	X	X	X	-	-	X	-	-	-	X	-
115	7	X	X	X	-	-	X	X	-	-	X	X
116	7	X	X	X	-	X	-	-	-	X	-	-
117	7	X	X	X	-	X	-	X	-	X	-	X
118	7	X	X	X	-	X	X	-	-	X	X	-
119	7	X	X	X	-	X	X	X	-	X	X	X
120	7	X	X	X	X	-	-	-	X	-	-	-
121	7	X	X	X	X	-	-	X	X	-	-	X
122	7	X	X	X	X	-	X	-	X	-	X	-
123	7	X	X	X	X	-	X	X	X	-	X	X
124	7	X	X	X	X	X	-	-	X	X	-	-
125	7	X	X	X	X	X	-	X	X	X	-	X
126	7	X	X	X	X	X	X	-	X	X	X	-
127	7	X	X	X	X	X	X	X	X	X	X	X

* = Group # (GRP) corresponds to the columns, or groups of 16 addresses (see page 44). All addresses within each RTU must remain within the Group of addresses (i.e., 0-15, 16-32, 32-47, etc.)

Table 2-11. RTU Communication Line Number Addressing

							With 64 PPU Line Option		
PPU-100 NO.	LINE ADDRESS	LINE ADDRESS JUMPERS					"MASTER" Jmpr (32)	PPU-100 NO.	LINE ADDRESS
		16	8	4	2	1			
0	0	-	-	-	-	-	X	8	32
0	1	-	-	-	-	X	X	8	33
0	2	-	-	-	X	-	X	8	34
0	3	-	-	-	X	X	X	8	35
1	4	-	-	X	-	-	X	9	36
1	5	-	-	X	-	X	X	9	37
1	6	-	-	X	X	-	X	9	38
1	7	-	-	X	X	X	X	9	39
2	8	-	X	-	-	-	X	10	40
2	9	-	X	-	-	X	X	10	41
2	10	-	X	-	X	-	X	10	42
2	11	-	X	-	X	X	X	10	43
3	12	-	X	X	-	-	X	11	44
3	13	-	X	X	-	X	X	11	45
3	14	-	X	X	X	-	X	11	56
3	15	-	X	X	X	X	X	11	47
4	16	X	-	-	-	-	X	12	48
4	17	X	-	-	-	X	X	12	49
4	18	X	-	-	X	-	X	12	50
4	19	X	-	-	X	X	X	12	51
5	20	X	-	X	-	-	X	13	52
5	21	X	-	X	-	X	X	13	53
5	22	X	-	X	X	-	X	13	54
5	23	X	-	X	X	X	X	13	55
6	24	X	X	-	-	-	X	14	56
6	25	X	X	-	-	X	X	14	57
6	26	X	X	-	X	-	X	14	58
6	27	X	X	-	X	X	X	14	59
7	28	X	X	X	-	-	X	15	60
7	29	X	X	X	-	X	X	15	61
7	30	X	X	X	X	-	X	15	62
7	31	X	X	X	X	X	X	15	63

NOTES:

1. The "MASTER" Jumper is a jumper located on the 175C Processor and is used to indicate line numbers 32 through 63, with the other Line Address jumpers then used to count up from 32.
2. The PPU Number is set on the Utility Board within the PPU-100. The PPU-50 has switches on the Display Board on the back of the door.
3. The PPU Line Cards have jumper settings to set them to lines 0,1,2, or 3 of that PPU.
4. The Line Address jumpers are on the RTU-175C Processor Board.

3.0 RTU INSTALLATION

3.1 GENERAL

This chapter provides detailed instructions on the tasks involved with the mechanical and electrical installation of the RTU-100, RTU-190 and RTU-200 panels. Proper installation of the RTU panels is of primary concern in order to ensure effective and trouble-free system operation. In most cases, problems can be traced back to improper power, ground, or wiring connections. Basic power, system grounding, and general wiring requirements of the SAFEnet System are relatively simple, but these aspects of the installation are critical to the overall operation of the system. Faulty power, grounding conditions, and/or any other improper installation techniques and/or conditions can cause system errors, problems, or failures in the overall system operation. Failure to comply with the installation requirements and procedures detailed herein may be grounds for MDI to void the warranty of the equipment installed. The basic tasks and recommended order of installation of the RTU panels described herein are as follows:

1. Mounting of the RTU enclosure to the wall. *(Section 3.3)*
2. Installation and connection of the required cable conduits. *(Section 3.3.1)*
3. Installation and connection of power and ground cabling. *(Sections 3.3.2 & 3.3.3)*
4. Installation and connection of Data Communication Lines. *(Sections 3.4.1 & 3.4.2)*
5. Connection of local bell outputs (if used). *(Section 3.4.3)*
6. Addressing of all modules within the RTU. *(Section 3.5)*
7. Installation/termination of Alarm Point protection circuit cables. *(Section 3.6)*
8. Installation/termination's of cabling to other optional RTU modules (ZPR Relay Modules, CIM or FIM Access Control cabling, RDD remote displays, etc.). *(Section 3.7)*
9. Final connection of AC power and backup batteries. *(Section 4.1)*
10. System power up and operational checkout. *(Section 4.2)*

All electrical equipment must be installed in accordance with any applicable Federal, State, and/or local codes, some of which are listed at the beginning of this manual.

** CAUTION **

Electronic circuitry is susceptible to damage caused by Electrostatic Discharge (ESD). Always take appropriate precautions to prevent component damage due to ESD while installing and working with the RTU panels and associated equipment. A grounding strap attached to the body (such as a wrist strap) is recommended by MDI for the best protection, however, if one is not available, always ground yourself to earth ground prior to touching any parts of the RTU panel or components. MDI cannot be held responsible for circuit or equipment damage due to ESD.

3.2 TOOLS/EQUIPMENT REQUIREMENTS

Some basic tools, test equipment and installation materials will be required to perform a proper installation the RTU panel. Verify that the equipment and materials in the following list are available prior to stating the installation process:

1. Common hand tools typically required for such an installation, such as screwdrivers, wrenches, wire cutters, wire strippers, nut drivers, pliers, etc.
2. System interconnect cabling and wiring, as required for each applicable task. Refer to Appendix 'D' of this manual for interconnect cable requirements.
3. U.L. Listed 10 VAC, 16 VA transformer, as provided with each RTU by MDI.
4. Termination resistors of each required size (EOL Assembly MDI# B10-001, 1-Kohm, 2-Kohm, 4-Kohm, 8-Kohm, etc.) as necessary for each 2-wire alarm circuit or access control door circuit. (Use 1%, metal film or equivalent resistors.)
5. Three (3) or four (4) 3/16 inch mounting bolts, of the appropriate variety based on the wall type, for each RTU to mounted.
6. Appropriate size and quantity of cable conduit, connectors, bushings, etc. as needed for proper cable installation and routing.
7. Electrostatic Discharge (ESD) grounding strap.
8. Volt-Ohm Multimeter for verifying and/or troubleshooting.
9. High impedance telephone handset for troubleshooting communication problems on 3002 MUX lines.
10. RTU EPROM Firmware set (provided by MDI) for each RTU panel, programmed with the correct optional parameters and backup telephone numbers, as applicable. Typically the Firmware parameters are pre-programmed at the MDI factory, however field specific changes may be required.
11. ZIM modules (provided by MDI) of the correct type and quantity, based on the site survey.
12. From 1 to 3 backup batteries for backup power, as required.
13. One zone assignment decal per RDM board. (Provided by MDI)

OPTIONAL TEST EQUIPMENT:

14. DB meter for measuring DB loss in certain communication lines.
15. Oscilloscope for trouble shooting RS-485 signal problems.

3.3 ENCLOSURE MOUNTING AND CONNECTIONS

The RTU Enclosure must be mounted on a non-conductive surface with sufficient room for the door to open and proper cable routing into the enclosure. The area must comply with the RTU environmental specifications (page 15) in a protected location not directly exposed to rain, snow, ice, or other such conditions. If the RTU must be installed in an area exposed to such weather conditions, an appropriately rated NEMA enclosure (type 4, type 12, etc.) must be provided.

Available space must also be considered for the enclosure door to fully swing open, to allow for easy access to the components of the enclosure, as well as for conduit routing and installation for cable connections into the enclosure. The dimensions of each of the RTU enclosures is shown in the Specification section of this manual on page 15, as well as in Figure 3-2 below.

To begin mounting the RTU enclosure, mark the location of the mounting holes. The mounting hole dimensions are shown in Figure 3-3. Drill mounting holes as follows:

- If the enclosure is to be mounted on wallboard or plaster board, drill holes for 3/16 inch TOGGLE bolts to be used.
- If the enclosure is to be mounted on wood, drill holes for 3/16 LAG bolts to be used.
- If the enclosure is to be mounted to metal or other conductive surface, a non-conductive mounting plate or panel should be installed. Drill larger clearance holes into the conductive wall in those locations where the mounting bolts of the enclosure will be located so as to isolate the enclosure mounting bolts from the conductive wall when attached to the non-conductive mounting plate. Mark and drill the non-conductive panel and mount the RTU in the correct location. See Figure 3-1 below.

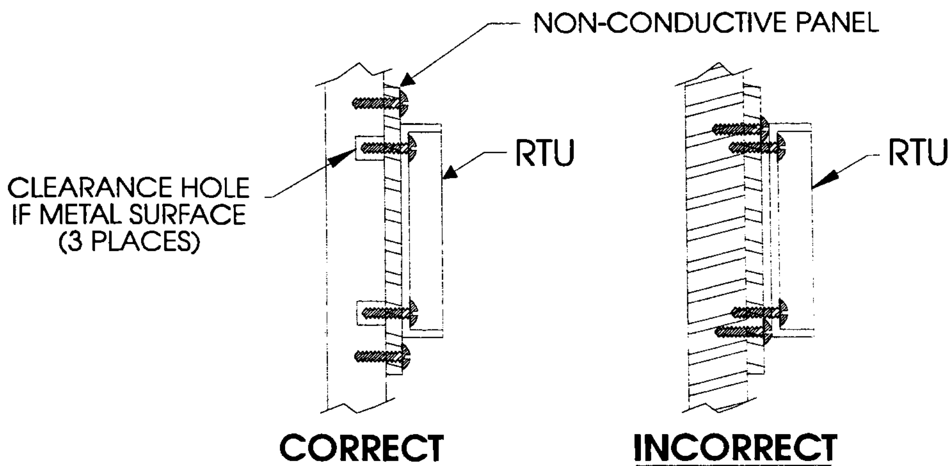


Figure 3-1. WALL MOUNTING OF RTU

The RTU enclosure can be temporarily hung from the top mounting hole(s) while the bottom holes are accurately marked for drilling. Ensure that the enclosure is mounted flush to the mounting surface.

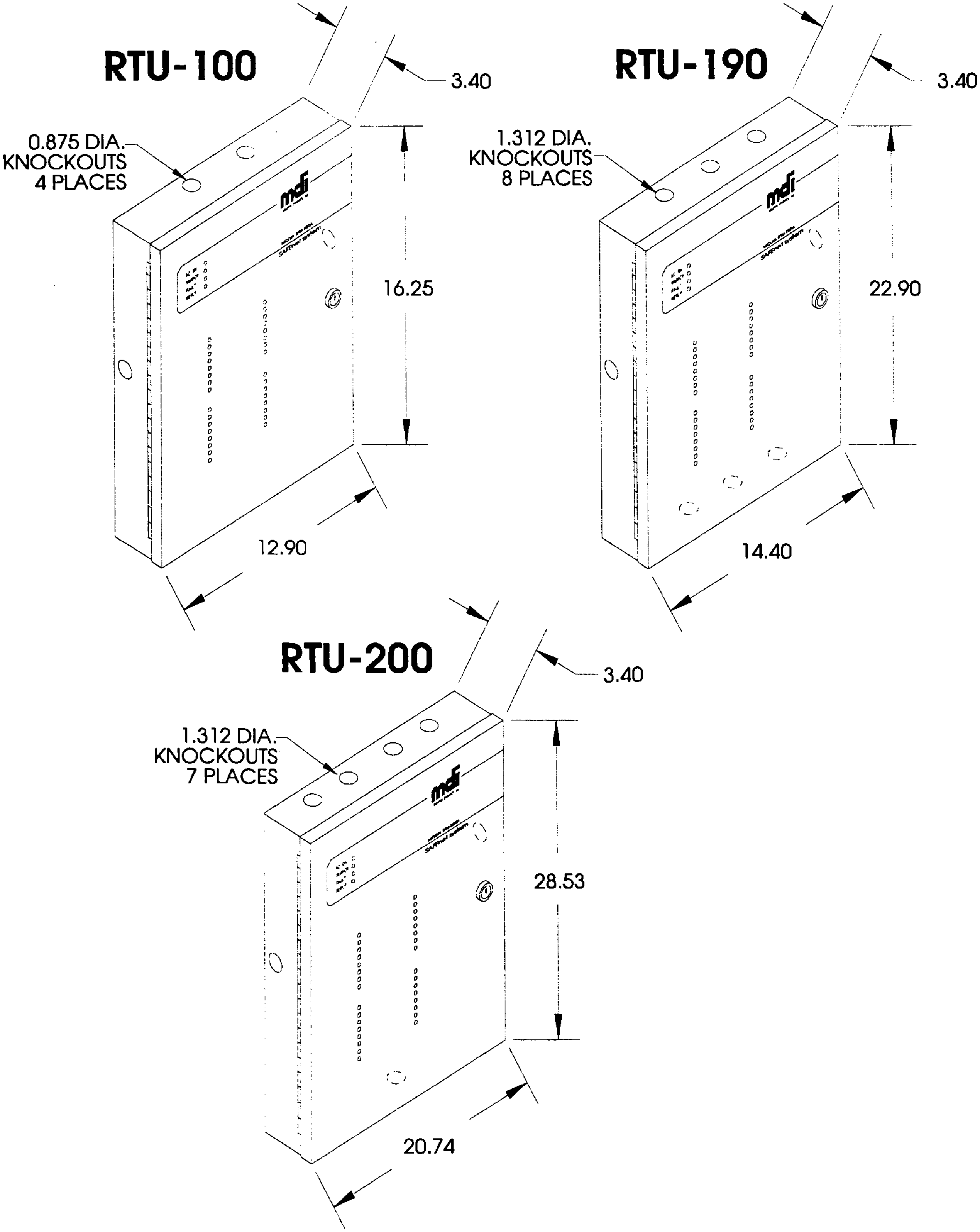


Figure 3-2. RTU ENCLOSURE DIMENSIONS

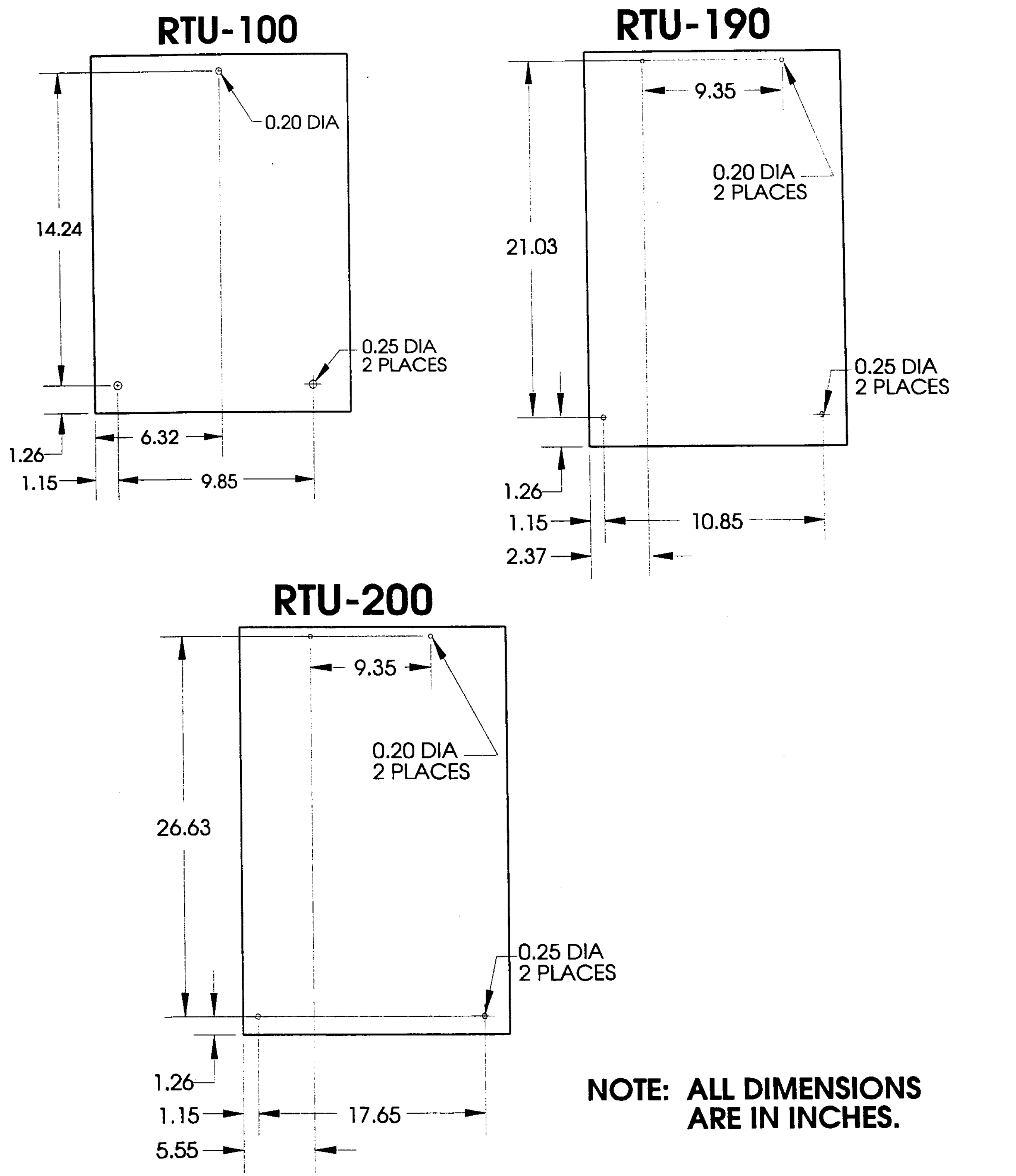


Figure 3-3. RTU ENCLOSURE MOUNTING HOLE MEASUREMENTS

3.3.1 Conduit Installation

Once the RTU Enclosure is properly mounted on the wall in the appropriate location, any required conduit installations and connections can be made to the enclosure. AC power conductors, telephone and/or data communication lines, and alarm and control output cabling/wiring should be brought into the enclosure via appropriate conduit.

Knockouts are provided on each of the MDI RTU enclosures with the RTU-100 knockouts sized for 1/2 inch conduit and the RTU-190 and RTU-200 knockouts sized for 1 inch conduit. Remove as many knockouts as required to provide for proper cable installation and routing. If larger conduit holes are required, care should be taken in cutting new holes, ensuring that the circuit boards are shielded from any metal shavings and chips which be produced.

3.3.2 Earth Ground

The RTU-100/190/200 panels require a solid earth ground (e.g. conduit or cold water pipe) using a minimum of a 12 AWG solid copper wire. Establish a good Earth Ground connection to a cold water pipe or similarly grounded conduit, and connect this wire to the TELCO board terminals TB1-8. **A good quality ground is critical to the proper operation of the RTU-100/190/200 subsystem.**

3.3.3 AC Power Connections

The RTU-100/190/200s are operated from an MDI Model # T10V, U.L. Listed, 10 VAC, 16 VA class 2 transformer. The transformer is to be plugged into an unswitched, dedicated AC outlet located within 10 feet of the selected location of the RTU enclosure. It is recommended that this outlet be resistant to tampering for security purposes.

1. Disconnect the ribbon cable from connector J2 of the 175C Processor Board (Figure 3-20).

2. Pull in a 2-conductor, minimum 22 AWG cable and connect to terminals TB1-1 and TB1-2 of the TELCO board (See Figure 3-4). Connect the other end of the cable to the 10 VAC, 16 VA transformer to be used for powering the RTU. Ensure proper length of the cable.

3. Plug in the 10 VAC transformer into the non-switched AC receptacle. With a multimeter, verify that there is 10 to 12 Volts AC across the TELCO board terminals TB1-1 and TB1-2. Check for 6.5 to 7.2 Volts DC on terminals TB1-6 and TB1-7 of the TELCO board.

4. Connect the Ribbon cable to J2 of the Processor board and verify that the "AC ON" LED indicator on the front of the RTU enclosure is illuminated.

5. Disconnect the J2 ribbon cable from the Processor board and remove the 10 VAC transformer from the receptacle. ENSURE ALL POWER IS OFF at the RTU prior to proceeding with the installation.

3.3.4 Lightning Protection

The RTU-100/190/200 panel circuitry incorporates some protection circuits for lightning and other forms of electrical surges. However, this lightning and surge protection will only be effective with proper grounding. Ensure that the "leased" and "switched" data service grounds, TB3-1 and TB3-6, are connected to a solid earth ground. In areas of severe electrical storms, the phone lines should be ordered with lightning arrestors to provide extra protection. If using RS-485 or RS-232 communication links, be sure to install in-line surge protection circuits. MDI cannot be held responsible for circuit damage and/or failure due to lightning. (Generally available protectors, such as the PROTEK Model # MDI TEL50E and # MDI 422E provide excellent communication line protection in adverse weather conditions.

3.4 TELEPHONE INTERFACE (TELCO) BOARD

The Telephone Interface Board (see Figure 3-4), typically referred to as the TELCO Board, is a standard part of every RTU-100/190/200. This board serves as the source of power generation and distribution throughout the entire RTU cabinet. It also serves as the communication board for 2-wire and 4-wire Multiplex, Differential, and Dial communications, as well as providing controlled bell output contacts. There are a number of different versions of the TELCO board available (-0 through -4), each version based on communication options offered in the RTU. RTU panels and TELCO boards must be ordered with the specification of the type of primary and secondary communication lines to be used (i.e., DIFF, MUX, DIAL, RS-232). Refer to the following pages for details on the different communication techniques and wiring terminations for the TELCO board. Figure 3-4 shows each of the board's Terminal Blocks and connections.

3.4.1 Communication Line Connections

The TELCO board provides the data communication line connections for the RTU panel via TB3, terminals 2-5 for the Primary communication line, and terminals 7-10 for the Secondary, or Backup communication line (see Figure 3-4). As previously stated, there are a number of different versions of the TELCO board in order to support the variety of communication line arrangements which are available for the RTU, including:

- Multiplex/Multiplex (MUX/MUX)
- Multiplex/Dial (MUX/DIAL)
- Differential/Differential (DIFF/DIFF)
- Differential/Dial (DIFF/DIAL)
- Dial/Dial (DIAL/DIAL)

The diagrams on the following pages illustrate the connections for each of these communication techniques. The type of communication, and the version number of the RTU, Processor Board and TELCO board should be determined with the use of Table 2-9 on page 40 of this manual. RS-232 communication is supported only with the Model 180 Processor which is provided with another version of the TELCO board. See Appendix 'A' for further details on RS-232.

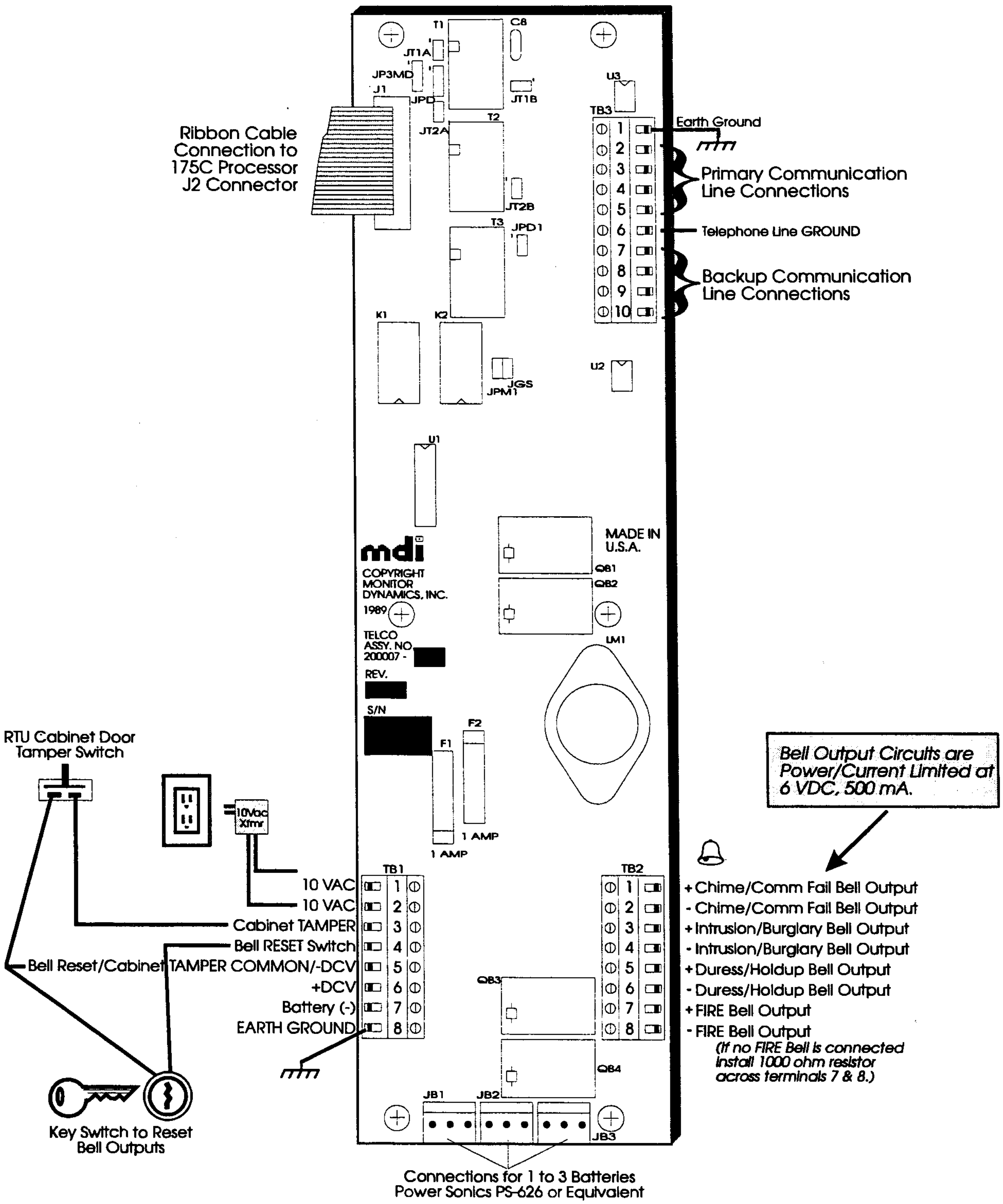


Figure 3-4. TELEPHONE INTERFACE (TELCO) BOARD

3.4.1.1 Multiplex/Multiplex (MUX/MUX) Communication

This configuration utilizes 2-wire or 4-wire dedicated data lines on standard 3002 voice grade telephone circuits, 24 AWG, at 300 baud for both the Primary and the Backup lines.

A. 2-wire configuration. Used in CLASS "A" proprietary systems. Communicates via dual 2-wire 3002 multiplex lines to the PPU Line Card, MLC 3002 either directly to the PPU or through a Passive Matrix Bridge. Pull in the appropriate telephone line cable from D-Mark, or punch down block, and connect per the diagram below.

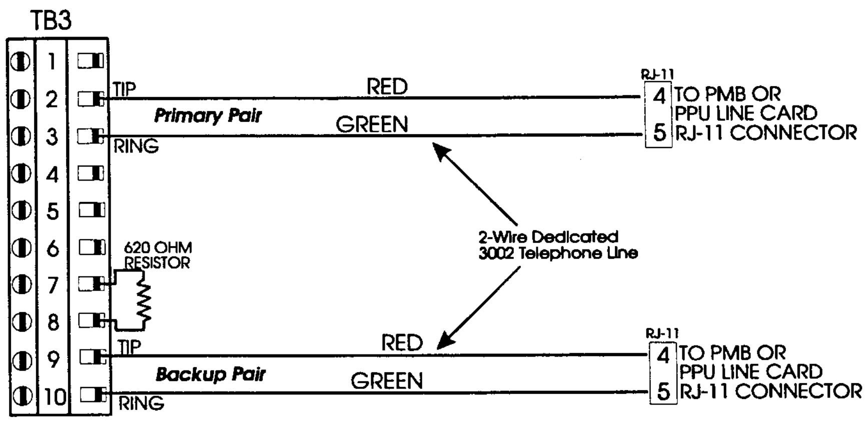


Figure 3-5. 2-WIRE MUX/MUX LINE CONNECTIONS

B. 4-Wire Configuration. Used when phone company provides a 4-wire drop instead of the standard 2-wire service. Transmit and receive functions are on separate pairs and terminate on the PPU Line Card (MLC 3002), or via a Passive Matrix Bridge. 4-Wire backup can only be accomplished by use of a 2-wire to 4-wire bridge as shown below. Pull in the appropriate telephone line cable from the D-Mark, or punch down block and connect per the diagram below.

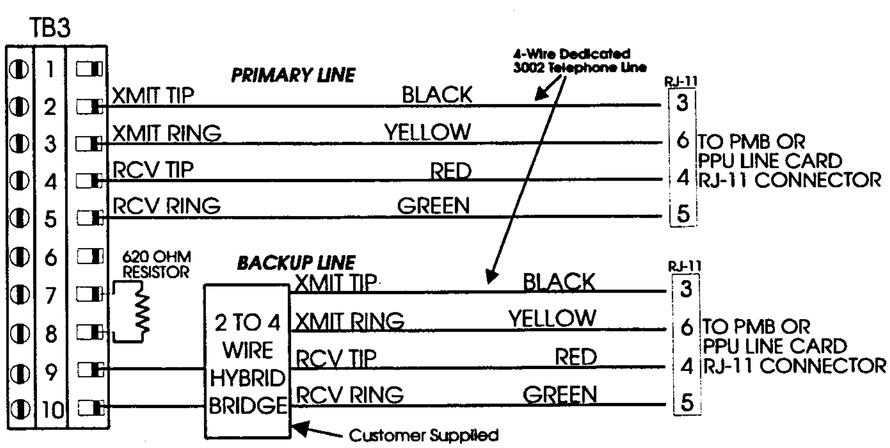


Figure 3-6. 4-WIRE MUX/MUX LINE CONNECTIONS

3.4.1.2 Multiplex/Dial (MUX/DIAL) Communication

The Multiplex/Dial Communication techniques utilize a 2-wire or 4-wire dedicated 3002 data lines for the Primary Communication line, identical to the MUX/MUX described above. The Backup line is standard DTMF Dial-up telephone service. Phone numbers to be dialed must be programmed into the RTU parameters of the 175C Processor Firmware EPROM (Low PROM).

A. 2-Wire Configuration. The primary is as described in 3.4.1.1.A. The backup dial line terminates on the PPU DLC-100 line card. When the dialer is activated the RTU 175C Processor will disconnect the extension phone. The Dialer is Dual Tone Multi-Frequency, "DTMF", unless otherwise requested. Pull in the appropriate telephone line cable from the D-Mark, or punch down block and connect per the diagram below.

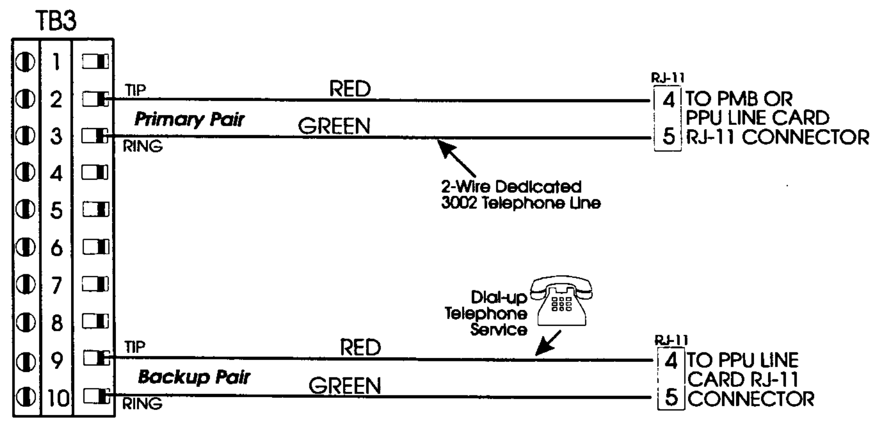


Figure 3-7. 2-WIRE MUX/DIAL LINE CONNECTIONS

B. 4-Wire Configuration. The primary line is as described in 3.4.1.1.B. The Dial backup is as described above and terminates on TB3-9 and TB3-10. Pull in the appropriate telephone line cable from the D-Mark, or punch down block and connect per the diagram below.

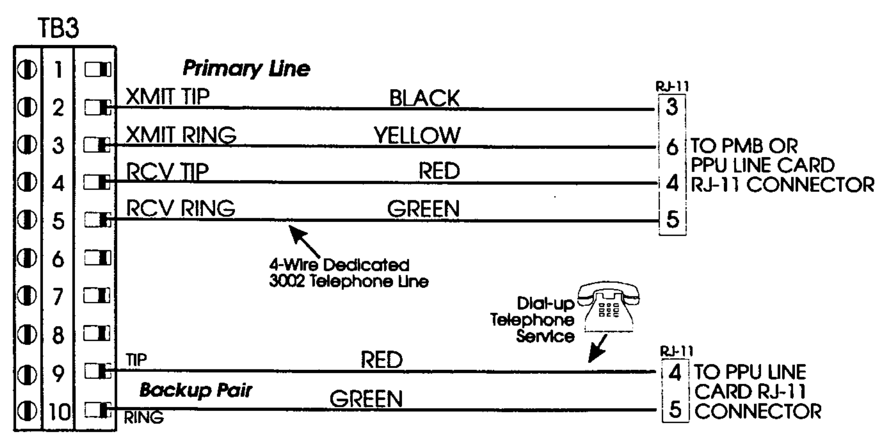
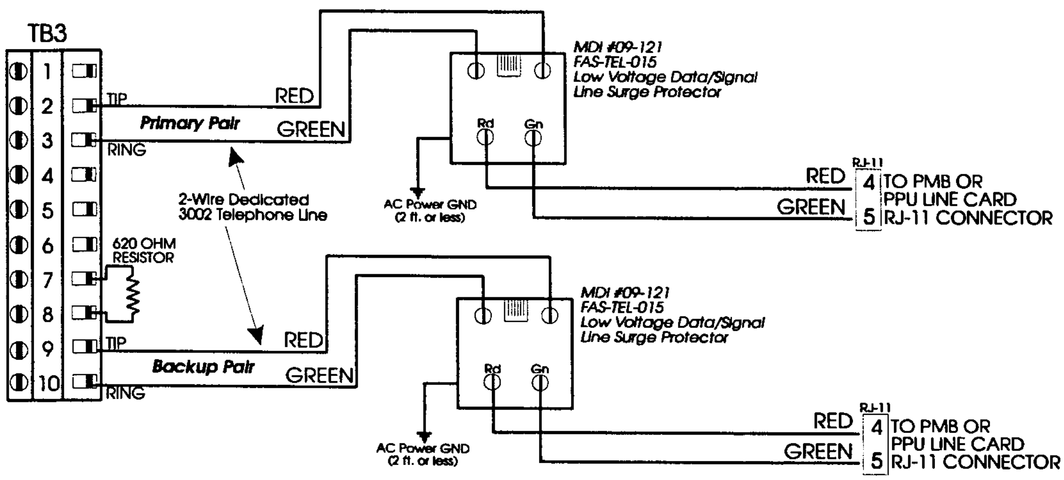


Figure 3-8. 4-WIRE MUX/DIAL LINE CONNECTIONS

If a particular site and/or installation is part of a U.L. Certified Central Station System with requirements for compliance to U.L. 1459 specifications, the telephone lines used for dedication MUX and Dial-up communications must be surge protected. Figure 3-9 below gives an illustration of the addition of telephone line surge protectors for a dedicated 2-wire or 4-wire MUX line (MDI Part No. 09-121), and for a Dial-up Backup line (MDI Part No. 09-120).

2-WIRE MUX/MUX



4-WIRE MUX/DIAL

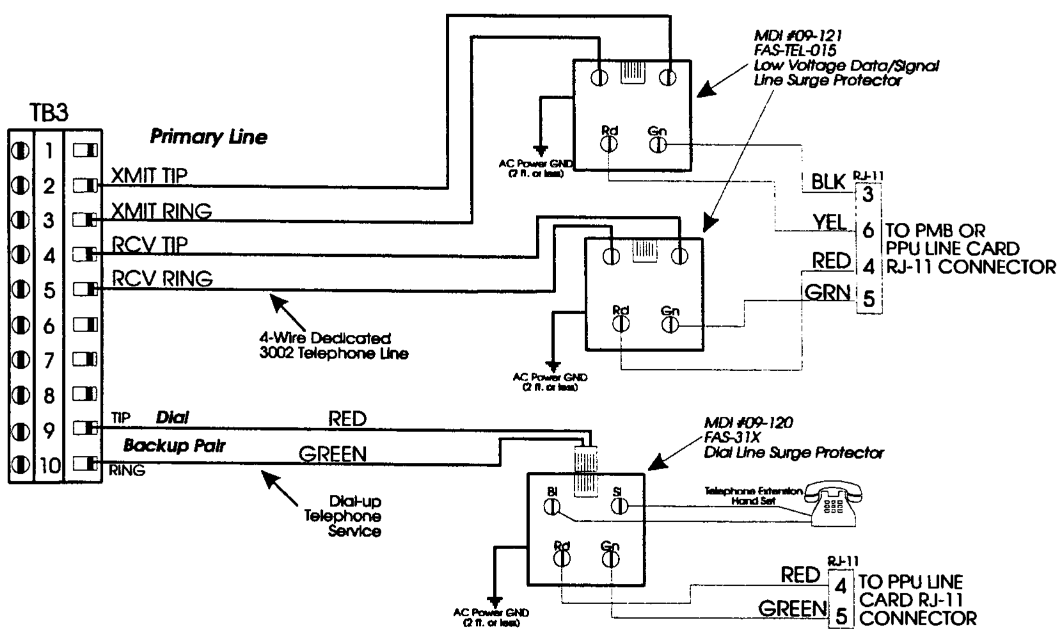


Figure 3-9. U.L. CERTIFIED MUX and DIAL LINE CONNECTIONS

3.4.1.3 Differential/Differential (DIFF/DIFF) RS-485 Communication

May be used in a CLASS "A" proprietary system, or when using newly installed or existing data communication equipment and/or fiber optics. This configuration utilizes standard 4-wire RS-485 serial communication operating at 1200 baud. RS-485 offers true Multidrop capability in that the wiring is paralleled to the next RTU without a Passive Matrix Bridge or any other type of hub. Maximum communication loop length is 4000 feet from the PPU to the last RTU on the line. RS-485 cabling must be 2 twisted pairs, shielded, at a minimum of 24 AWG wire. Pull in the appropriate cable terminate per the diagram below.

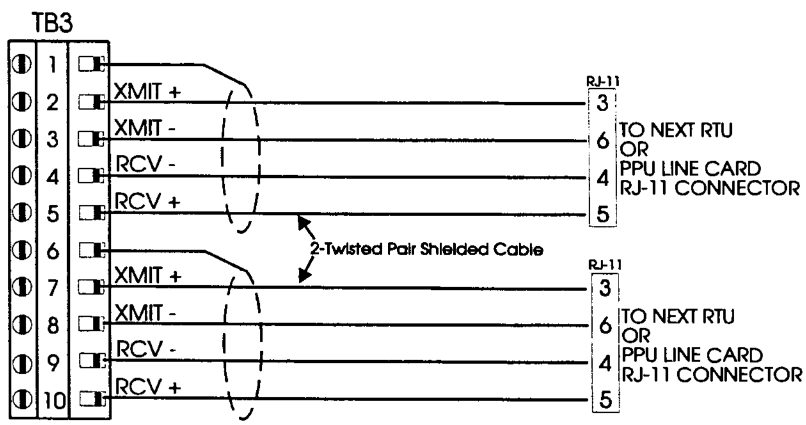


Figure 3-10. DIFF/DIFF LINE CONNECTIONS

3.4.1.4 Differential/Dial (DIFF/DIAL) Communication

This configuration utilizes standard 4-wire RS-485, as described in paragraph 3.4.1.3 above, for primary communications. The Backup line uses DTMF Dial-up communication as described in paragraph 3.4.1.2 above. Pull in the appropriate RS-485 cable, as well as the telephone line cable from the punch down block, and terminate per the diagram below.

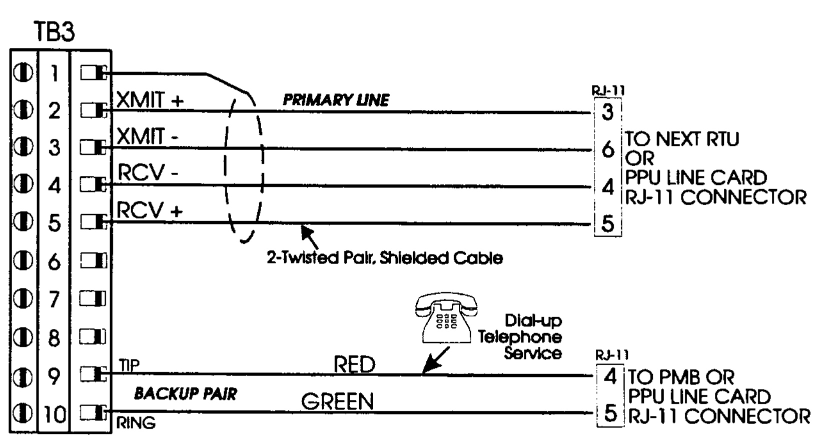


Figure 3-11. DIFF/DIAL LINE CONNECTIONS

3.4.1.5. DIAL/DIAL Communication

This configuration uses the standard DTMF Dial-up communication described in 3.4.1.2 for both Primary and the Backup communication channels. Telephone numbers to be dialed must be programmed into the RTU parameters. Sub-Phone is not available on this configuration. Pull in the appropriate telephone line cable from the D-Mark, or punch down block and connect per the diagram below.

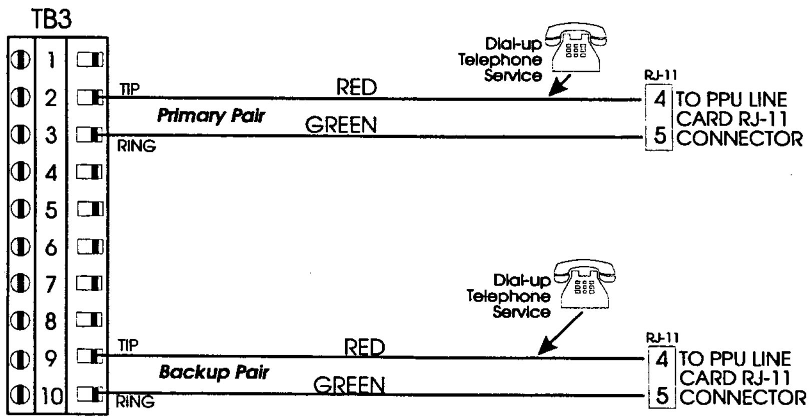


Figure 3-12. DIAL/DIAL LINE CONNECTIONS

3.4.1.6. Differential through T1 Interface.

This configuration can be used to provide a serial RS-485 communication interface to an existing T1 network by converting the RS-485 to RS-232 with a standard converter. The T1 interface conversion and modem may be provided by the end-user or installer and the connections may vary, based on the equipment used. Typical connections may be as shown in the diagram below.

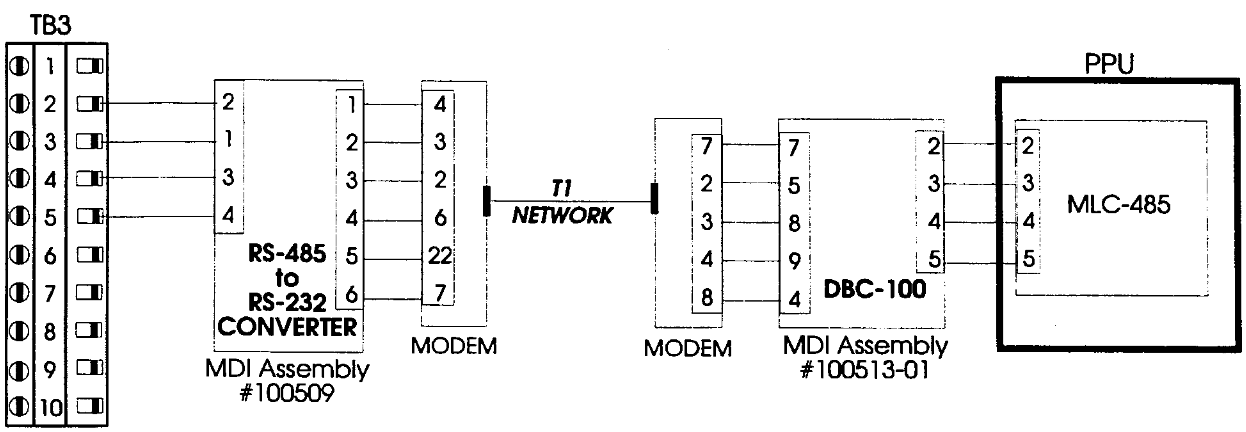


Figure 3-13. DIFF to T1 LINE CONNECTIONS

3.4.2 Multiple RTU Connections to a Single Line

In most installations, requirements exist for the interface and connection of multiple RTU panels on a single or common communication line back to the PPU and the Central Host System. The methods and techniques for this installation requirement depends on the type of communication line to be used.

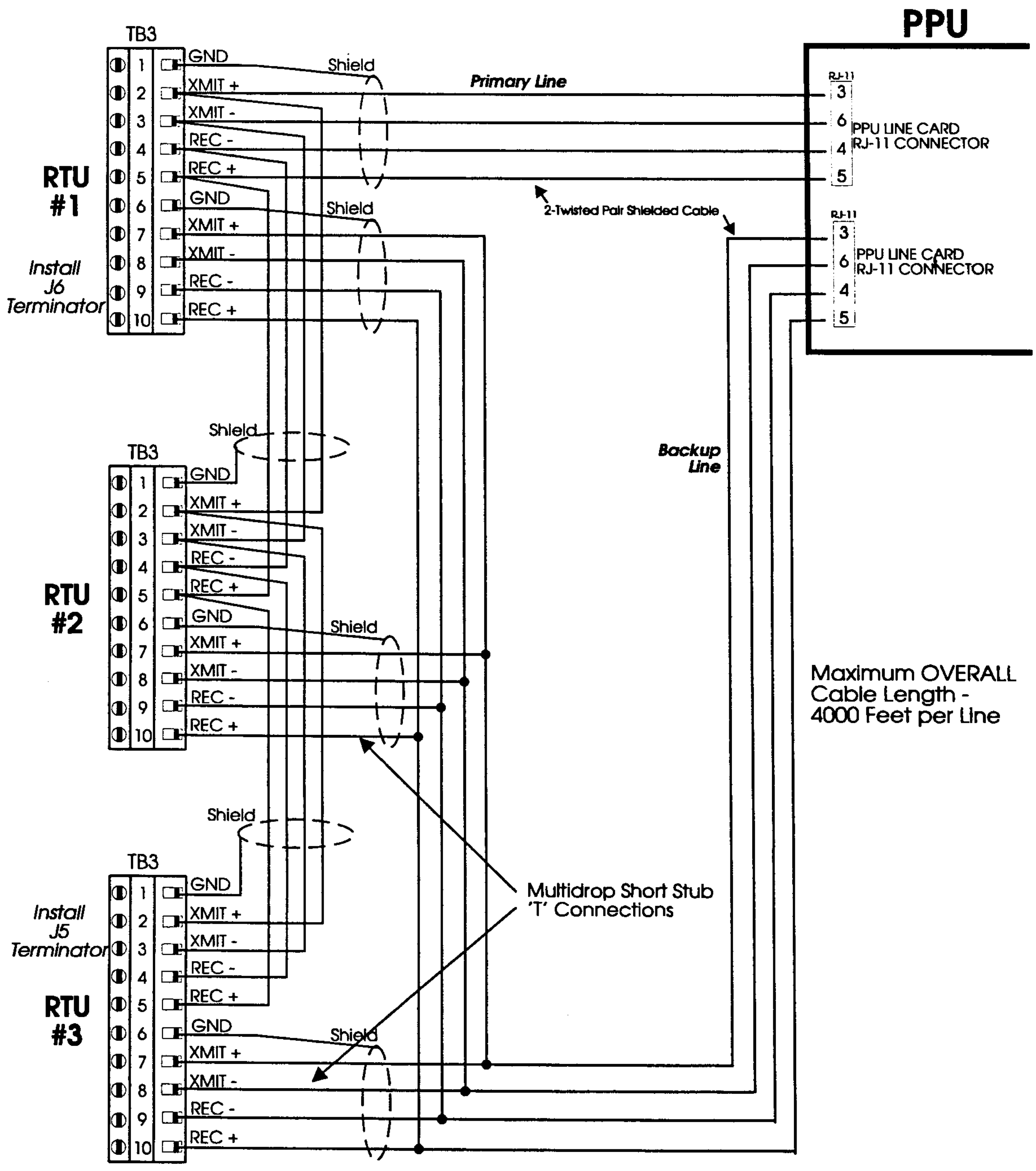
For DIFF communication (RS-485), the connection requirements involve a multidrop connection from one RTU to the next RTU, which is detailed in paragraph 3.4.2.1. For dedicated 3002 MUX lines, the interface requirements include the usage of a Passive Matrix Bridge (PMB), which is an interface module used to split the MUX telephone line and provide properly terminated (600 ohm) connections for multiple RTU panels. The PMB installation and connections are detailed in paragraph 3.4.2.3 . RS-232 communication is basically a one-to-one type of connection and would require some type of external port sharing device of data broadcast device in order to interface multiple RTUs to a single line. RS-232 communication is detailed further in Appendix 'A'. Since DIAL line communications are connected directly to a telephone line interface jack in the same manner as a telephone handset, multiple connection to the same line is very simply just that, and no further discussion is required.

3.4.2.1 Multiple RTUs on a DIFF Line

As previously described, Differential communication utilizes standard 4-wire RS-485 serial communication. RS-485 offers the advantage of true "Multipdrop" connection capability in that the communication wiring may be directly paralleled from one RTU to the next with no other intermediate device required.

RS-485 communication cabling requires the use of a cable with 2 Twisted Pairs, Shielded, minimum 24 AWG, with the shield wire connected at only one end of any branch connection. Remember, that the maximum overall communication loop length is 4000 feet from the PPU to the last, or furthest RTU on the line. The loop length calculation must include all connection branches and is measured from point A to point B, but not back again like some other types of communication.

RS-485 communication also includes the requirement for proper line termination in order to prevent data signal echoes or intermittent noise generated by the poll and response signals. Line termination jumpers are provided on the 175C Processor Board, jumpers JP5 for the Primary line and JP6 for the Backup (see Figure 3-21). These jumpers should be installed ONLY on the last RTU connected on the line, or the RTU that is furthest away from the PPU on that line. Typically, only one RTU per communication line should have the termination jumper installed. Figure 3-14 illustrates the connection requirements for multiple RTUs on a DIFF RS-485 communication line.



– *Insert the RS-485 Termination Jumpers on the Processor Board of the Last RTU or Farthest RTU on the Communication Line.*
J5 = PRIMARY LINE J6 = BACKUP LINE

Figure 3-14. MULTIPLE RTU CONNECTIONS, RS-485 (DIFF) LINE

3.4.2.2 Multiple RTUs on a MUX Line

When using dedicated 3002 Multiplex (MUX) data lines for RTU communication, and multiple RTU panels are required on single communication line, these RTU panels cannot be connected directly to the line. Since the 3002 MUX lines are actually dedicated telephone lines, the proper line impedance and/or termination must be maintained in order for the data signals to be transmitted and received properly. For this reason, a Passive Matrix Bridge must be installed to enable connections to multiple RTU panels on a single MUX line.

3.4.2.3 PASSIVE MATRIX BRIDGE (PMB)

The Passive Matrix Bridge, PMB-16, is used to connect multiple RTU panels to a single 3002 line PPU circuit. The PMB module provides a convenient, pre-wired bridge for splitting 600 ohm, 3002 Multiplex (TELCO "MUX") data lines. Depending on the number of RTU panels required to be connected to the MUX line, the PMB module can be configured, with jumpers, to provide a 16-Way Connection (4 X 4) for connecting up to 16 RTUs, a 9-Way Connection (3 X 3) for connecting up to 9 RTUs, or a 4-Way Connection (2 X 2) for connecting up to 4 RTUs. Jumpers are provided for terminating unused ports with a 600 ohm load. The PMB board can mounted in the RTU Enclosure, or it is more typically mounted external to the RTU.

If more than 16 connections are required for RTUs, it is also possible to cascade multiple PMB modules together. A PMB can be connected to the PPU, and then the outputs of the PMB can be then connected to another PMB. Although not at all practical, it is possible to take a single line and split it up to 256 ways by taking a 16-way PMB and connecting each of the 16 output connectors to another 16-way PMB. Consideration must be given to the dB loss which will be created by each connection and each PMB. A 16-Way PMB has an inherent -12 dB loss, a 9-Way has a -9.5 dB loss, and a 4-Way will add a -7 dB loss to the line. Since dB loss in the line directly effects the signal quality and strength of the data on the line, care must be taken to ensure that line losses do not become to great, which will cause intermittent communication problems.

The PMB-16 can be used for both 2-wire and 4-wire MUX line circuits. When using the 2-wire mode, only one PMB is needed for splitting the Communication line. When used in the 4-wire MUX line mode, two PMB modules must be used in parallel, with one used for splitting the transmit pair and the other for the receive pair. Each PMB can be connected to the PPU line with either an 8-position RJ-11 modular phone jack (J1), or via terminal block TB3.

When shipped from the MDI factory, the PMB-16 is configured as a 16-way bridge, as shown in Figure 3-15 below. There will be no shorting straps installed on any of the terminal blocks and **ALL** of the jumpers will be installed at locations JP1 thru JP16. If a 16-Way bridge is required, simply REMOVE the jumpers for each RTU port that is connected to an RTU. The RTU numbers and port numbers correspond to the jumper numbers JP1 to JP16. Be sure to keep the termination jumpers in place for each available port connection that is not connected to an RTU. An unconnected port with no termination jumper adds unnecessary signal attenuation as well as an unbalanced condition on the bridge. The 16-way Bridge signal attenuation is -12 db.

16-Way Bridge (4X4), 2-Wire Configuration

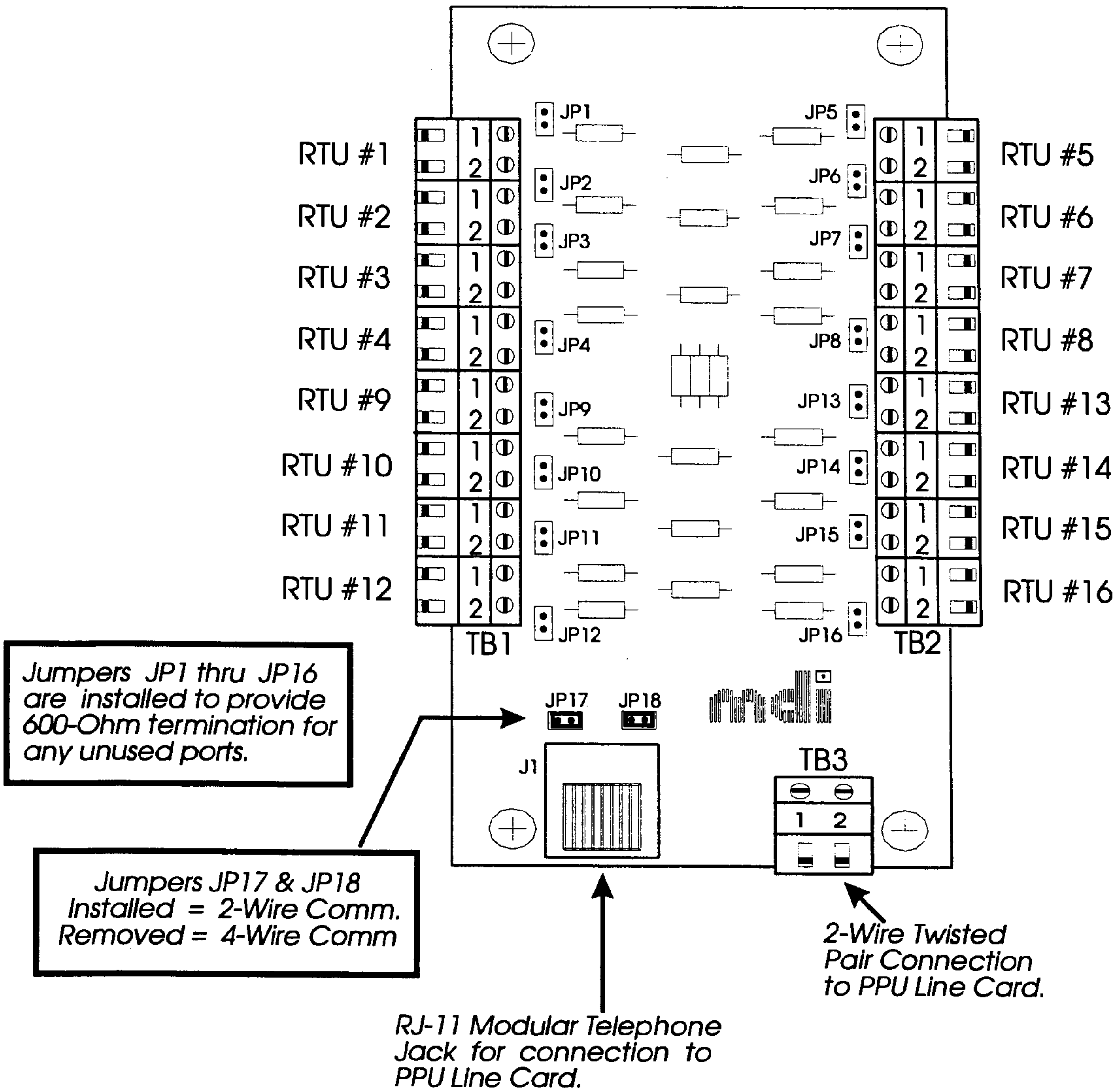


Figure 3-15. PASSIVE MATRIX BRIDGE, 16-WAY (4 X 4), 2-Wire

Based on the system configuration of the site being installed, determine how many RTU panels are to be installed on the MUX line and always try to reduce the PMB bridge configuration if possible. If the system requires a quantity of from 5 to 9 RTUs on the MUX line, reduce the PMB to a 9-Way Bridge (3 X 3) configuration.

9-Way Bridge (3 X 3), 2-Wire

1. *Place Shorting Straps across RTU Ports 4, 8, and 12.*
2. *DO NOT install Termination Jumpers on Ports 13-16.*
3. *Terminate any available RTU Ports that are not Connected to an RTU.*
4. *Inherent Line Loss is Approx. -9.5 dB.*
5. *Jumpers JP17 and JP18 are installed.*

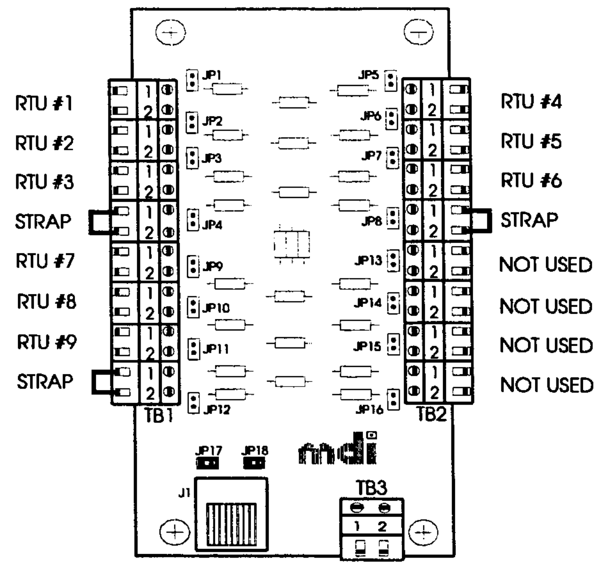


Figure 3-16. PASSIVE MATRIX BRIDGE, 9-Way (3 X 3), 2-Wire Configuration

If the system requirements are for a quantity of 2 to 4 RTUs on the MUX line, reduce the PMB to a 4-Way Bridge (2 X 2) configuration.

4-Way Bridge (2 X 2), 2-Wire

1. *Place Shorting Straps across RTU Ports 3, 4, 7, and 8.*
2. *DO NOT install Termination Jumpers on Ports 9-16.*
3. *Terminate any available RTU Ports that are not Connected to an RTU.*
4. *Inherent Line Loss Is Approx. -7 dB.*
5. *Jumpers JP17 and JP18 are installed.*

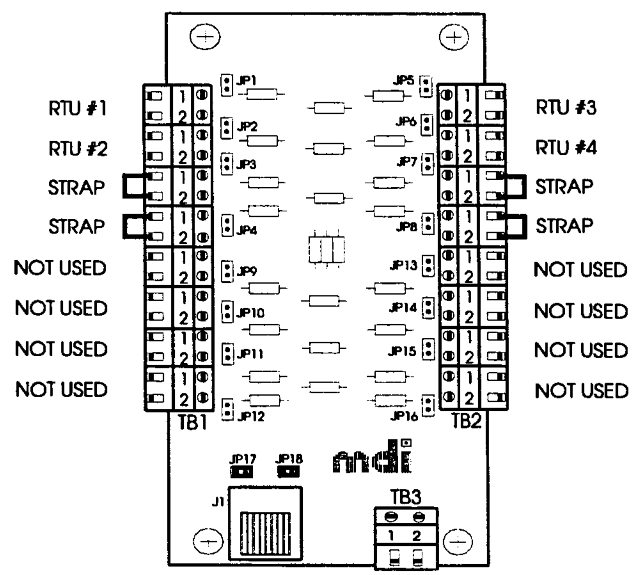
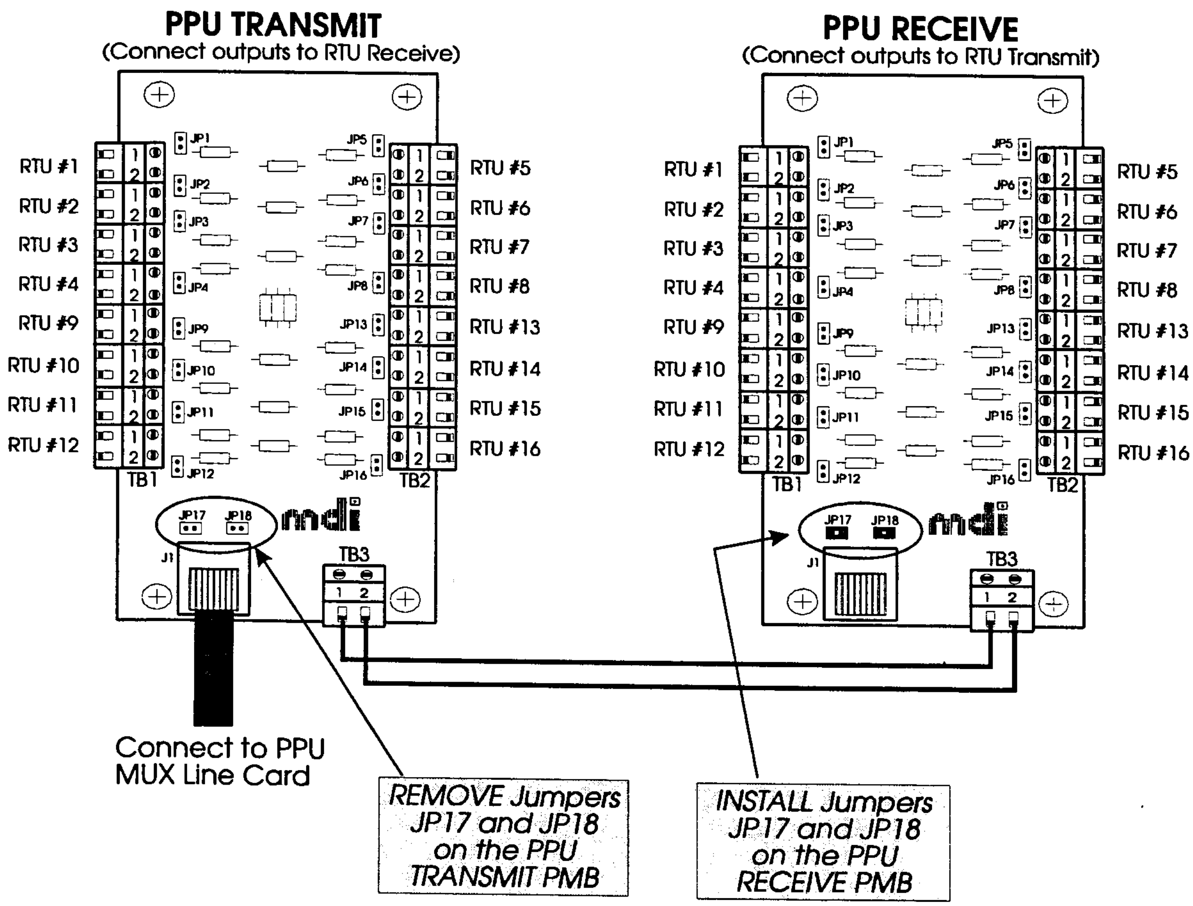


Figure 3-17. PASSIVE MATRIX BRIDGE, 4-Way (2 X 2), 2-Wire Configuration

If a dedicated 4-wire 3002 MUX line configuration is required, the MUX line connection to the RTU's will require dual PMB modules, one for the Transmit pair of wires and the other for the Receive pair of wires from the 4-wire MUX line. On the PMB designated for the PPU Transmit line, remove jumpers JP17 and JP18. These two jumpers should remain installed on the other PMB designated for the PPU Receive line. Connect the 3002 MUX line cable coming from the PPU to the RJ-11 phone jack connection on the PMB designated as PPU Transmit. Interconnect the two PMB modules with a pin-to-pin connection of TB3. See Figure 3-18 below.



** NOTE - PMB's above are shown in the 16-Way (4 X 4) Configuration. Always reduce the Configuration of the bridge to the size requirements necessary.

Figure 3-18. PASSIVE MATRIX BRIDGE, 4-WIRE CONFIGURATION

Figures 3-19 and 3-20 on the following pages show examples of the communication line connections from multiple RTU panels to the Passive Matrix Bridge modules. Figure 3-19 shows a 2-Wire communication line and Figure 3-20 shows a 4-Wire configuration.

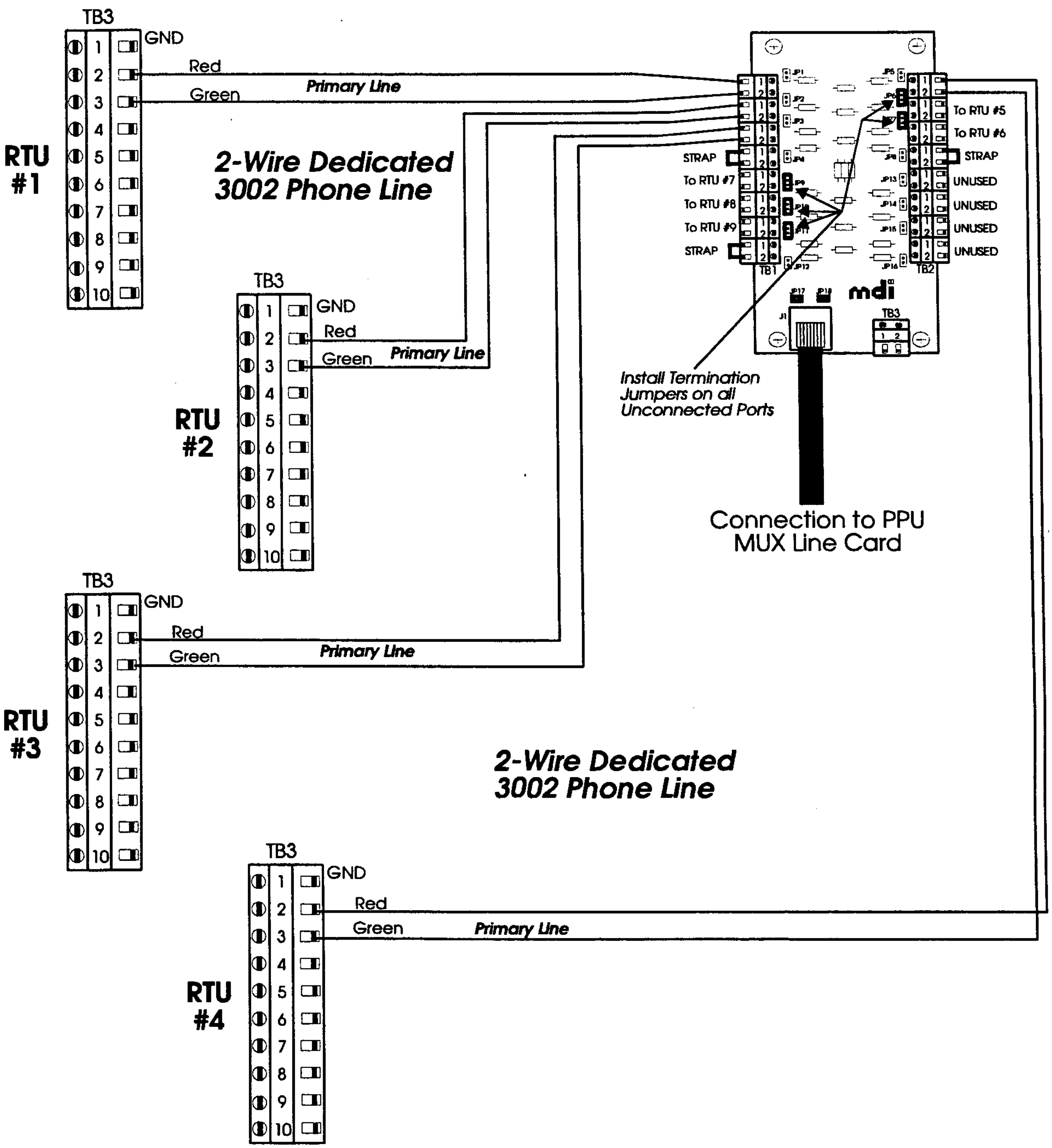


Figure 3-19. MULTIPLE RTU CONNECTIONS, 2-WIRE MUX LINE

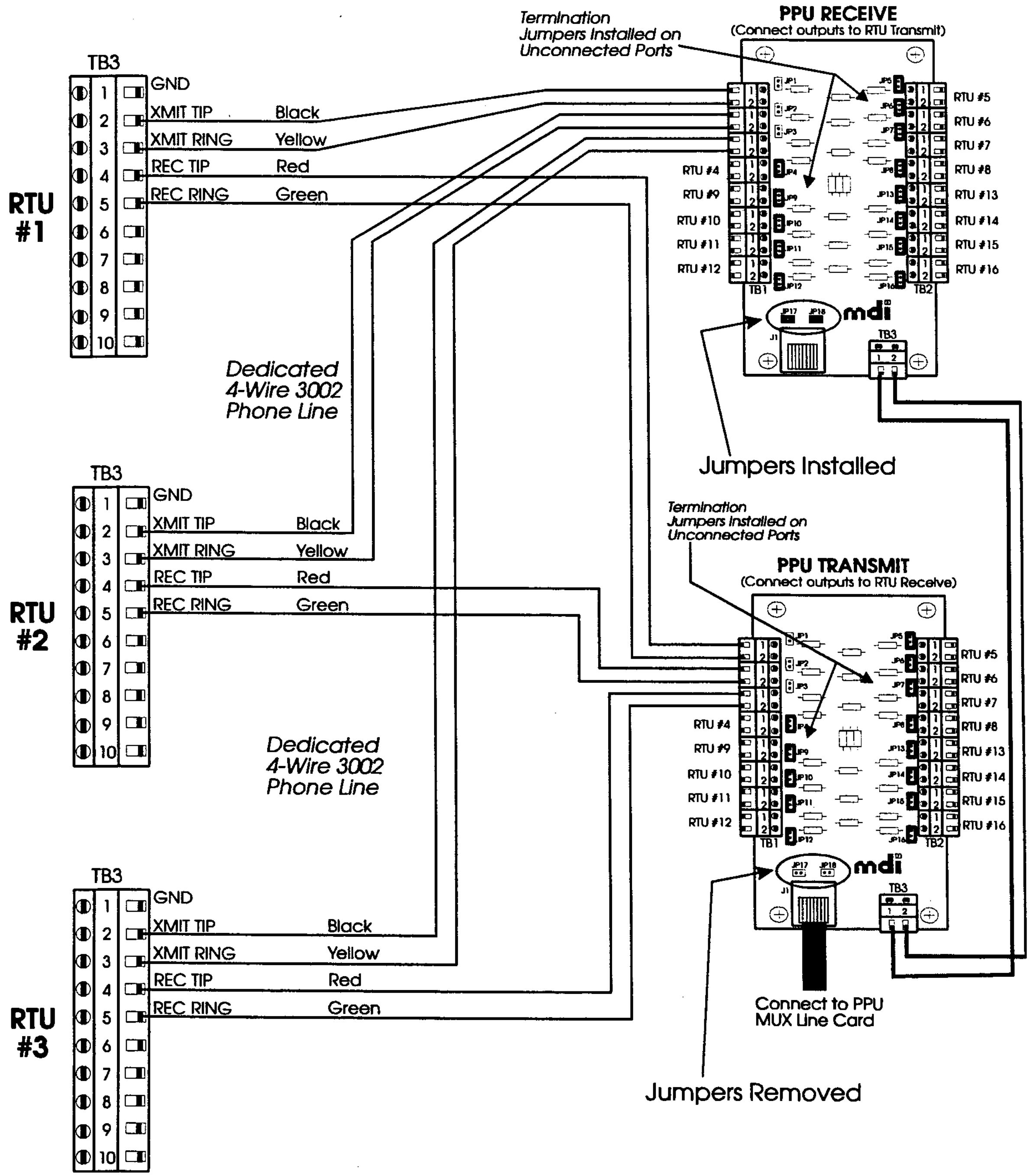


Figure 3-20. MULTIPLE RTU CONNECTIONS, 4-WIRE MUX LINE

3.4.3 Local Bell Outputs

The RTU TELCO board provides the control of four (4) on-board local bell outputs which can be used to provide an audible alarm based on the activation of certain alarm zones. The alarm input points which are to activate one of the bell outputs is configured based on the ZIM installed with that alarm input. The bell outputs will provide 6 Volts DC at up to 500 ma. Only one (1) bell output will ever be active at any time. If multiple alarms that are linked to bell outputs are active simultaneously, the one with the highest priority will be active. The priority order, highest to lowest, is Fire, Holdup/Duress, Intrusion/Burglary, and Chime. Bell outputs will remain active until reset by either a local reset switch (across TB1-4 and TB1-5), a "Reset Bell" command generated at the Host Computer, a Day/Night Acknowledge command at the Host Computer, or the bell outputs will automatically reset (except the fire bell) after a preset time period (up to 254 minutes) which is specified in the RTU Firmware parameters (default is 10 minutes).

Local bells are connected to the TELCO Board TB2 (see Figure 3-4) using 22 AWG (minimum) stranded 2-conductor cable. Cut the appropriate length of cable and connect one end to the bell unit. Run the cable through one of the knockouts or conduit and terminate to the TELCO board TB2 as detailed below for each output, ensuring proper DC voltage polarity is observed.

A. CHIME: This output provides a steady activation on the loss of RTU communication with the PPU. If communication is lost on either the Primary or the Secondary line, the output will activate, and deactivate when Comm is restored. Connections are positive wire to TB2-1 and negative to TB2-2. On older system, the Chime output provided a momentary output in the "ANNUNCIATOR" mode ('AN' ZIM).

B. INTRUSION/BURGLARY: This output provides a steady activation on an alarm condition, provided the area is in the "ARMED" or "CLOSED" mode. If the Area is Disarmed (Open), the alarm points are disabled and no alarm nor bell activation will occur. This output is linked to Protection ZIMs (PI, PB), Intrusion/Burglary ZIMs (BI, II, MI), and Entry Delay ZIMs (ED, IE). Connect positive lead to TB2-3 and negative to TB2-4.

C. DURESS/HOLDUP: This output provides a steady activation on the occurrence of a Duress or Holdup alarm condition, and is used with Duress/Holdup ZIMs (HI, DB). Connect the positive lead to TB2-5 and the negative lead to TB2-6.

D. FIRE: This output provides a pulsed activation (approximately 1 Hz rate) on the occurrence of a Fire alarm and is used with Fire ZIMs (FI, FD, FB, FR). The Fire bell output will not automatically reset by the RTU bell rest timer, but must be reset by command or the reset switch. The Fire and Intrusion/Burglary bell functions may be connected to share the same physical bell by strapping TB2-4 and TB2-8 together. The burglary bell is a steady activation while the fire bell will pulse. If the Fire bell output is not used, a 1000 ohm resistor must be connected across TB2-7 and TB2-8 or a fault light will result on the RTU display (upper left corner of enclosure cover). Connect the Fire bell positive lead to TB2-7 and the negative lead to TB2-8.

3.4.3.1 Local Bell Reset Switch

If the Fire protection or local bells are used and connected to the TELCO board bell outputs, an external keyswitch may be wired to the RTU TELCO board and used to reset the bell outputs. Activation of the switch will silence, or reset, any active local bell output, provided the alarm condition that caused the bell has been cleared. If the an alarm condition that is configured by the ZIM to activate a bell is still active, the bell output cannot be reset until the alarm condition is reset. When the reset switch is activated, the Host Computer System will report a "RTU RESET" followed by a "RESET OFF" when the switch is released. Note that the bell outputs are disabled during the time that the reset switch is in the closed position, therefore, all of the bell outputs can be indefinitely disabled if the reset switch is locked in a closed position, or by shorting across TB1-4 and TB1-5. This can be useful during alarm system testing.

The switch used for this function should be a SPST, normally open, momentary contact switch, typically a Keyswitch to ensure that only those individuals with the key can perform the reset. The switch is connected across TELCO board terminals TB1-4 and TB1-5. A typical switch recommended by MDI may be one offered and/or manufactured by *Fort Lock,* switch part number SW 203118-ST. (Can be purchased from MDI.)

3.4.4 RTU Cabinet Tamper Switch

Each RTU-100, RTU-190, and RTU-200 enclosure includes one or two tamper switches factory installed and connected to monitor the opening of the cabinet door. The tamper switches are wired in series and factory connected across TB1-3 and TB1-5 of the TELCO Board (Figure 3-4). Additional switches from auxiliary cabinets could be added to the series loop, if desired.

3.5 RTU 175C PROCESSOR BOARD

The 175C Processor Board is the heart and brains of the RTU-100/190/200 panel. The processor board contains the operating system firmware, database and processing RAM, communication channels for the host and readers, and performs virtually all the necessary data processing, monitoring and control functions of the RTU panel.

There are multiple versions of the 175C Processor Board based on the communication type chosen for the RTU to be installed. These differences may be visible in the component population on the circuit board, again based on what circuitry is required to support the type of data communication to be used. The board is normally labeled in the upper left portion of the board as to the type of data line supported (i.e., DIFF/DIFF, or MUX/MUX, or MUX/DIAL, etc.). This cannot be changed to a different type without being sent to the MDI factory.

The Processor board contains a number of jumpers, shown in Figure 3-21, used to select certain operational parameters and communication address settings. The following information, along with Figure 3-21, should be used to locate and verify the proper jumper settings as well as locate any other major components on the board.

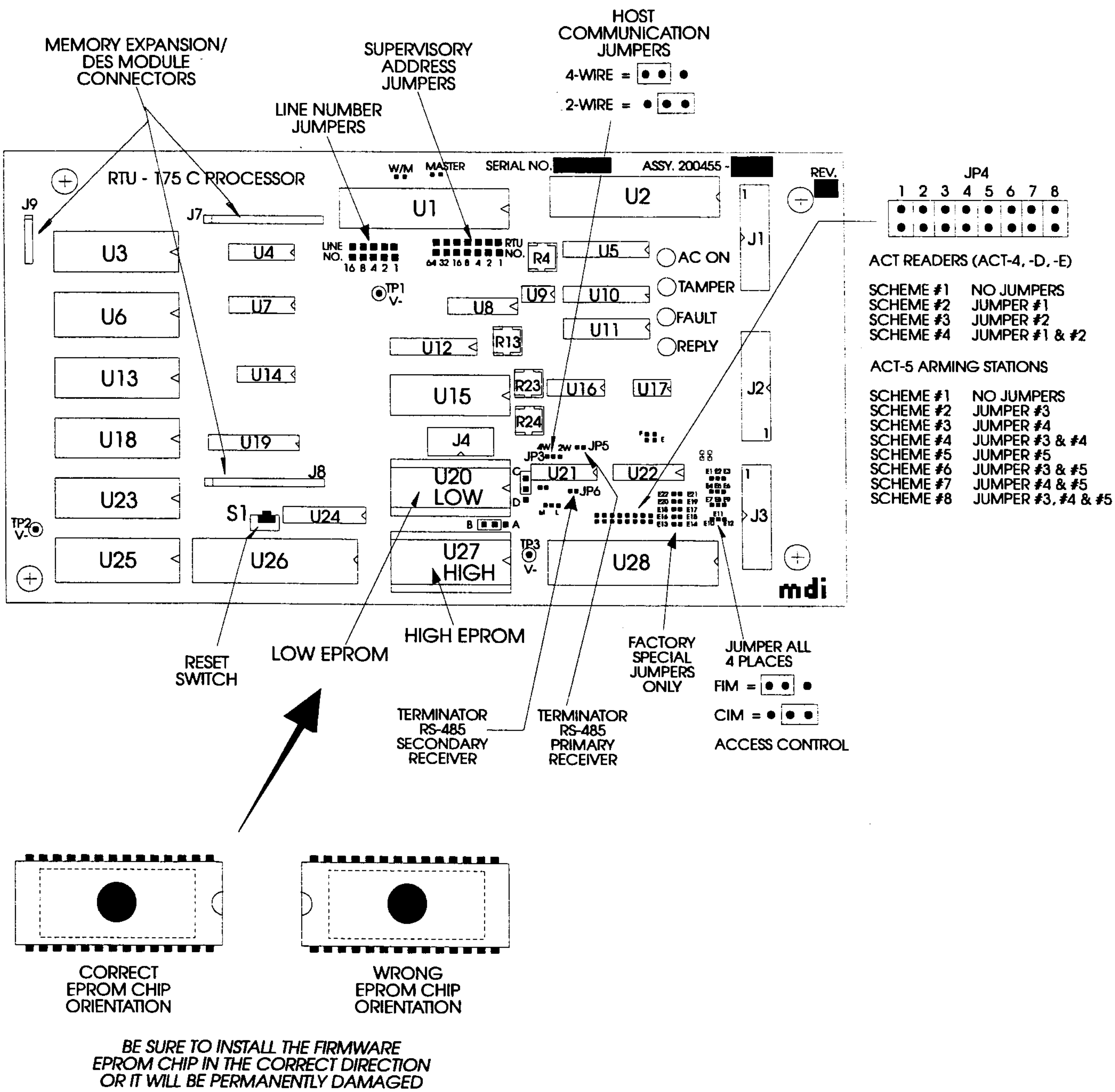


Figure 3-21. RTU 175C PROCESSOR BOARD

3.5.1 Processor Board Address Jumpers

Addressing of the RTU panels is discussed at length in paragraph 2.5 of this manual. Using this information and the site survey data, determine the Line Number and Supervisory Address for each RTU and set the respective jumpers accordingly, or verify the correct setting if the address determinations have already been made and set at the factory. Use the address settings descriptions in Table 2-10 and Table 2-11 to help determine the exact jumper configurations.

3.5.2 Processor Firmware (EPROM)

Verify the EPROMs located at U20 (Low EPROM) and U27 (High EPROM). Ensure that they are inserted correctly into the sockets with Pin 1 in the upper right position and all of the legs are inserted into the socket, not sticking out or bent. If these IC's are plugged into the socket backwards, they will be damaged at power up and no longer function. If the parameters in the Low EPROM ever need to be changed, ensure that the new EPROM is labeled properly. ALWAYS be aware of Electrostatic Discharge (ESD) when handling IC's and circuit boards.

3.5.3 Access Control, FIM or CIM Jumpers

If the RTU will be used for controlling and monitoring Access Control Card Readers and/or Keypads, the board must be set as to whether the readers will interface to the RTU via FIM boards (RS-485 serial communication) or CIM boards (direct data wiring). This is done with jumper pins E1 thru E12 in the lower right portion of the Processor Board (see Figure 3-21). The jumpers are grouped in four sets of three jumper pins. On all four sets of jumpers, inserting a jumper on the left two pins sets the board for FIM type access control. Insert the jumper on the right two pins of all four sets to configure the board for CIM access control. These jumpers will typically be set at the factory. (Note - the 175C Processor Board cannot be used for FIM access control if it was not specified and configured at the factory to be used as such.)

3.5.4 Other Jumpers and Components

A. ACT Reader Wiring Schemes - The MDI ACT Series of card readers, card reader interface modules, and arming stations, such as the ACT-4, ACT-5, ACT-D and ACT-E, communicate to the RTU via FIM boards (with exception of the ACT-3, which uses the CIM). This FIM communication interface is serial RS-485, which allows for multidrop connections. The FIM board provides up to four (4) serial communication ports, and there are four (4) different wiring schemes used to interface the readers and reader modules back to the RTU, which are set by jumpers JP4 (see figure 3-20). These jumpers set the wiring connection scheme to be used so that the Processor is able to poll and interpret messages from the ACT units properly. Diagrams of the different schemes are shown in Figure 3-49.

B. Jumper J3 is used only for Multiplex (MUX) communication and is used to set whether the MUX line is to be 4-wire or 2-wire communication. Set the jumper on the left two pins to select 4-wire, on the right two pins to select 2-wire.

C. RS-485 Terminators, JP5 and JP6. These jumpers are used only for Differential (DIFF) communication, which is RS-485. The jumpers should be installed at the RTU panel that is the last RTU on the multidrop communication line, or the one that is the farthest away from the Host Computer. JP5 is the jumper for the Primary communication line and JP6 is the jumper for Backup (Secondary) communication line, and should only be installed in the appropriate RTU, as required.

D. If expanded cardholder memory capacity is required, a MEX-8, MEX-16, or MEX-32 module will be attached to the Processor Board. If DES encrypted communication is required, a DES Encryption chip can be attached to the Processor Board, or added to a Memory Expansion module on the Processor Board. These modules are "piggy-back" type boards and interface to the Processor board via insertion connectors which connect to the J7, J8 and J9 connectors of the Processor (see Figure 3-54). The required Software and/or Firmware options must be enabled and configured for the proper operation of encryption and expanded memory.

E. The Processor Board contains a Reset Switch which, when momentarily pressed, will perform a Hard reset and restart the processor board and operating system firmware programs.

3.6 REMOTE INPUT MODULES

The Remote Input Modules provide the alarm point input terminations and monitoring for Alarm Sensors. The RIM modules are now available in two versions; the RIM-8 and the RIM-16. The RIM-8 module provides eight (8) inputs and supports eight (8) non-supervised alarm zones or four (4) supervised zones. The RIM-16 module provides 16 inputs, however it supports ONLY 2-WIRE SUPERVISED alarm monitoring and therefore provides for eight (8) fully supervised alarm zones. Both provide alarm zone monitoring and reporting, card access control interface and monitoring, as well as providing the data interface to Remote Display Modules (RDM-8R and RDM-8KUD), Remote Display Drivers (RDD), and Zero Power Relay Modules (ZPR-8).

3.6.1 RIM-8

The RIM-8 input module (Figure 3-22) provides the termination and monitoring for up to eight alarm zones. Each RIM-8 will monitor up to eight (8) 2-wire Class BA non-supervised input zones, up to four (4) 2-wire Class B supervised input zones, up to four (4) 4-wire Class A supervised input zones. Diagrams of the wiring and connections for each of the monitoring techniques are given on the following pages.

Each RIM-8 can also be configured to monitor and control up to two (2) Access Control Card Readers and/or Keypads, each with request-to-exit and door contact monitoring. The type of monitoring and supervision/wiring is determined by the ZIM that is selected and installed for pair of zones.

Each RIM-8 occupies one data communication address which is set via Jumpers JA at the lower right corner of the board. The actual system address of the board is based on this address setting in conjunction with the Supervisory address of the 175C Processor Board.

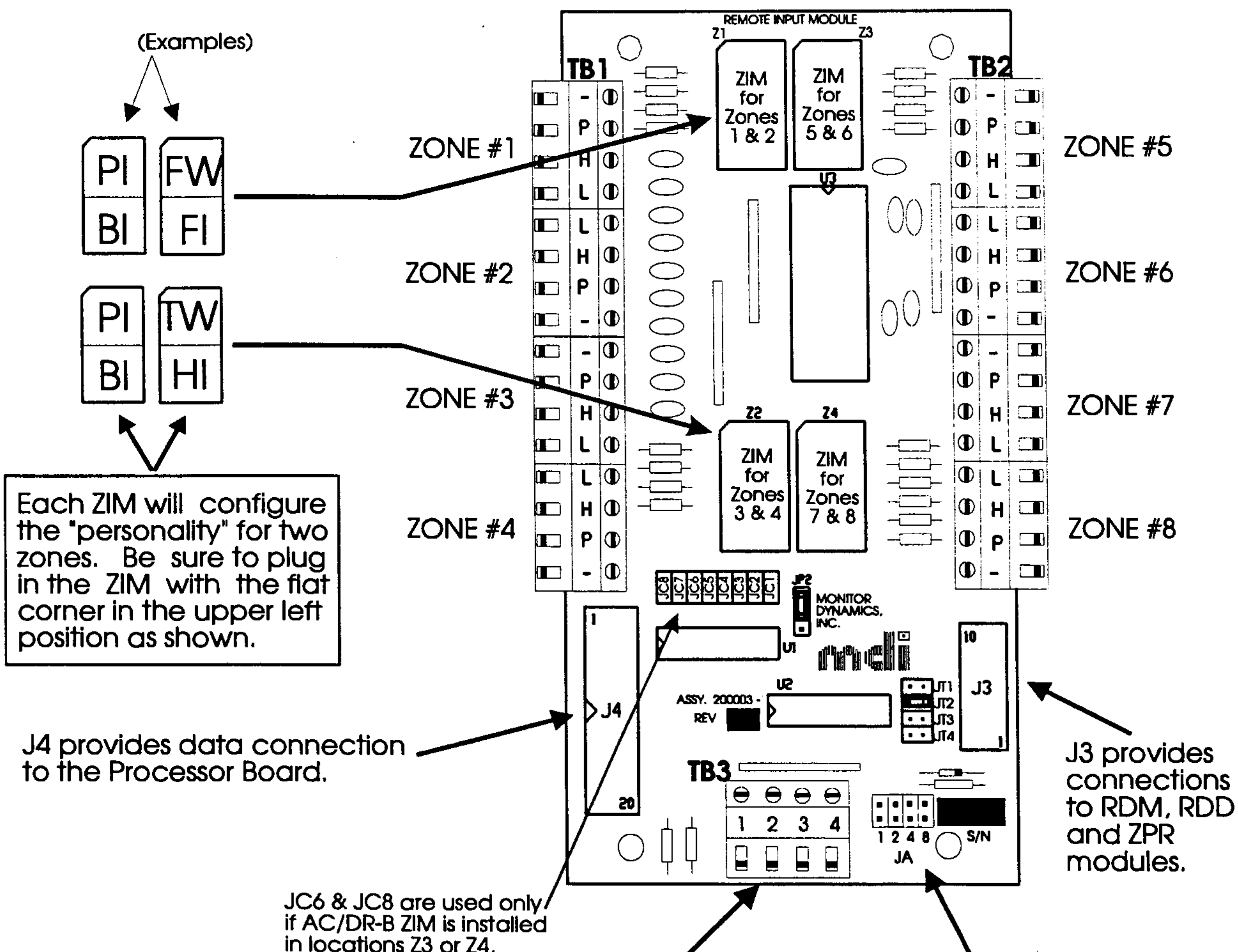
3.6.1.1 RIM-8 Addressing

The RIM-8 address is set via jumpers JA (details for address determination are in paragraph 2.5). Install jumpers on JA1, JA2, JA4, and JA8 corresponding to the address value required (see Figure 3-22). Ensure that you do not duplicate an address within the same RTU enclosure.

3.6.1.2 Zone Identification Modules, ZIM

The Zone Identification Modules (ZIM) for the RIM-8 are a 16-pin module, and are installed into each RIM as determined by the site survey. The zone identification for the eight (8) zones of each RIM-8 module are configured by using four (4) ZIM modules. Each ZIM that plugs into a RIM-8 module provides the zone "personality" for two (2) zones. While most users may standardize on 4 or 5 basic ZIM types, a wide variety of ZIMs are available to accommodate practically every protection device, circuit type or output mode. Be sure to orient the ZIM modules with the flat corner in the upper left position as shown. See Figure 3-22 for the location of each ZIM to be installed.

Remote Input Module RIM-8



TB3 Definition

Terminal 1 = Chassis Ground
Terminal 2 = Display Strobe Select
Terminal 3 = CIM-EXP Select
Terminal 4 = Arm/Disarm Buss

ZIM Locations

Z1 = ZIM Control for Zones 1 & 2
Z2 = ZIM Control for Zones 3 & 4
Z3 = ZIM Control for Zones 5 & 6
Z4 = ZIM Control for Zones 7 & 8

JA Address Jumpers

0 = none
1 = 1
2 = 2
3 = 1 & 2
4 = 4
5 = 1 & 4
6 = 2 & 4
7 = 1,2 &4
8 = 8
9 = 1 & 8
10 = 2 & 8
11 = 1,2 & 8
12 = 4 & 8
13 = 1,4 & 8
14 = 2,4 & 8
15 = 1,2,4 & 8

All other Jumpers are factory set and normally do not require any changes.

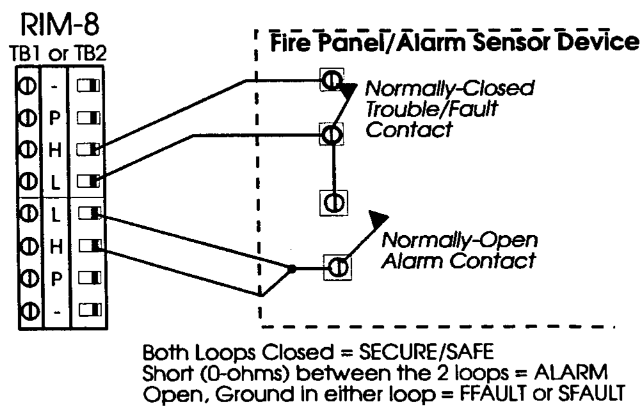
Figure 3-22. REMOTE INPUT MODULE, RIM-8

3.6.1.3 RIM-8 Alarm Input Wiring

The alarm input protection wiring is installed and connected according to the ZIM types installed in the RIM-8 module, which was determined by the site survey. Each alarm input zone(s) must be wired correctly to match the requirements of the installed ZIM type. There are 4 basic wiring and monitoring configurations as follows:

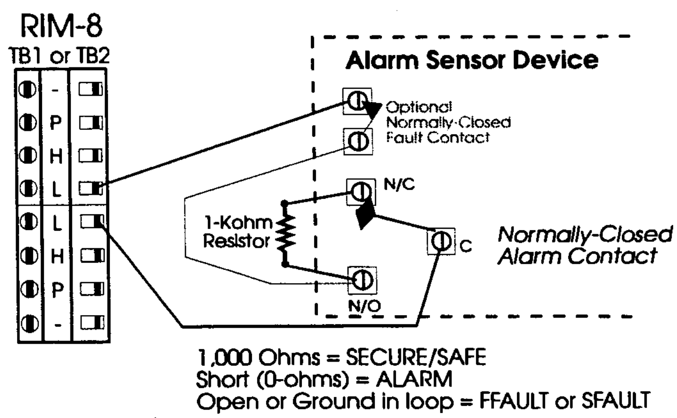
4-Wire Supervised (FW) Monitoring (CLASS A)

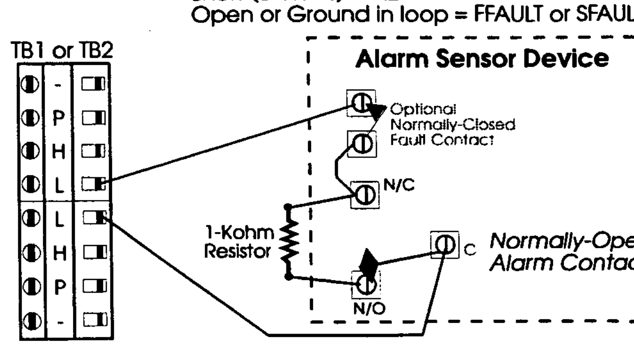
The 4-wire Supervised circuit shown is basically two (2) closed loops connected into 2 zones, with the alarm sensor connected between the 2 loops. Through firmware, line faults, opens, and grounds are reported on the odd zone as Fire Faults (FFAULT) or Security Faults (SFAULT). Alarm conditions are reported on the even zone. This circuit always utilizes two (2) inputs and may be connected to zones 1 & 2, 3 & 4, 5 & 6, or 7 & 8 depending on the ZIM placement. ZIM types might be FW/FD, FW/FI, FW/PI, FW/PS, etc. No End-of-Line, EOL, resistor is used.



2-Wire Supervised (TW) Monitoring (CLASS B)

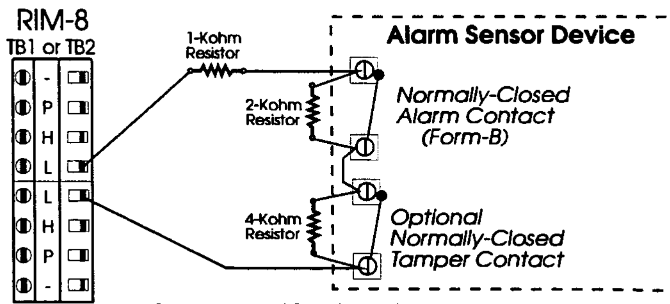
The 2-wire Supervised circuit shown is a single 2-wire loop, with EOL, connected across 2 zone inputs. This circuit may be connected to zones 1 & 2, 3 & 4, 5 & 6, or 7 & 8. Through firmware line faults, opens, and grounds are reported on the odd zone as Fire Faults (FFAULT) or Security Faults (SFAULT). Alarm conditions are reported on the even numbered zone. The circuit and sensor can be wired as a normally-closed or normally-open contact with a 1,000 ohm EOL resistor. Since "Open Circuit" is detected and reported as a fault, an optional normally-closed Fault/Tamper contact can also be wired in series with the loop. ZIM types include TW/FD, TW/FI, TW/PI, TW/PS, etc.



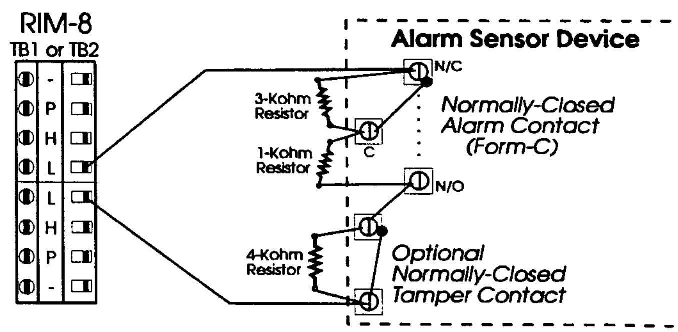


2-Wire Supervised (TS) Monitoring (CLASS B) with Separate Tamper Circuit

The 2-wire Supervised circuit shown is a single 2-wire loop, with a multiple resistance series loop including EOL and separate tamper monitoring, connected across 2 zone inputs. This circuit may be connected to zones 1 & 2, 3 & 4, 5 & 6, or 7 & 8. Through firmware, line faults, such as shorts, opens and ground faults, are reported on the odd zone as Fire Faults (FFAULT) or Security Faults (SFAULT). A separate resistance level is allocated for Circuit Tamper which is detected and reported as a HAZARD Alarm also on the odd zone. Alarm conditions are reported on the even numbered zone. The circuit and sensor can be wired as a normally-closed or normally-open contact with a 1-Kohm EOL resistor, a 2-Kohm (or 3-K for Form-C) for the alarm contact, and a 4-Kohm for the Tamper Contact. ZIM types include TS/FI, TS/HI, TS/PI, TS/BI, etc.

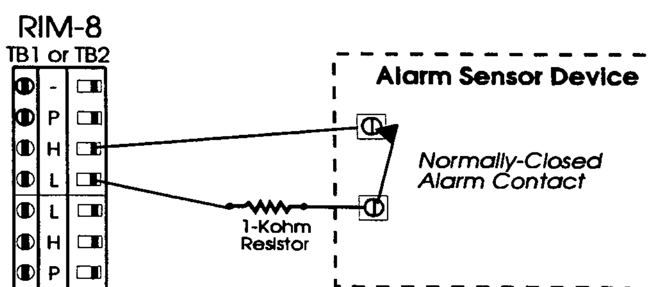


1-Kohms = SECURE/SAFE
3-Kohms = ALARM Condition
5-Kohms = TAMPER/HAZARD Condition
Short (0-ohms) = SFAULT or FFAULT
Open Circuit = SFAULT or FFAULT
Ground In Circuit = SFAULT or FFAULT

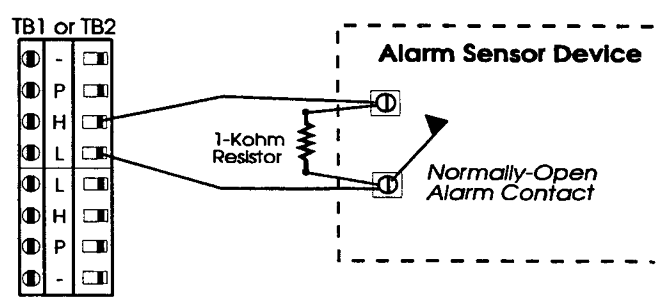


2-Wire Non-Supervised Monitoring (CLASS AB)

The 2-wire Non-Supervised circuit shown is a single 2-wire loop, with EOL, connected across a single zone. This monitoring technique can be used on any one of the eight zones of the RIM. Devices may be either normally open or normally closed and detects and report opens, shorts, and grounds as alarm conditions, with 1-Kohm as the secure condition. ZIM types may include HI, HS, PI, PS, MS, SP, etc. Two single zone types must be defined for each ZIM ordered (i.e. PI/PI or PI/HI, etc.).



1,000 Ohms = SECURE/SAFE
Short, or Open, or Ground = ALARM



3.6.1.4 RIM-8 Arming Control

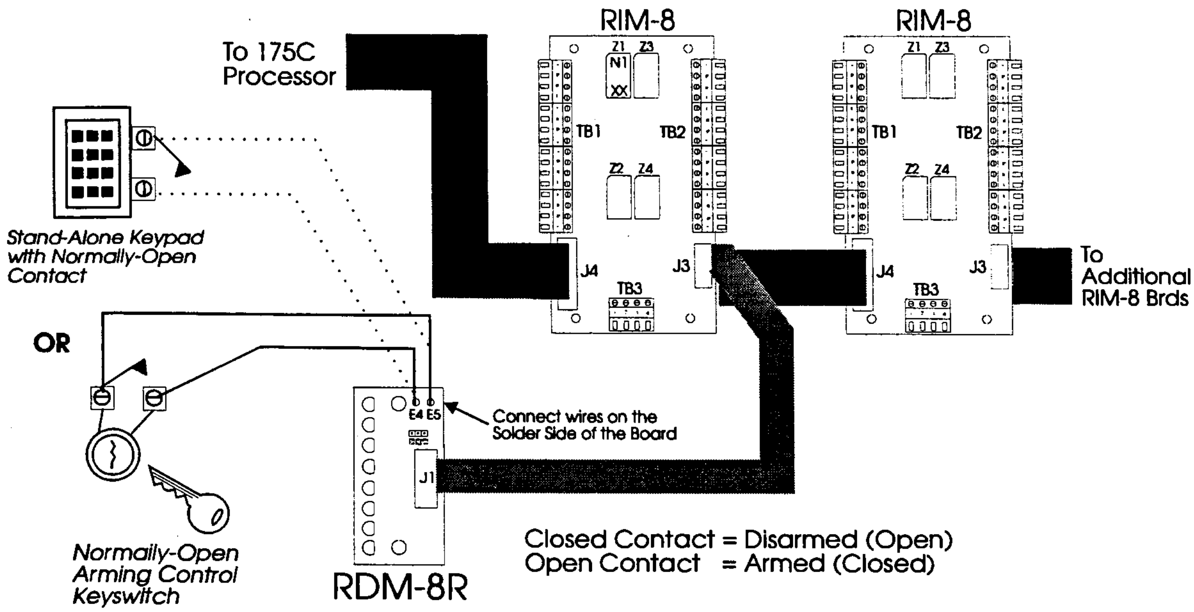
Arming control is used for the opening and closing (arm/disarm) of accounts, or areas of the facility at certain times of the day. When an area or account is Open (disarmed), any Intrusion/Burglar alarm zones (BI and ED ZIMS) on that same RIM-8 are disabled and will not report. All other alarm types will still report. The arm/disarm command is applied to Intrusion zones on subsequent RIM boards as well until the processor sees another arming control ZIM installed, or the last RIM in that RTU enclosure. The opening and closing of the areas can be performed by one of three (3) different methods:

A. SIMPLE Arming - Arming and Disarming is performed via a contact closure, such as a Keyswitch or a simple keypad with a locally programmed code that, when entered correctly, activates a relay. This type of Arming Control is selected with an N1 ZIM, or a TW/S1 ZIM, with up to eight (8) ZIMs with keyswitches or keypads supported per RTU-190/200. Up to four (4) per RTU-100. The N1 ZIM provides for direct connection of the Switch to an RDM-8R display module, which is connected to the same RIM where the applicable ZIM is installed. The TW/S1 ZIM provides for supervised connection of the same type of Switch or Contact to the RIM board across input zones #1 and #2. This is a much simpler connection and provides detection and reporting of wiring Faults as well as Arming Control. See Figure 3-23 for details of both ZIM and connection types.

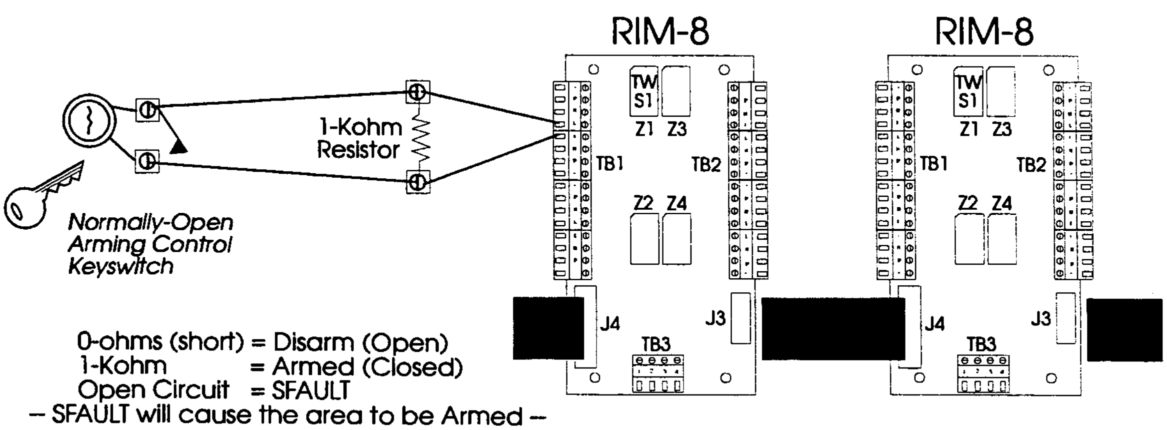
B. SOFT USER ID Control - Arming is controlled with up to 99 User ID Codes, each with 5-digits, programmed at the Host CPU and downloaded to the RTU memory. To arm or disarm an area/account, a valid User ID code must be entered at the keypad assigned as the Arming Station for the same account as the applicable Open/Close input zone. Arming Station keypads can be an RDM-8KUD connected directly to the applicable RIM (Figure 3-28), a DCP connected via an RDD (paragraph 3.7.4.1 and Figure 3-31), or an ACT-5 Station connected RS-485 to a FIM board (see the ACT-5 installation manual). These types of arming control require an N2, S2, or S5 (ACT-5 only) ZIM.

C. COMPUTER CONTROLLED - This type of Arming control is based on commands from the Host Computer System. It can used with any type of arming control ZIM and does not necessarily require keyswitches, keypads or arming stations. The Arm/Disarm commands are manually or automatically generated and sent to the RTU by the Host CPU.

The drawing below illustrates the connections required for switch/contact closure type arming control the RTU.



Arming Control with Switch Closure connected to the RDM-8 Module using N1 ZIM.



Arming Control with Switch Closure connected to Supervised Input Zone #1. TW/S1 ZIM provides for switch to be connected across 1-Kohm EOL.

Figure 3-23. ARMING CONTROL VIA SWITCH/CONTACT CLOSURE

3.6.2 RIM-16

The RIM-16 input module (Figure 3-24) provides the termination and monitoring for up to eight (8) 2-wire supervised alarm zones. Each RIM-16 actually includes 16 alarm inputs, however it supports ONLY 2-Wire supervised alarm point monitoring, and therefore will monitor up to eight (8) supervised input zones. Diagrams of the wiring and connections are given on the following pages.

A major advantage of the RIM-16 is that each RIM-16 board can be configured, with the proper ZIMs, to monitor and control up to four (4) Access Control Card Readers and/or Keypads, each with request-to-exit and door contact monitoring. With Special Firmware Options enabled and the proper configuration of ZIMs, the RIM-16 can also be configured to monitor and control eight (8) Card Readers from a single board. This configuration, however, uses four (4) addresses and can access only zones 5-8 of each of the four addresses for access control reader, REX and door monitoring. The REX and door contact monitoring from any reader can be wired to the RIM board in the RTU enclosure, or wired locally at the reader interface

Each RIM-16 occupies a minimum of two (2) data communication addresses with the starting, or base address (always an even number) set via Jumpers JA at the lower right corner of the board. The actual system address of the board is based on this address setting in conjunction with the Supervisory address of the 175C Processor Board.

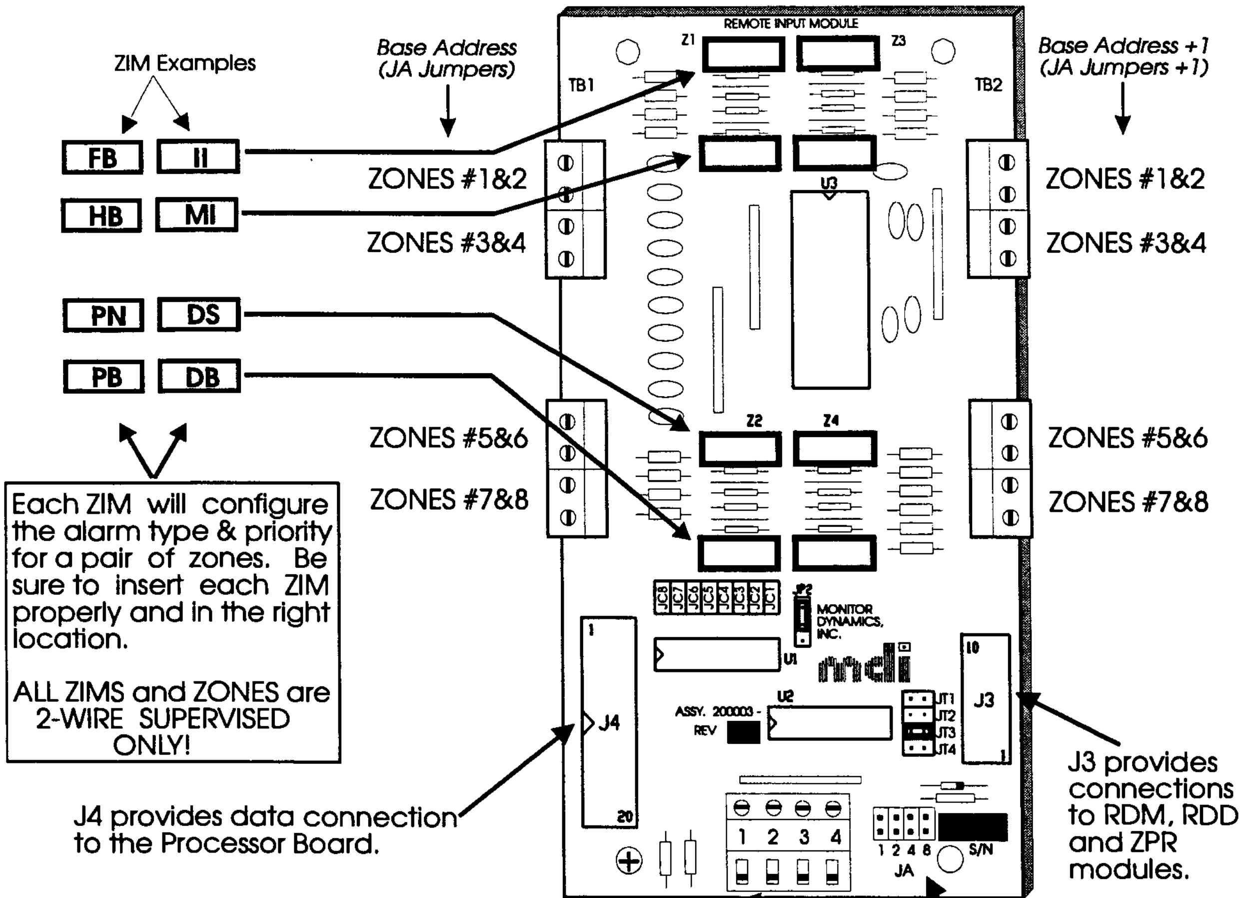
3.6.2.1 RIM-16 Addressing

The RIM-16 starting/base address is set via jumpers JA (details for address determination are in paragraph 2.5). Install jumpers on JA1, JA2, JA4, and JA8 corresponding to the address value required (see Figure 3-24). Since the RIM-16 uses a minimum of two addresses, the starting/base address is set on the jumpers with the subsequent addresses automatically allocated to the jumper JA settings +1, +2 , and +3, as applicable. Ensure that you do not duplicate an address within the same RTU enclosure.

3.6.2.2 Zone Identification Modules, ZIM

The Zone Identification Modules (ZIM) for the RIM-16 are a 2-pin module, and are installed into each RIM as determined by the site survey. The eight (8) 2-wire supervised zones of each RIM-16 module are configured as far as zone identification and priority by using eight (8) ZIM modules, one for each of the supervised zones. Each ZIM that plugs into a RIM-16 module provides the zone identification, or "category", for that supervised zone (2 inputs). While most users may standardize on 4 or 5 basic ZIM types, a wide variety of ZIMs are available to accommodate practically every type of protection device (see Table 2-4). Ensure that both pins of the ZIM module are fully inserted into the socket in the positions shown in Figure 3-24.

Remote Input Module RIM-16



TB3 Definition

Terminal 1 = Chassis Ground
Terminal 2 = Display Strobe Select
Terminal 3 = CIM-EXP Select
Terminal 4 = Arm/Disarm Buss

JA Address Jumpers

(Must be even #)
0 = none
2 = 2
4 = 4
6 = 2 & 4
8 = 8
10 = 2 & 8
12 = 4 & 8
14 = 2,4 & 8

ZIM Locations

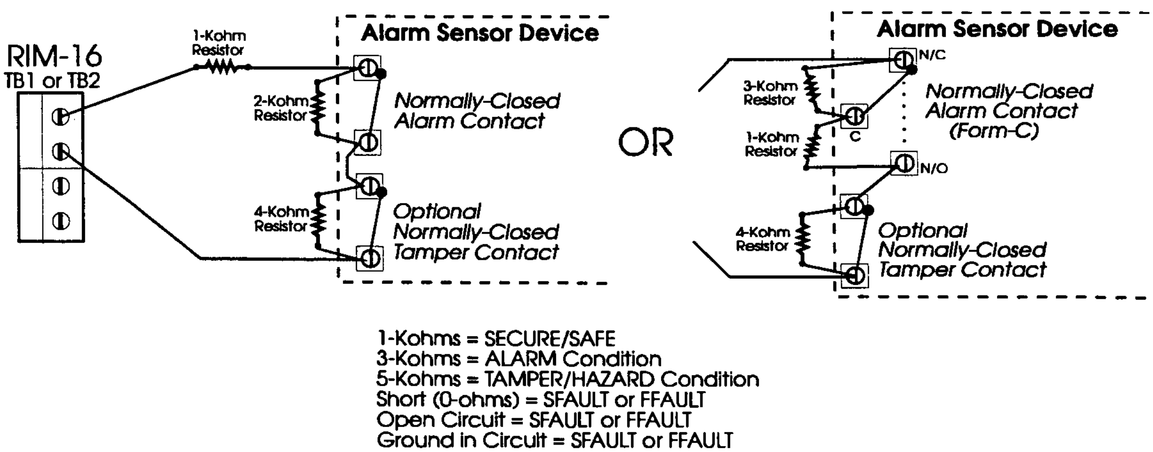
Z1 = ZIM Control for Base Address Zones 1 & 2
Under Z1 = ZIM Control for Base Address Zones 3 & 4
Z2 = ZIM Control for Base Address Zones 5 & 6
Under Z2 = ZIM Control for Base Address Zones 7 & 8
Z3 = ZIM Control for Base Address+1 Zones 1 & 2
Under Z3 = ZIM Control for Base Address+1 Zones 3 & 4
Z4 = ZIM Control for Base Address+1 Zones 5 & 6
Under Z4 = ZIM Control for Base Address+1 Zones 7 & 8

All other Jumpers are factory set and normally do not require any changes.

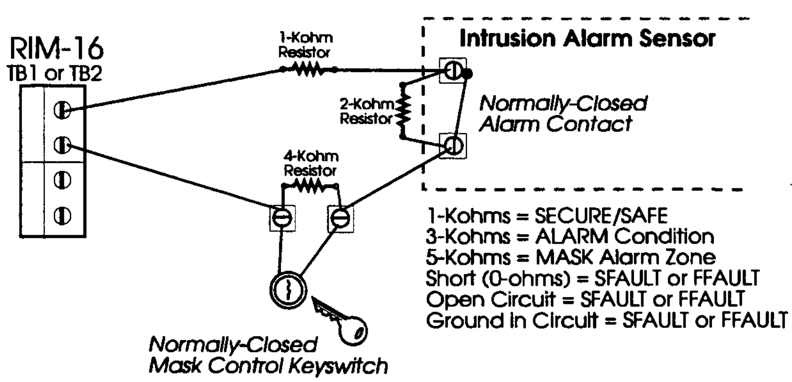
Figure 3-24. REMOTE INPUT MODULE, RIM-16, CONFIGURATION

3.6.2.3 RIM-16 Alarm Input Wiring

The alarm input protection wiring is installed and connected in the same manner for all alarm monitoring ZIM types installed in the RIM-16 module. The RIM-16 provides ONLY 2-wire fully supervised alarm circuits with a separately monitored and reported tamper circuit, if desired. This monitoring technique will report Alarm Conditions on the EVEN numbered zones (2, 4, 6, or 8), and the Fault (SFAULT or FFAULT) conditions and circuit Tamper (HAZARD) conditions on the ODD numbered zones (1, 3, 5, or 7). The wiring for each monitoring circuit requires three resistors connected in series, such that the 1-Kohm serves as the normal End-of-Line (EOL), a 2-Kohm (or possibly 3-Kohm with a Form-C contact) across the Alarm Sensor Contact, and a 4-Kohm across the normally-closed Tamper Contact. If the Tamper circuit is not required, simply delete the 4-Kohm resistor from the wiring requirements.



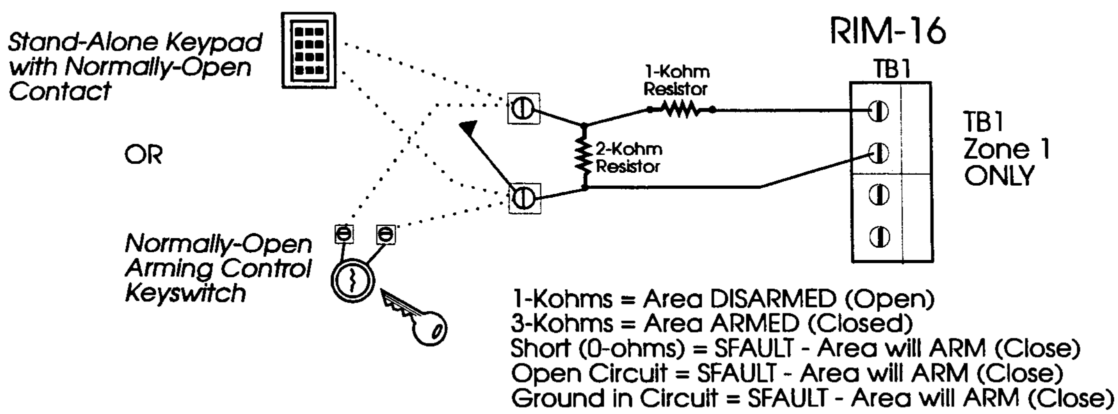
The RIM-16 also supports a SPECIAL ZIM which is used to provide a local, Hard-Wire Mask Control through the use of a local Keyswitch or contact closure. The ZIM is labeled "MI" (see Table 2-4), and the wiring is exactly the same as above except that the Tamper Circuit is replaced with "Mask Control" contact. The system interprets the 5-Kohm condition, turning the keyswitch to the open position, into an "Apply Mask" command. When the circuit is returned to the 1-Kohm Safe condition by returning the keyswitch to the closed position, the mask is removed.



3.6.2.4 RIM-16 Arming Control

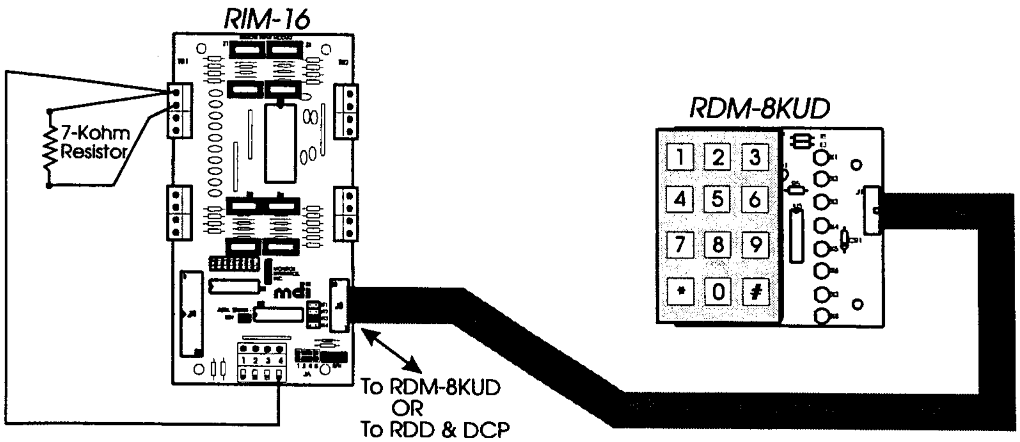
The RIM-16 Board also provides for Arming Control to be used for the opening and closing (arm/disarm) of accounts, or areas of the facility at certain times of the day. Arming Control with the RIM-16 board is selected by one of two (2) Arming Control ZIMs; the "AN" ZIM, which is non-reporting Arming Control, and the "AS" ZIM, which is the reporting version of Arming Control. The method and/or hardware used to initiate the opening and closing of the areas is selected by the installation and wiring that is installed, with the system sensing the resistance value that is connected across the alarm input termination points. Arming Control can be performed by one of three (3) different methods:

A. SIMPLE Arming (Contact Closure) - Arming and Disarming (Open/Close)is performed via a contact closure, such as a Keyswitch or a simple keypad with a locally programmed code that, when entered correctly, activates a relay. This type of Arming Control is supported by both the "AN" or the "AS" ZIM, and will support up to four (4) keyswitches or keypads per RTU-100/190/200 with only one ZIM per RIM-16 board installed in the Z1 (upper left) location. The interface wiring is completely supervised in order to monitor and report line fault conditions (SFAULT) if the input detects a Short, Open, or Grounded Circuit condition. If a Fault is detected, the area will automatically be forced to an ARMED (Closed) condition, if it is not already in that state. The input zone wiring used to select this type of Arming is as follows:

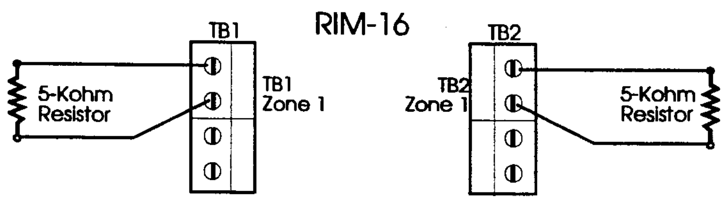


B. SOFT USER ID Arming Control - Arming is controlled with up to 99 User ID Codes, each with 5-digits, programmed at the Host CPU and downloaded to the RTU memory. To arm or disarm an area/account, a valid User ID code must be entered at the keypad assigned to that account as the Arming Station. Arming Station keypads can be an RDM-8KUD attached directly to the RIM-16, or a remote DCP connected to an RDD, which is connected directly to the RIM-16. This type of Arming Control is supported by both the "AN" or the "AS" ZIM, and will support up to four (4) remote keypads per RTU-100/190/200 with only one ZIM per RIM-16 board installed in the Z1 (upper left) location.

This type of Arming Control is selected by simply installing a 7-Kohm resistor across the input connections of Zone #1 (top left pair of connectors on TB1), along with a single wire connection from the top terminal of TB1 to the terminal TB3-4. The input wiring is also supervised to detect and report line Faults (Short, Open, Ground), which will also force the area closed (armed). The input zone wiring used to select this type of Arming is as follows:



C. ACT-5 ARMING STATION Control - Arming is controlled through the use of the MDI ACT-5 Arming Stations which are interfaced to the RTU via FIM boards. The ACT-5 units operate on the same premise as Soft User ID, except the ACT-5 units are "smart" stations in remote locations communicating to the RTU via RS-485 to a FIM board. This Arming Control technique will support up to eight (8) ACT-5 Arming Stations with two (2) arming ZIMs allowed per RIM-16, one in each of the top two locations (Z1 and Z3). ACT-5 Arming Control is selected by installing a 5-Kohm resistor across the Zone #1 input. Installation and operation of the ACT-5 units is detailed in the MDI ACT-5 Operations Manual. The input zone wiring used to select ACT-5 Arming is as follows:



All of these arming techniques will also support COMPUTER CONTROLLED Arming. This type of Arming control is based on commands from the Host Computer System, and will function with or without keyswitches, keypads or arming stations. The Arm/Disarm commands are manually or automatically generated and transmitted to the RTU by the Host CPU.

Remember that, when in the "DISARMED" mode, intrusion zones (II, IE, and MI ZIMs) are disabled. All remaining alarm zones are monitored and reported. In the "ARMED" mode, all alarm zones are monitored and reported.

3.7 OTHER OPTIONAL RTU FUNCTION MODULES

There are numerous additional function modules which can be added to the RTU panel's configuration depending on the requirements of the site, such as alarm point LED Display Panels, Arming Control Keypads, Card Access Control Interface Modules, and even expanded local memory to allow for increased storage memory for cardholder records. The following pages, paragraphs, and figures will serve to describe the functionality and installation requirements for these optional add-on modules.

3.7.1 RDM-8R Remote Display Module

The RDM-8R Remote Display Module (Figure 3-25) is a small, eight (8) zone LED display device that mounts on the front door of the RTU enclosure, typically with the LEDs showing through the enclosure door. For service personnel, RDM's have also be installed on the enclosure door with the LED's facing in, so as not to compromise security. The RDM-8R provides eight (8) bright red LED's and connects directly to the RIM-8 or RIM-16 module, or via an RDD or ZPR Relay board. This serves to provide a real time status display of the alarm input zones for the RIM it is connected to, or of the Relay Outputs linked to that RIM, right there at the RTU without having to call the Control Center to get the status. The RDM-8R connection is via a 10-conductor ribbon cable that is permanently attached to the RDM. Each RTU can contain one RDM-8R for each RIM within the enclosure. Jumpers E1, E2 and E3 are set whether the RDM will display alarm zone status or ZPR Relay Output status. When the RDM-8R is connected to a RIM-8, each LED corresponds to the one of the eight input zones of the RIM-8 board. If the RDM-8R is connected to a RIM-16, the LEDs will correspond to the EVEN numbered alarm zones only. This is because the RIM-16 actually has 16 input zones, however the board supports ONLY 2-wire supervised monitoring, reporting FAULT conditions on the odd numbered zones and ALARM conditions on the even numbered zones are the alarm conditions for each zone pair. Only Alarms are displayed with the RIM-16. See Figure 3-26.

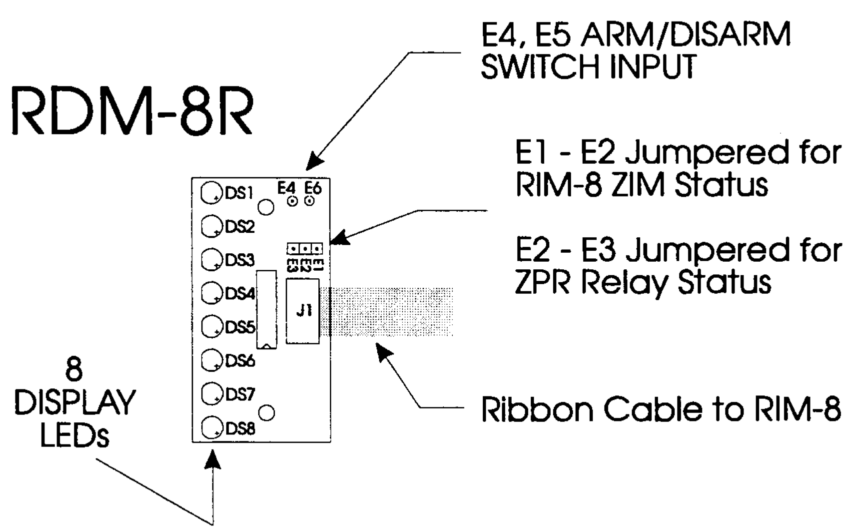


Figure 3-25. RDM-8R REMOTE DISPLAY MODULE

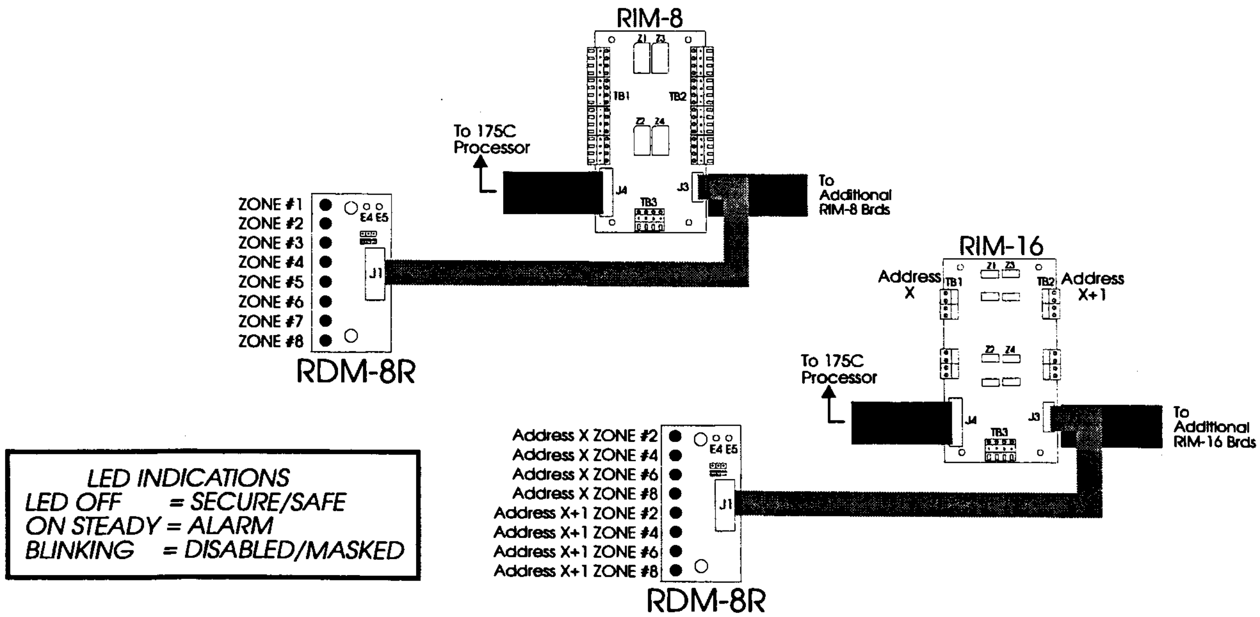


Figure 3-26. RDM-8R REMOTE DISPLAY MODULE CONNECTION

3.7.2 RDM-8KUD Remote Display Module with User ID Keypad

The RDM-8KUD (Figure 3-27) is an eight (8) zone, LED status display device in conjunction with a 12-key digital keypad. The LED display portion of the RDM-8KUD looks and functions exactly the same as the RDM-8R, showing the real-time status of the eight (8) alarm input zones of the RIM board it is attached to. The Keypad is used as the Arming Station to Arm and Disarm (Enable and Disable) the Intrusion/Burglar alarm zones of the attached RIM (and subsequent RIMs as applicable).

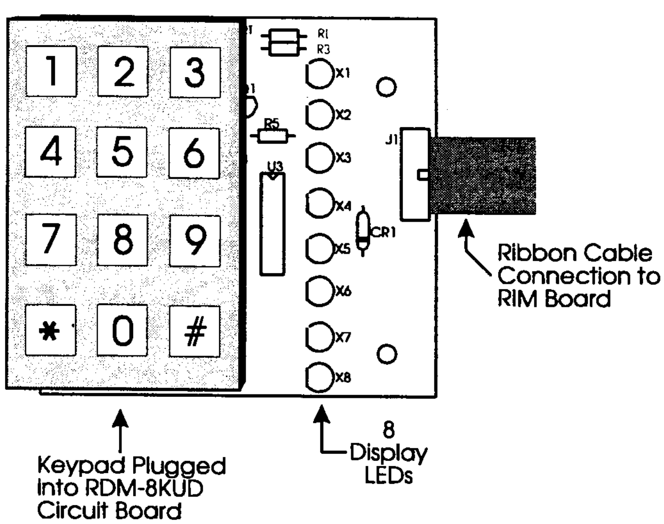


Figure 3-27. RDM-8KUD REMOTE DISPLAY MODULE With KEYPAD

The RDM-8KUD connects directly to a RIM-8 or RIM-16 with a 10-conductor ribbon cable and mounts to the front door of the RTU enclosure with the Keypad on the outside of the door and the circuit board on the inside the door. The Status LEDs and Keypad connectors protrude through holes in the enclosure door to allow for the mounting and connecting of the keypad and to view the LEDs while the door is closed.

Use of the Keypad for Arm/Disarm (Open/Close) requires an "S2" ZIM for the RIM-8, or an "AN" or "AS" ZIM in the case of the RIM-16, installed in the Zone #1 (Z1) ZIM location (upper left ZIM socket). The RTU firmware and System parameters for the account being controlled by the keypad must be configured for SOFT USER ID. The Arm/Disarm (Open/Close) function is performed by entering the user's 5-digit User ID code, which is programmed and configured at the Host CPU and then downloaded to the RTU. A single RDM-8KUD, with appropriate Arming Control ZIM, can be used to Arm and Disarm the entire RTU, unless additional keypads and arming ZIMs are installed on subsequent RIM boards. The Arm/Disarm command will be applied to all RIMs and input zones, of that RTU, that are subsequent to that of the Arming ZIM, and will stop when it sees the end of the RTU or another Arming Control ZIM.

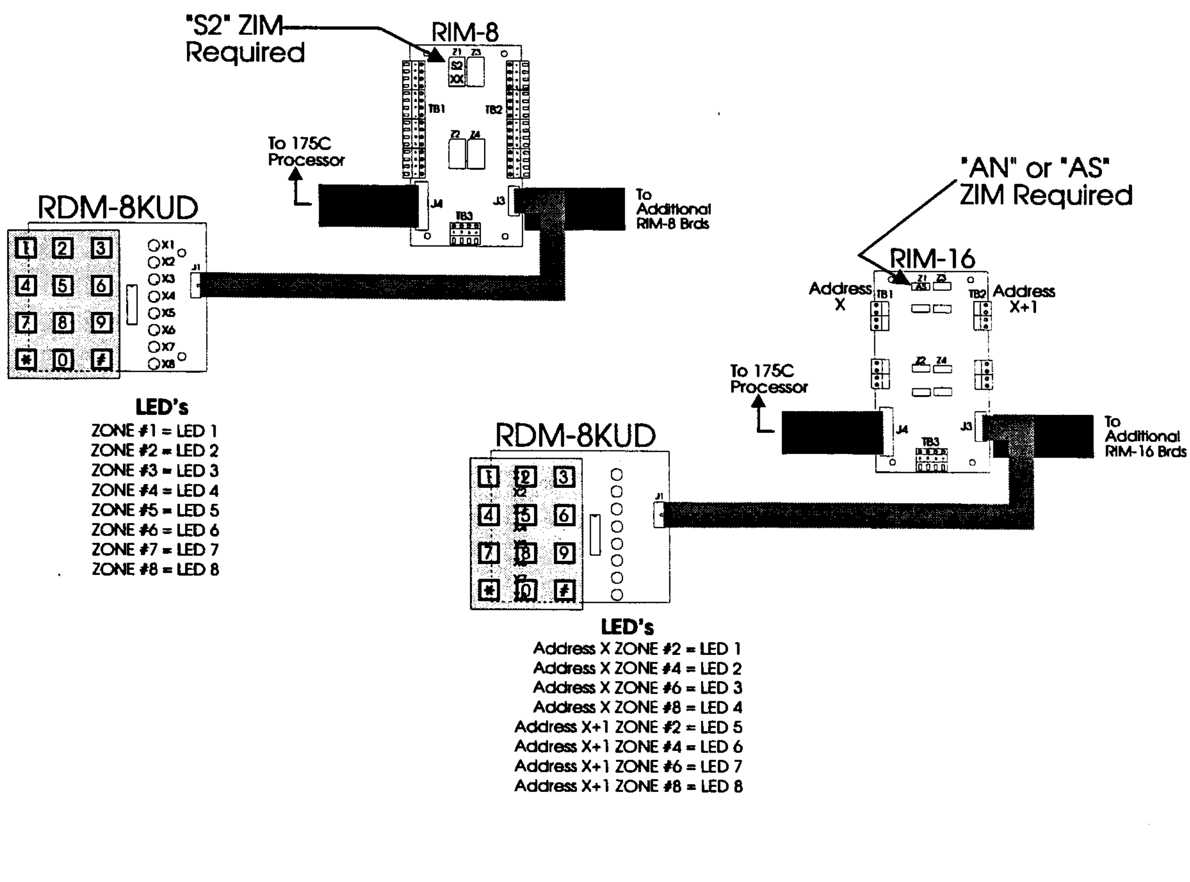
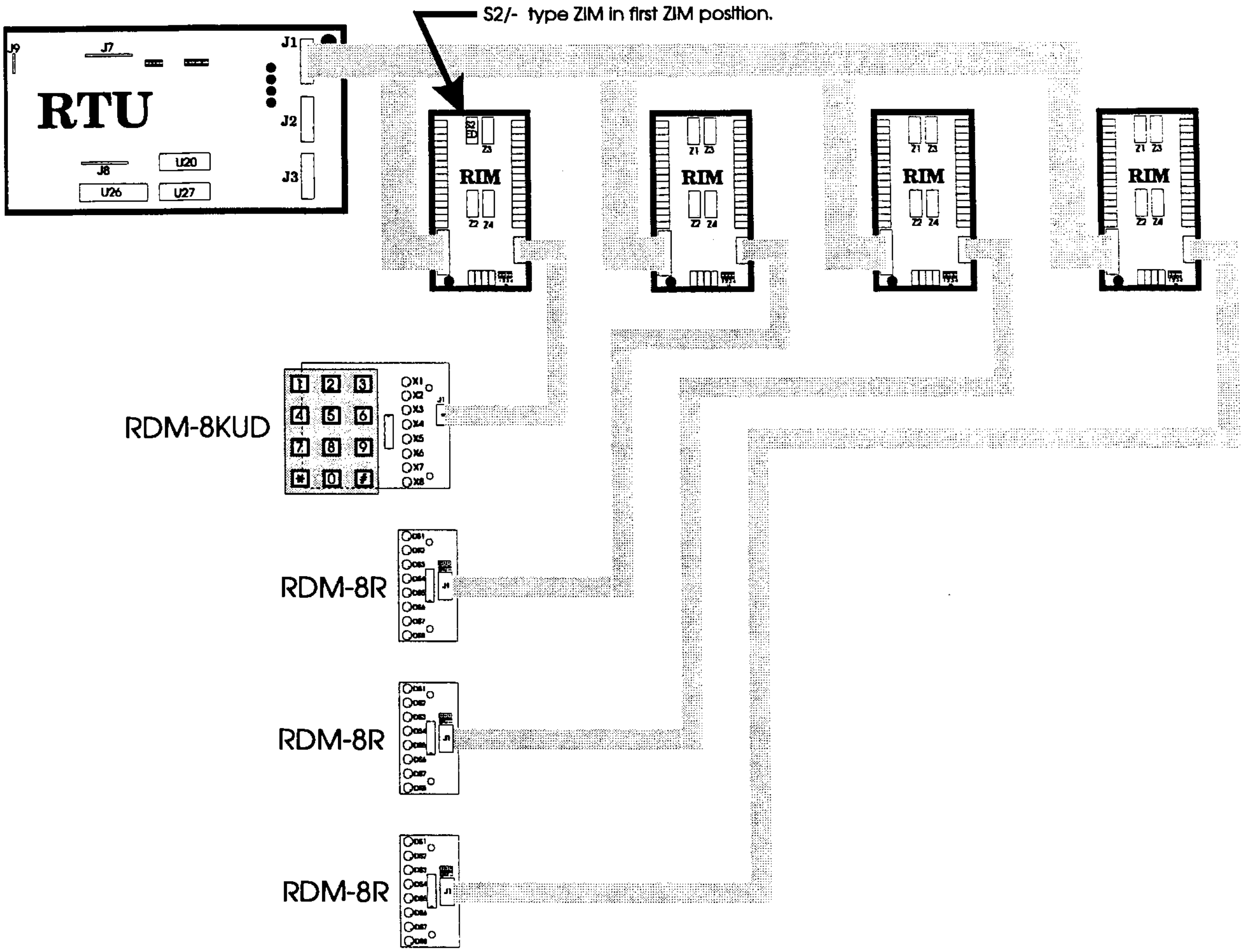


Figure 3-28. RDM-8KUD CONNECTIONS



This illustration shows a single S2 ZIM and Keypad controlling all four RIM's. By adding a second S2/- ZIM to the first position of the third RIM-8, the keypad would then control only the first 16 zones (first two RIM-8s), and the last 16 zones would be controlled from the SAFEnet System console via commands.

The RDM-8R displays can also be connected directly to a ZPR-8 (ROM) or a ZPR-8R (ROAM) module, or an RDD module.

This illustration is a sample configuration shown using RIM-8 Boards, however RIM-16 boards, with appropriate ZIMs, could also be used in the same configuration.

Figure 3-29. REMOTE DISPLAY MODULES SYSTEM DIAGRAM

3.7.3 Display Control Panel (DCP) and Extension Panel (DEP)

In some installations, requirements will exist to have an LED status display panel and/or an Arming Control station at a remote location away from the RTU panel, such as right on the wall adjacent to the entrance door of a special secured area. This type of installation would allow the immediate viewing of the status of the area from outside the door, or to Arm and Disarm the area prior to entering that area. You certainly don't want to install an RTU with an RDM-8KUD in this location, therefore, this type of installation requirement can be accommodated with the use of remote Display Control Panels (DCP) and/or Display Extension Panels (DEP) that interface to the RTU via the Remote Display Driver (RDD) module.

The Display Control Panel (DCP) is an Arming Control Station with integrated LED Status Display in an esthetically pleasing package also made to flush mount into the wall in public areas and hallways (see Figure 3-31). The DCP includes a 12-key digital keypad for Soft User ID Arming Control, along with an eight (8) LED status display panel in the DCP-8, or a sixteen (16) alarm zone LED status display panel in the DCP-16. The DCP connects and interfaces to the RTU panel via the RDD module. One or more DCPs can be used for Arming Control with the same RTU depending on the configuration of the RIM and the RDD modules (see Figures 3-30 and paragraph 3.7.4.1).

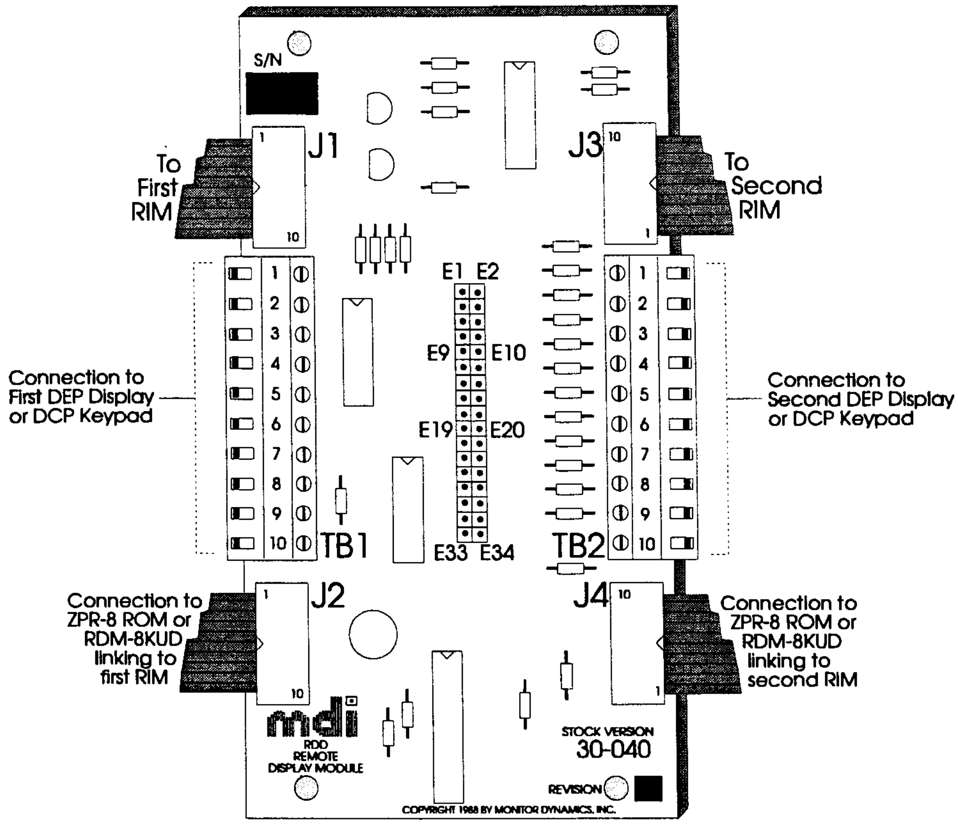
The Display Extension Panel (DEP) is simply an Alarm Status Display panel for 8, 16, 24, or 32 alarm zones in an esthetically pleasing package made to flush mount into the wall in public areas and hallways. The DEP module includes up to 32 LEDs in columns of eight (8) and connects/interfaces to the RTU via the RDD module (see Figure 3-32). The RDD will display the alarm zone status for up to four (4) RIM boards, and can be used as a standalone device or in conjunction with a DCP.

3.7.4 Remote Display Driver (RDD)

The Remote Display Driver (RDD) module provides the interface link between the RIM boards in the RTU and the DEP display and/or DCP keypad devices at the remote locations. The RDD mounts inside the RTU enclosure, normally right below the associated RIM board(s), and is connected to the RIM board(s) via a ten-conductor ribbon cable. The RDD includes numerous jumpers which are used to select several configuration/operational options available on the board (see Figure 3-30). The RDD can interface up to two (2) RIM-8 or RIM-16 modules with two (2) DEP display panels or two (2) DCP keypad/display panels allowing the display and/or control of up to sixteen (16) alarm zones. In order to display the status for 32 alarm zones on a single DEP device, two (2) RDD modules would be required and would be wired and interfaced together in a manner to display on a single 32-zone DEP (see Figure 3-32).

The RDD provides for several interface options for Arming Control and status display with DCP panels, depending on how many RIMS, Arming Control ZIM's and DCP's are used. Since the RDD is the interface between up to two (2) RIM boards and up to two (2) DCP modules, up to two (2) Arming Control <u>SYSTEMS</u> can be connected and controlled with one RDD.

Remote Display Driver (RDD-2)



RDD JUMPER SETTINGS

E01 to E02	USER ID Arm/Disarm. Install for ALL configurations using the DCP-8/16U.
E03 to E04	Not Used.
E05 to E06	Not Used.
E07 to E08	Not Used.
E09 to E10	USER ID Arm/Disarm. Install for ALL configurations when using the DCP-8/16U.
E11 to E12	Not Used.
E13 to E14	USER ID Arm/Disarm. **ONE System**. 1 or 2 RIMs & 2 DCP's. Link 2nd DCP to 1st RIM.
E15 to E16	Not Used.
E17 to E18	Not Used.
E19 to E20	RIM One Data. 1 System, 2 DCPs. Display 1st RIM to 2nd DCP as LEDs 1 thru 8.
E21 to E22	RIM Two Data. 2 Systems, 2 DCPs. Display 2nd RIM to 2nd DCP as LEDs 1 thru 8.
E23 to E24	Not Used.
E25 to E26	RIM Two Data. 1 or 2 Systems. Display 2nd RIM to 1st DCP as LEDs 9 thru 16.
E27 to E28	RIM One Data. Display 1st RIM to 1st DCP as LEDs 9 thru 16.
E29 to E30	RIM One Data. 2 Systems. Display 1st RIM to 2nd DCP as LEDs 9 thru 16.
E31 to E32	User ID Arm/Disarm. **TWO systems**. 2 RIMs & 2 DCPs, w/separate Arming Control.
E33 to E34	RIM Two Data. 1 System. Display 2nd RIM to 2nd DCP as LEDs 9 thru 16.

Figure 3-30. REMOTE DISPLAY DRIVER & JUMPERS

3.7.4.1 RDD Configuration Options

As shown in Table 3-1 below, the RDD allows the flexibility to configure how the DCP panels will be used, with options varying from one DCP controlling one or two RIM's, or two DCP's both controlling the same one or two RIM's, or two DCP's each controlling separate RIM's.

AVAILABLE RDD CONFIGURATIONS

# of RIM Boards	# of Arming Control Systems	# of DCP Panels
1	1	1
1	1	2
2	1	1
2	1	2
2	2	2

Table 3-1. RDD and DCP INTERCONNECT CONFIGURATIONS

Since a single Arming Control ZIM can actually apply to, and control, more than two RIM boards (possibly the entire RTU), a DEP can be connected to display the remaining zones that are not displayed on the DCP LED's.

The jumpers on the RDD are used to configure whether one or two Arming Control SYSTEMS are in use with the RDD, and to specify where the alarm zones of which RIM are to be displayed on the LEDs of each DCP. Since the DCP can include 8 or 16 LED's for alarm zone status, the jumpers allow for the configuration of which RIM's alarm zones will be displayed on which column of LED's on which DCP. Refer to Figure 3-30 for a complete description of all the jumpers on the RDD module.

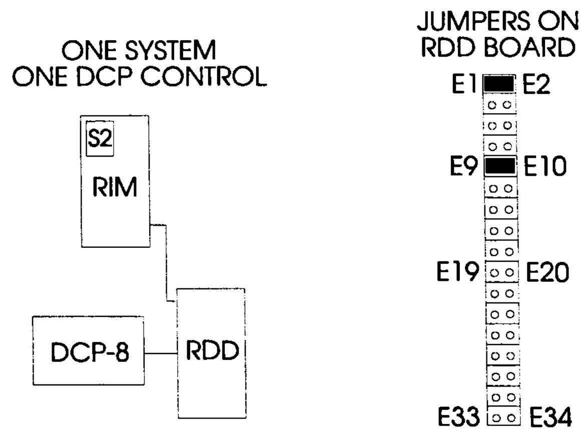
The RDD to DCP-8/16 connection is via a 10 conductor, 22-gauge cable connected pin-to-pin from TB1 or TB2 of the RDD, to TB1 of the DCP. A U.L. 2576 style cable is recommended. See Figure 3-31 for pin-to-pin connections. If more than one DCP-8/16 is desired to perform the same function, the DCP's may be connected in parallel. Distance limits must be taken into account if DCP-8/16s are connected in parallel.

The following paragraphs will serve to provide further configuration details and connection illustrations for the different RDD to DCP configurations.

The examples below are shown with an "S2" ZIM in the RIM board for Arming Control, however, RIM-16 boards with an "AN" or "AS" ZIM could also be used.

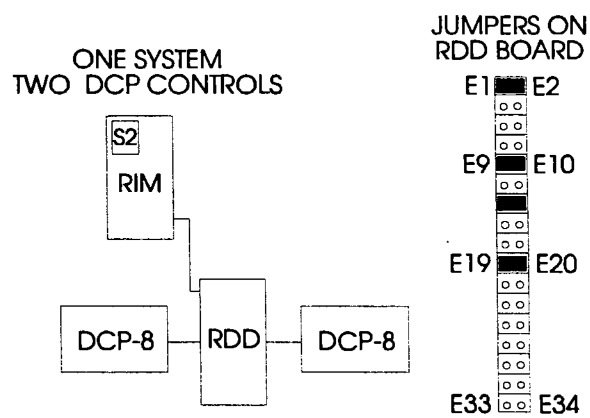
1. One RIM-8/16, One DCP-8UD Arming Station.

   Jumper E1 to E2 and E9 to E10. Use J1 on RDD module for RIM-8 input. Use TB1 on RDD module for DCP-8. Single Arming Control System for one RIM. LED's on the DCP-8 will display status of alarm zones 1 thru 8 with a RIM-8, or only the even numbered alarm zones (2,4,6,8) for each address when using a RIM-16.



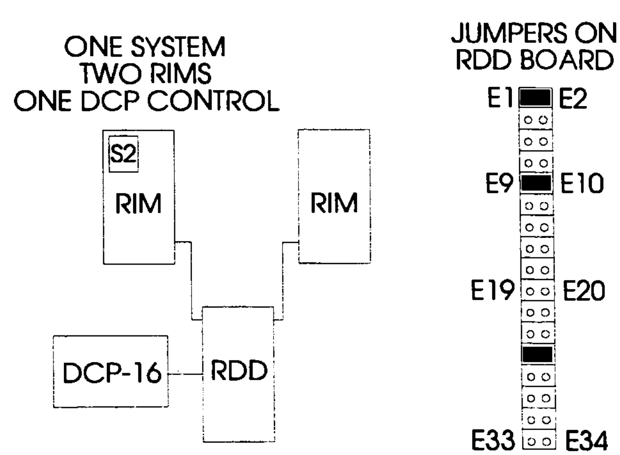
2. One RIM-8/16, Two DCP-8UD Arming Stations, both controlling the same RIM.

   Jumper E1 to E2, E9 to E10, E13 to E14, and E19 to E20. Use J1 on RDD module for RIM input. Use TB1 for first DCP-8 and TB2 for second DCP-8. Single Arming Control System for one RIM with two Arming Stations. Jumpers shown are set for the LED's on both DCP's to display alarm zones 1 thru 8 for a RIM-8 board or the even numbered zones for a RIM-16.

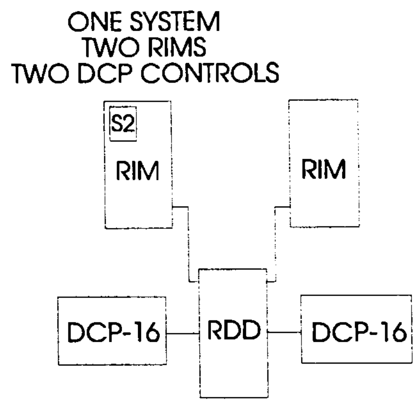


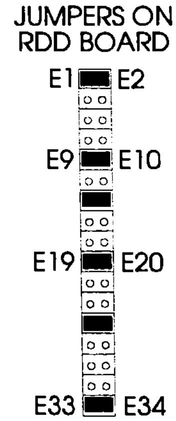
3. Two RIM-8/16's, One DCP-16UD Arming Station controlling both RIM's.

   Jumper E1 to E2, E9 to E10, and E25 to E26. Use J1 on RDD module for first RIM and J3 on RDD for second RIM. Use TB1 on RDD-2 module for DCP-16. Single Arming Control System controlling both RIM's. Jumpers shown will display the first RIM alarm zones as 1 thru 8 on the DCP, and the second RIM's zones as 9 thru 16 (using RIM-8 boards). If RIM-16 boards are used, only the even numbered zones are displayed.



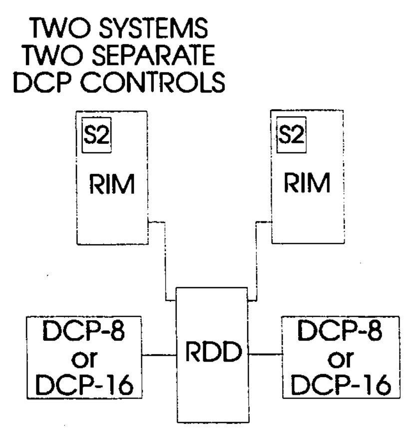
4. Two RIM-8/16's, Two DCP-16UD Arming Stations, both controlling the same two RIM boards.

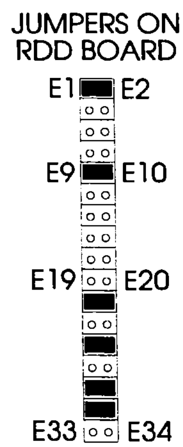




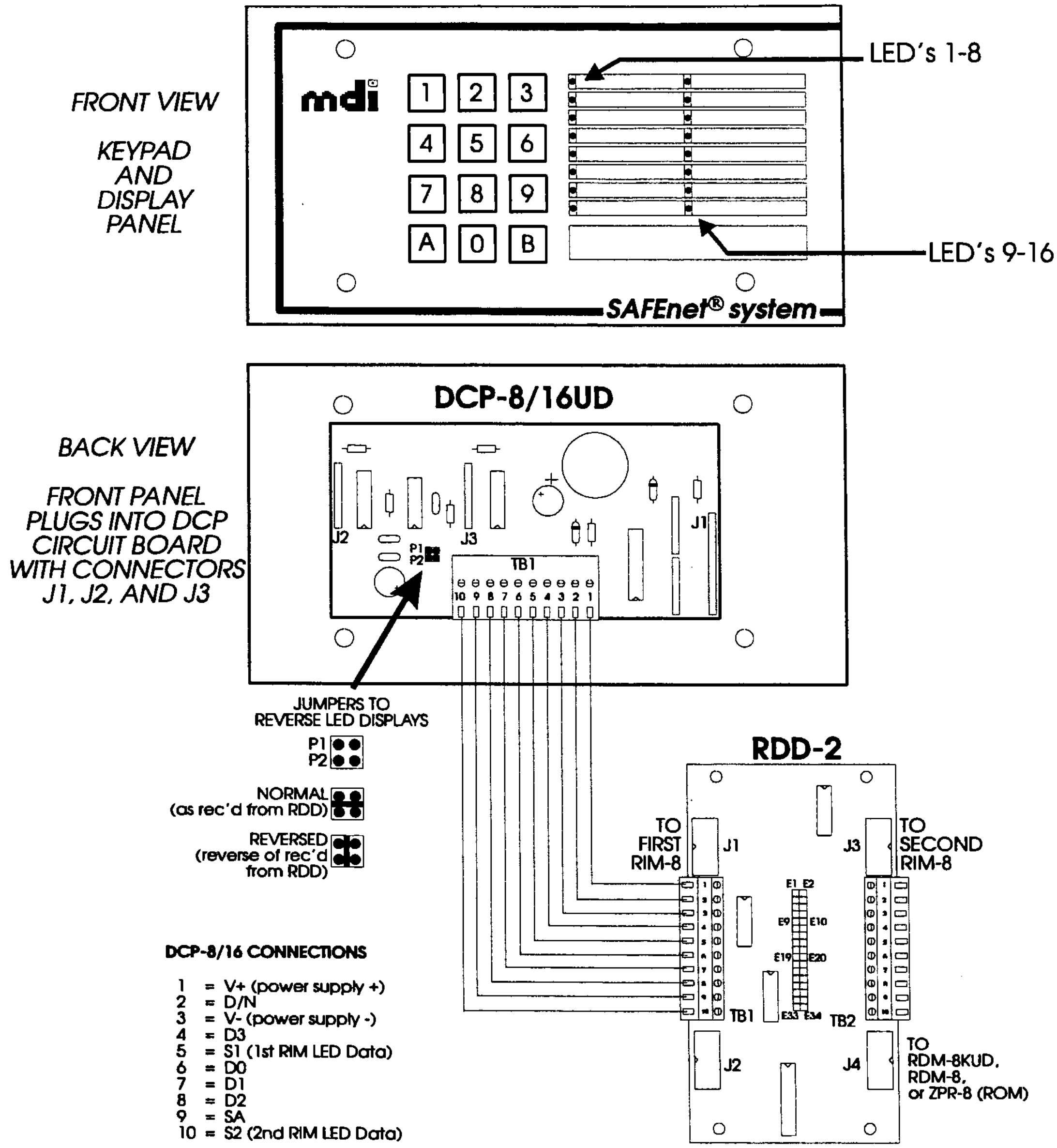
Jumper E1 to E2, E9 to E10, E13 to E14, E19 to E20, E25 to E26, and E33 to E34. Use J1 on RDD module for first RIM input and J3 for second RIM input. Use TB1 for first DCP-16 and TB2 for second DCP-16. Single Arming Control System with two DCP-16 Arming Stations, both controlling the same zones. Jumpers shown are set to display the alarm zones of the first RIM as LED's 1 thru 8 on both DCP's, and the alarm zones of the second RIM as LED's 9 thru 16 on both DCPs. If RIM-16 boards are used, only the even numbered zones for each address are represented by the LED's on the DCP panels.

5. Two RIM-8/16's, Two DCP-8UD or DCP-16UD Arming Stations, each controlling separate RIM input zones (Multiple Area Arming).





Jumper E1 to E2, E9 to E10, E21 to E22, E25 to E26, E29 to E30, and E31 to E32. Use J1 on RDD module for first RIM input and J3 for second RIM input. Use TB1 for first DCP and TB2 for second DCP. Two separate Arming Control Systems with two DCP panels each controlling separate RIM's. Jumpers shown are set to display the alarm zones of each RIM as LED's 1 thru 8 on the DCP controlling that RIM. If using DCP-16's, the alarm zones from the opposite RIM will display on LED's 9 thru 16 of the DCP. Again, remember that, if using RIM-16 boards, only the even numbered zones from each address are represented on the LED's of the DCP panels.



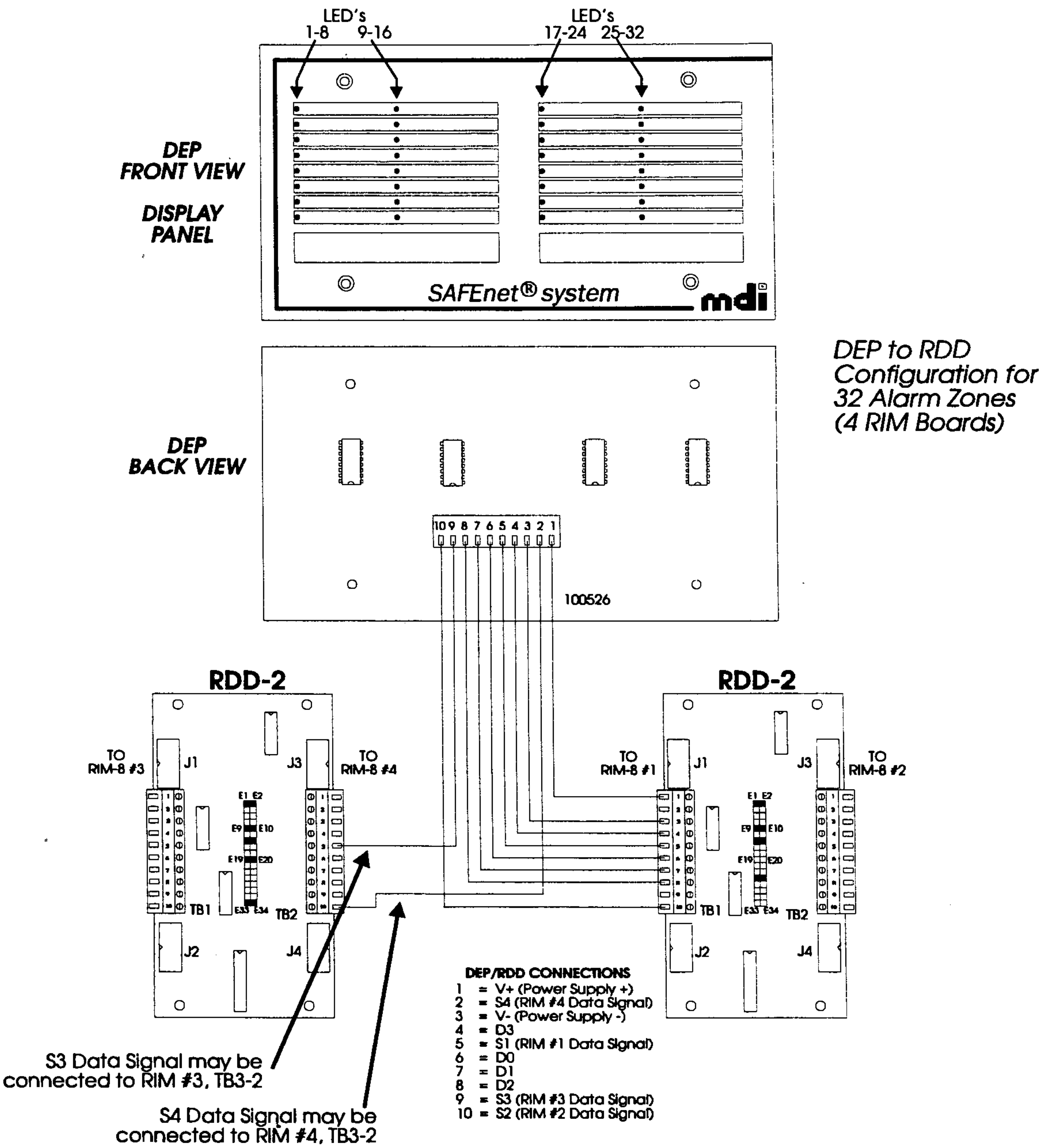
NOTES:

1. Jumpers P1/P2 installed in the vertical position will cause the LED Display to be reversed from what the RDD is sending. For example, if the RDD is sending the 2nd RIM data to be on LED's 1-8, they would appear on LED's 9-16 because the P1/P2 jumpers are in that position.

2. Any column of LED's not used must have the data line (S2 or S2) terminated to +V at the DCP.

3. A DEP panel can be connected in parallel with a DCP using pins 1,3,4,6,7,8 and RIM data lines S1 and S2.

Figure 3-31. RDD to DCP CONNECTIONS



NOTES:

1. If 16 or less alarm zones are to be displayed, only one (1) RDD is required.
2. Any active LED displays not used must have DEP Data Signal (S3, S4, etc.) terminated at +V.
3. Instead of the 2nd RDD, the S3 and S4 data signals can be connected directly to connector TB3-2 of RIM #3 and RIM #4, provided the DEP is within 100 feet of the RTU.
4. A DEP may be connected in parallel with a DCP to provide more LED's for status.
5. RDD Jumper Settings are based on configuration and connections shown and will vary based on the number of Arming Stations used.

Figure 3-32. RDD to DEP CONNECTIONS

3.7.5 ZPR-8 ROM - Zero Power Relay Board

The ZPR-8 Relay board is a basic Relay Output Module (ROM) with eight (8) Form-C, dry contact, DPST latching relays (see Figure 3-33). Each ZPR-8 ROM board is connected to, and addressed through, a RIM board (RIM-8 or RIM-16). Each relay contact is rated for 2.0 amps @ 24 VDC, or 0.5 amps @ 24 VAC.

The ZPR-8 relay board can be used to control and/or activate/deactivate a number of different devices, such as remote annunciators, lighting controls, environmental controls, etc. On-board jumpers can be used to configure the board for host computer control of the relay outputs (control mode), or for direct link of the relays to the alarm zones on the associated RIM board (display/local mode), in the same manner as an RDM display would operate.

With a jumper installed across E1 and E2 (control mode), the relays will operate under host computer control, which means that the relays will change state only upon receipt of a command from the host computer system. With a jumper installed across E2 and E3 (display/local mode), relay operation will be locally linked to the change of state of alarm zones on the a RIM board to which the ZPR-8 is attached. In this configuration, a relay output will activate (set) when it's associated alarm zone changes to an alarm condition, and will deactivate (reset) when the alarm zone resets or restores to the secure mode. The relay # to alarm zone # linkage depends on the type of RIM used.

<u>RIM-8 Alarm to Relay Links</u>

Alarm Zone #1 = Relay #1
Alarm Zone #2 = Relay #2
Alarm Zone #3 = Relay #3
Alarm Zone #4 = Relay #4
Alarm Zone #5 = Relay #5
Alarm Zone #6 = Relay #6
Alarm Zone #7 = Relay #7
Alarm Zone #8 = Relay #8

<u>RIM-16 Alarm to Relay Links</u>

Base Address Alarm Zone #2 = Relay #1
Base Address Alarm Zone #4 = Relay #2
Base Address Alarm Zone #6 = Relay #3
Base Address Alarm Zone #8 = Relay #4
Base Address+1 Alarm Zone #2 = Relay #5
Base Address+1 Alarm Zone #4 = Relay #6
Base Address+1 Alarm Zone #6 = Relay #7
Base Address+1 Alarm Zone #8 = Relay #8

Always keep in mind that, when using the display/local mode of operation with the ZPR-8 ROM board, the relay will rapidly chatter if the corresponding ZIM is removed from the RIM board. Also, be aware that "non-displaying" alarm zones (holdup/duress) will not activate relay outputs.

Another thing to remember when planning the location of the ZPR-8 board is always try to position and connect the ZPR-8 relay board to a RIM that <u>does not</u> have Access Control or Arming Control ZIM's installed, as some relays may not be usable in those conditions. A relay associated with the Arming Control ZIM (zone #1 of the RIM), which would be relay #1, cannot be used since it will cause the audible buzzer or sonalert of the associated Arming Station Keypad to activate. Any relay associated with an Access Control ZIM, typically relays #5, #6, #7, and #8, may activate with a door alarm even though it is not linked in any way to that reader or door.

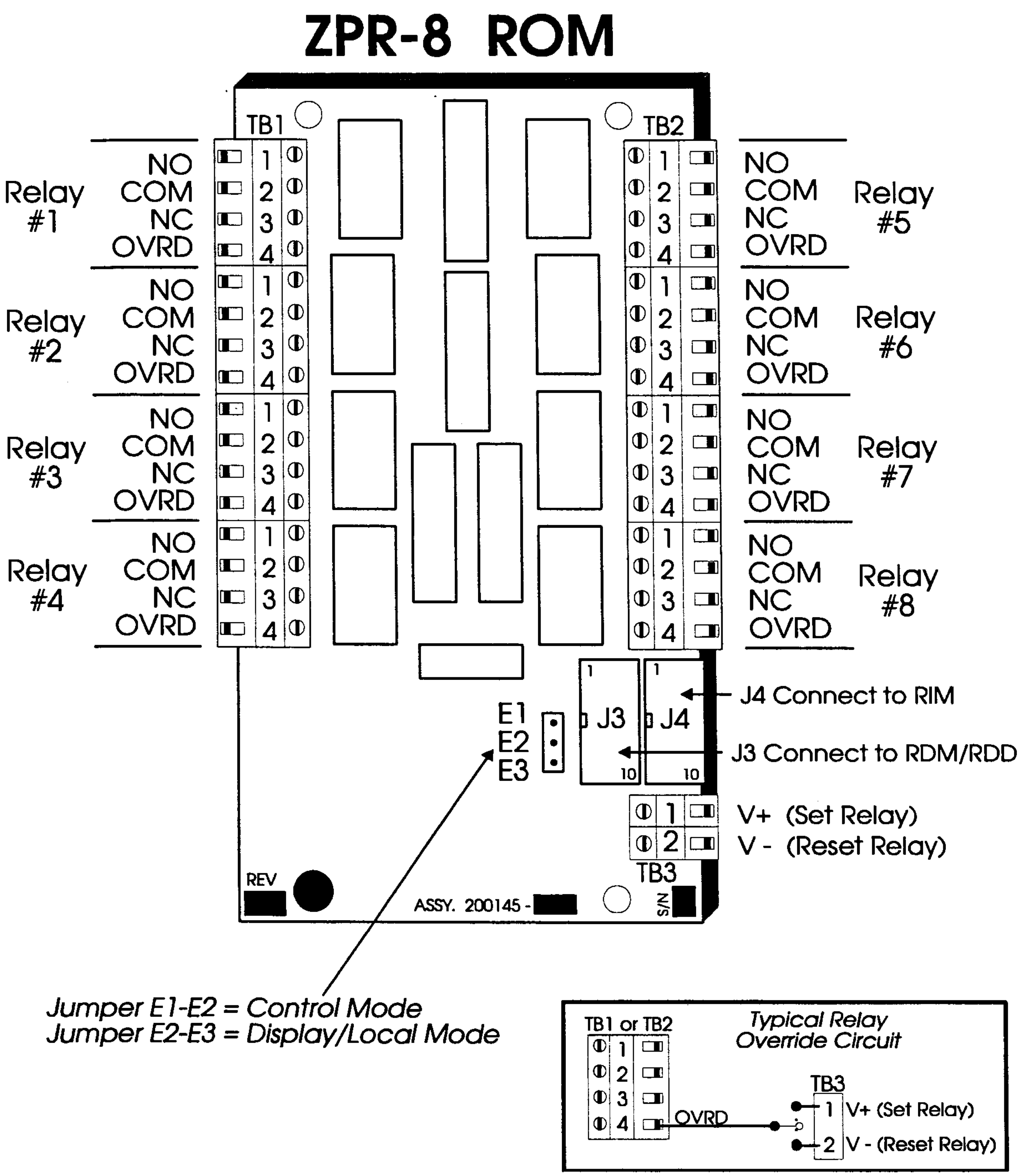


Figure 3-33. ZPR-8 ROM, RELAY OUTPUT MODULE

Each relay has four (4) connections associated with it, those being:

NO = Normally Open Contact
COM = Common Connection (common connection for both NO and NC)
NC = Normally Closed Contact
OVRD = Override Connection

The OVRD connector is used as an override to HOLD the relay in the SET or RESET conditions (activated or deactivated) regardless of commands sent to it by the RTU processor or the Host Computer. Connections for the Override input are via TB3, with V+ used to 'SET' a relay, and V- used to 'RESET' it (see Figure 3-33). The "Normally-open" and "Normally-closed" connections are used with the "Common" for the connection to, and the control of an external device. Since the relays are Form-C relays, dry-contact relays, power for the device being controlled must be provided from an external source. Connections are made on TB1 or TB2 with a minimum 22 AWG, 2-conductor cable and should normally remain within 1000 feet or less.

The ZPR-8 ROM board is interfaced and connected to the RIM board with a 10-conductor ribbon cable, connected from the J4 connector of the ZPR-8 board to the J3 connector of the RIM board. The J3 connector of the ZPR-8 board can be used to connect to a Remote Display Module (RDM) or to a Remote Display Driver (RDD) in order to provide an LED alarm status display. J3 and J4 of the ZPR-8 are pin-for-pin the same. The ZPR-8 ROM board wil be labeled ZPR–01

3.7.6 ZPR-8A ROAM - Addressable Zero Power Relay Board

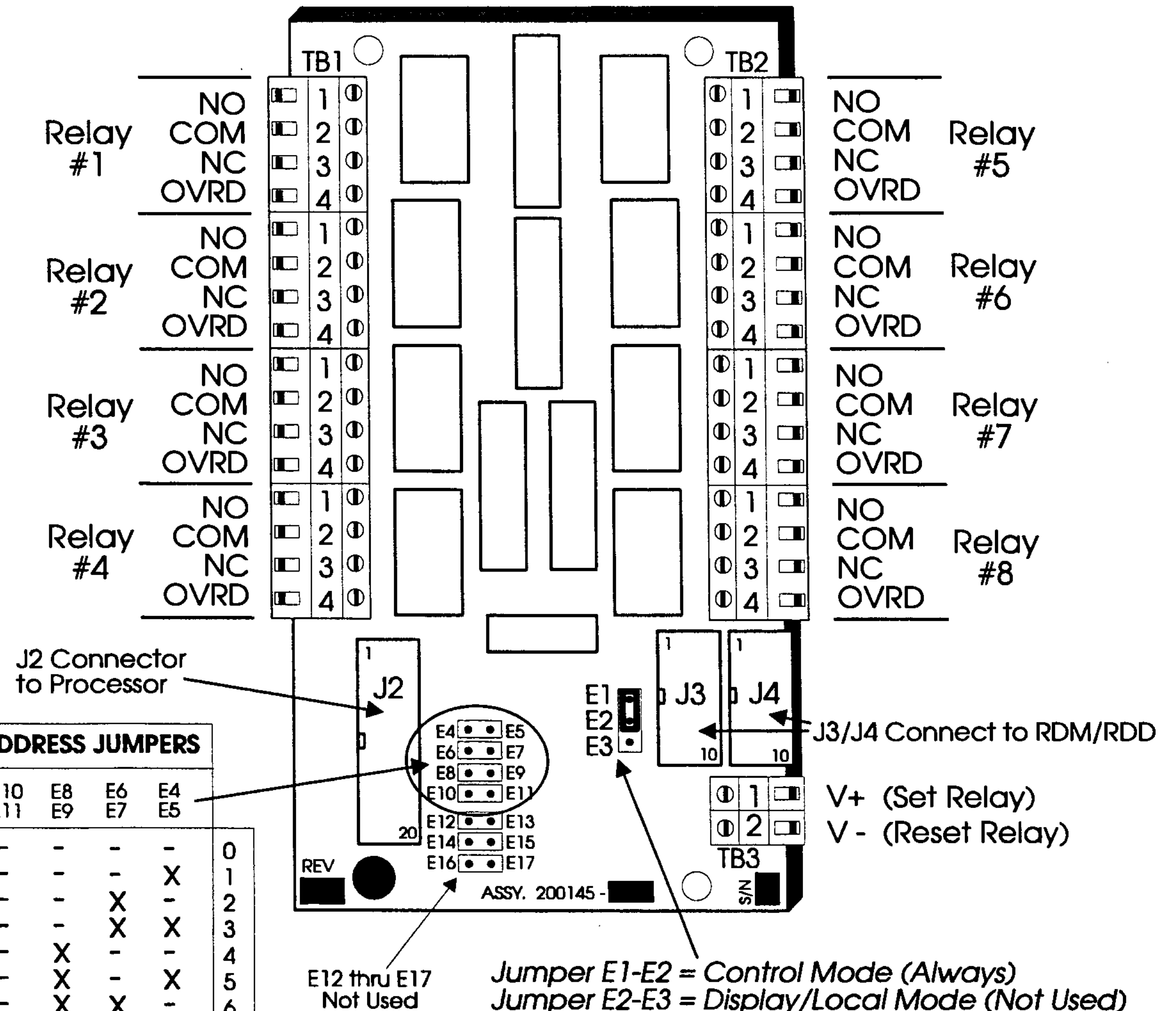
The ZPR-8A Relay board is a Relay Output Addressable Module (ROAM) with the same basic functions and capabilities of the ZPR-8 ROM except that it has it's own communication address and is not dependent on another board. The ZPR-8A provides eight (8) Form-C, dry contact, DPST latching relays (see Figure 3-34) which are controllable only via commands generated from the Host Computer. Each relay contact is rated for 2.0 amps @ 24 VDC, or 0.5 amps @ 24 VAC. The ZPR-8A board is interfaced with and connected directly to the RTU Processor Board and with it's own communication address set via jumpers E4 through E11, as shown in Figure 3-334

The ZPR-8A relay board is used to control and/or activate/deactivate a number of different devices, such as remote annunciators, lighting controls, environmental controls, etc., based on manual or automatic commands generated from the Host Computer System. A jumper must always be installed across E1 and E2 to set the board for the "Control" mode of operation. The "Display/Local" mode (E2 to E3) is never used on the ZPR-8A board.

Each relay has four (4) connections associated with it, those being:

NO = Normally Open Contact
COM = Common Connection (common connection for both NO and NC)
NC = Normally Closed Contact
OVRD = Override Connection

ZPR-8A ROAM



ADDRESS JUMPERS

E10 E11	E8 E9	E6 E7	E4 E5	
-	-	-	-	0
-	-	-	X	1
-	-	X	-	2
-	-	X	X	3
-	X	-	-	4
-	X	-	X	5
-	X	X	-	6
-	X	X	X	7
X	-	-	-	8
X	-	-	X	9
X	-	X	-	10
X	-	X	X	11
X	X	-	-	12
X	X	-	X	13
X	X	X	-	14
X	X	X	X	15

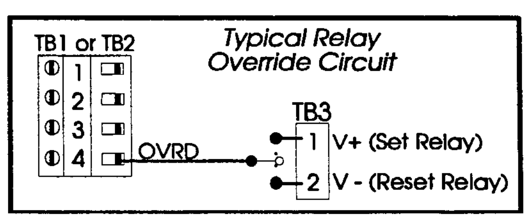


Figure 3-34. ZPR-8A ROAM, RELAY OUTPUT ADDRESSABLE MODULE

The OVRD connector is used as an override to HOLD the relay in the SET or RESET state (activated or deactivated) regardless of commands sent to it by the RTU processor or the Host Computer. Connections for the Override inputs are via TB3, with V+ used to 'SET' a relay, and V- to 'RESET' it (see Figure 3-34). The "Normally-open" and "Normally-closed" connections are used with the "Common" for the connection to, and the control of an external device. Since the relays are Form-C, "Dry-Contact" relays, power for the device being controlled must be provided from an external source. Relay output connections are made on TB1 or TB2 with a minimum 22 AWG, 2-conductor cable and should normally remain within 1000 feet or less.

Connector J2 is used for the connection to the RTU Processor Board via a 20-conductor ribbon cable connected to J1 of the processor board, along with the RIM boards. The J3 or J4 connector of the ZPR-8A board can be used to connect to an Remote Display Module (RDM) in order to provide an LED status display of the relays. The ZPR-8A ROAM board will be labeled ZPR-02.

3.7.7 Card reader Interface Module, CIM-2

The Card reader Interface Module (CIM) provides a direct wire interface for Access Control Card readers to the 175C Processor Board (see Figure 3-35). The CIM-2 supports Magnetic Stripe, Wiegand-effect, and Proximity type card readers with data and control lines wired directly to the CIM module within the RTU. Each CIM board provides an interface for up to two (2) card readers. If more than two readers are required, a CIM Expander module must be added, which will interface up to four CIM boards and then support up to eight (8) card readers.

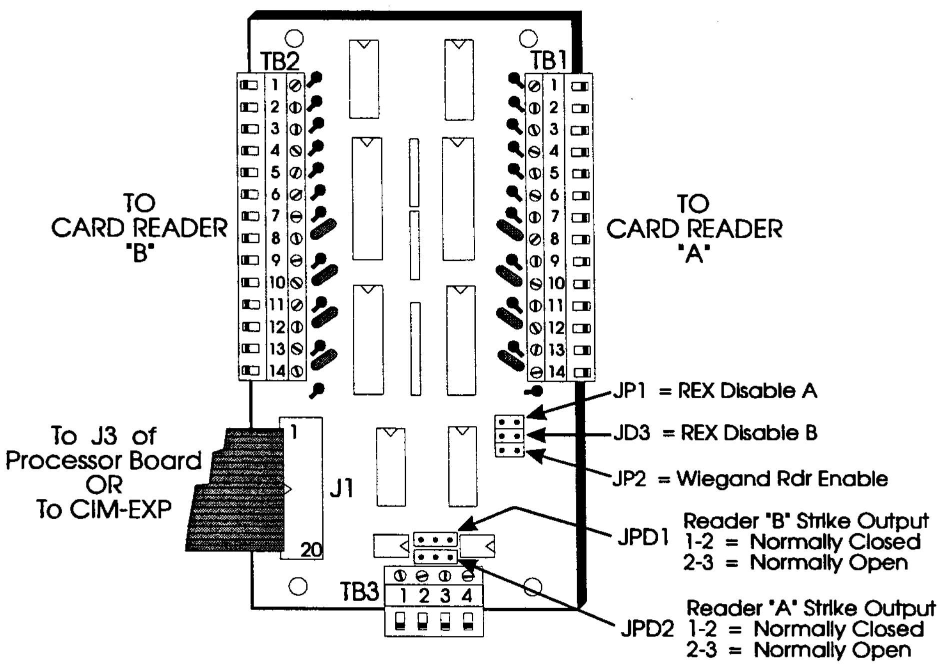
The CIM-2 board provides connections to the card reader for the Data Lines (data 0 and data 1), reader LED control lines, reader keypad inputs, and for reader power, provided the reader power requirement is 5 VDC and that the overall RTU panel power requirement does not exceed 450 mA @ 5 VDC (see Appendix 'C'). Card reader 'A' is connected to TB1 on the right side of the board, and card reader 'B' is connected to TB2 on the left side of the board (see Figure 3-35). It should be noted that the +5 VDC power (V+ and V-, pins 1 and 14) provided by the CIM is actually +2.5 VDC (pin 1) and -2.5 VDC (pin 14) with respect to the RTU chassis ground. Door Contact and REX devices must be wired to, and monitored by, the RIM board input corresponding to Access Control ZIM for that reader (see Figure 3-37).

The CIM board also provides a Door Strike control output connection for each of the two readers in the form of a solid state, optocoupler type output. Each control output is rated at a maximum of 100 mA @ 24 VDC. If the current draw of the strike to be used will exceed 100 mA, an isolation relay will be required with the strike connected across the contacts of the isolation relay, as shown in Figure 3-36. On-board configuration jumpers JPD1 (reader 'B') and JPD2 (reader 'A') are used to specify if the applicable door strike output will operate as normally energized (normally-closed) or normally de-energized (normally-open). A separate Floating Ground Power Supply must be provided for Door Strike Power. Ensure that the Door Strike cable is a completely separate, single twisted pair, shielded cable. DO NOT connect the Door Strike with a pair of wires located within the same cable sleeve as the reader data lines as noise will be generated in the data lines by the current surge of the strike activating and deactivating.

The CIM includes jumper JP2 which is installed to select if Wiegand-effect card technology or format is to be used. Removing the jumper selects Magnetic Stripe card type. Proximity cards and card readers are typically Wiegand-effect card formats.

Another configurable option on the CIM is the capability to disable the Request-to-Exit (REX) activation of the door strike for each reader. This is set with jumpers JP1 (reader 'A') and JD3 (reader 'B') . This option allows for the disabling of the door alarm for exiting purposes without actually unlocking the door and is typically used on doors with crash bars or similar device.

CIM-2



TB1 & TB2

1 = +V to Reader/Keypad (+2.5 VDC)
2 = CIP (Card in Progress)
3 = Key Valid
4 = LED 2 (Grant/Deny)
5 = No Connection
6 = LED 1 (Enter Pin)
7 = DATA 0 (Mag Data -)
8 = DATA 1 (Mag Data +)
9 = No Connection
10 = Key 1 for Pin Pad
11 = Key 2 for Pin Pad
12 = Key 4 for Pin Pad
13 = Key 8 for Pin Pad
14 = -V to Reader/Keypad (-2.5 VDC)

TB3 STRIKE CONNECTIONS

1 = Reader 'B' +
2 = Reader 'B' -
3 = Reader 'A' +
4 = Reader 'A' -

Figure 3-35. CIM-2, CARD READER INTERFACE MODULE

Door Strike connections are made via TB3, terminals 3 & 4 for the 'A' reader and terminals 1 & 2 for the 'B' reader. Ensure that the door strikes, power supplies, protection diodes, and isolation relays are correctly installed with proper polarity. A 1N4001 or equivalent Protection Diode should always be installed across the strike coil, as shown. The drawing below is shown with an isolation relay connected to the CIM door strike control output. An Isolation Relay should be used anytime the current draw of the door strike or door lock may exceed 100 mA. The cable to the Door Strike must be a single, shielded twisted-pair, 18 AWG cable at a maximum distance of 1000 feet. A separate Door Strike Power Supply must be provided to supply power to the door locks. The power supply is typically 12 or 24 Volts DC depending on the requirements of the Door Strike/Lock that is used, and must use a floating ground to supply power to multiple locations.

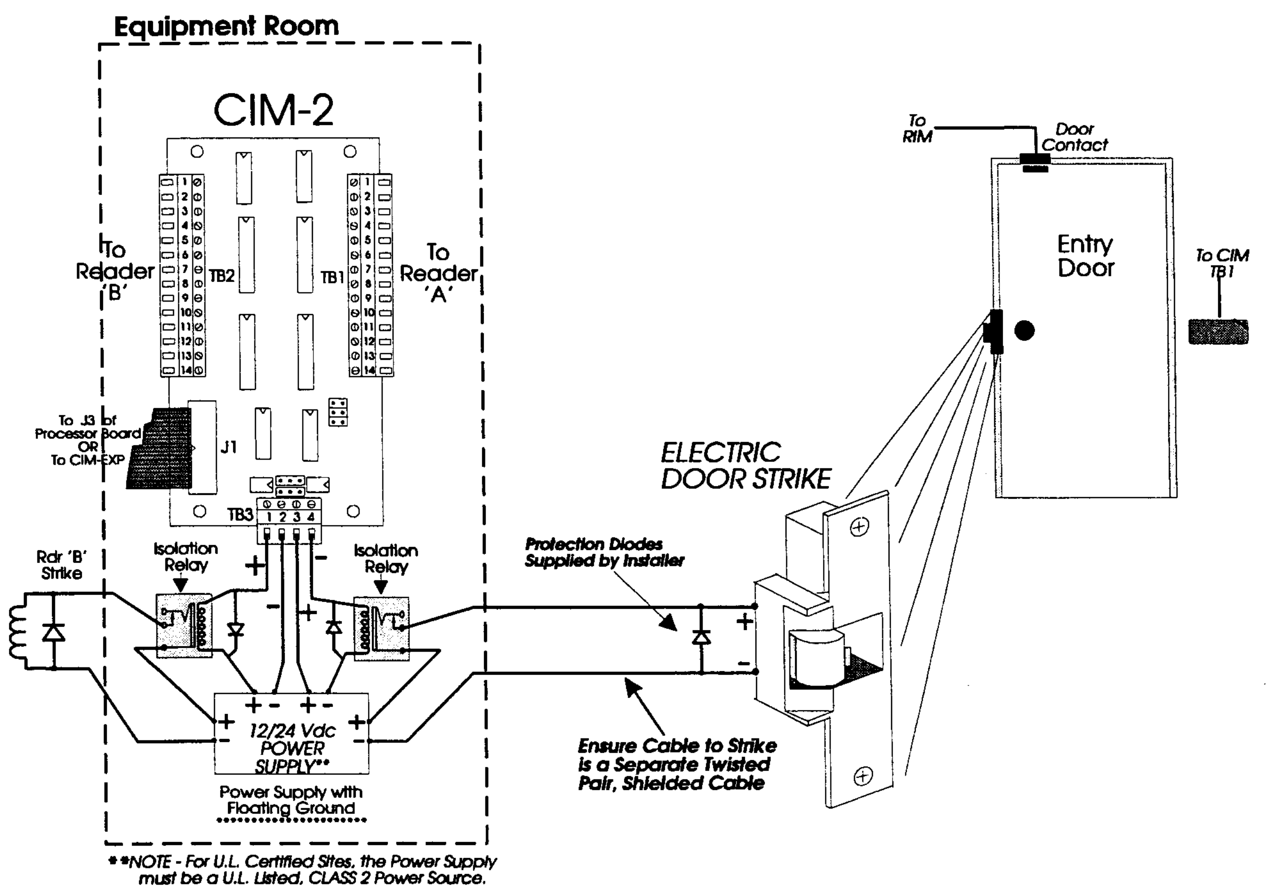


Figure 3-36. CIM DOOR STRIKE CONNECTIONS

Magnetic Switches and Contacts are used to monitor the Open/Closed position of the door during Access Control transactions as well as to monitor for unauthorized door openings and door props after valid openings. Request-To-Exit (REX) buttons or sensors are used on the secured side of the Card Reader Controlled door to allow for proper egress from the area through the door without causing an alarm condition. Door Switches and Contacts are typically wired in a NORMALLY-CLOSED position, while Request-To-Exit devices and typically a NORMALLY-OPEN contact. The door contact and REX devices are wired and connected back to the RIM board inputs corresponding to the Access Control ZIM. The cable use for each sensor should be a 2-conductor, minimum 22 AWG cable with a maximum length of 1000 feet. The wiring and connection requirements for the RIM-8 and the RIM-16 are shown in Figure 3-37 below.

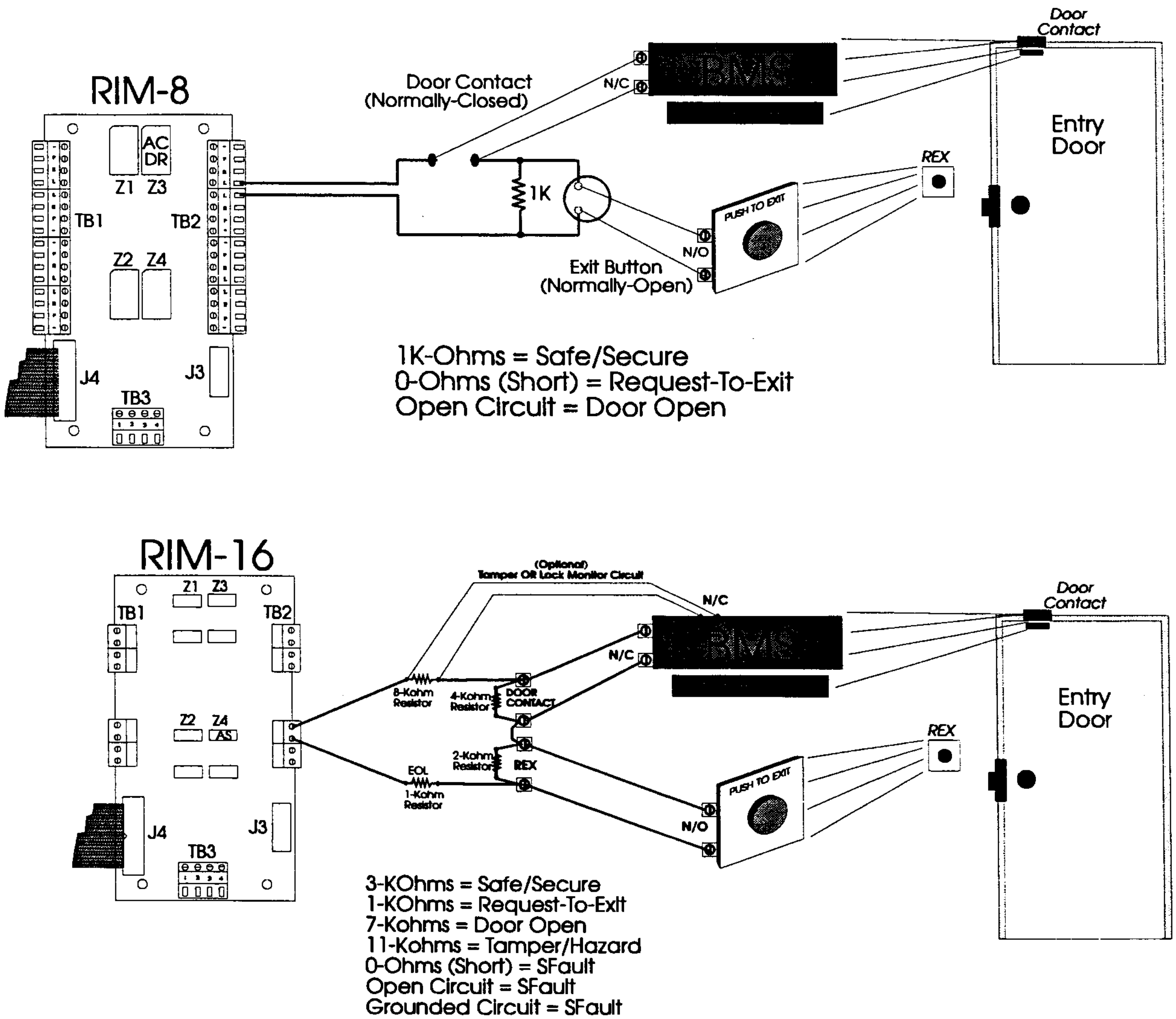


Figure 3-37. DOOR CONTACT & REX CONNECTIONS TO CIM

The supervised Door and REX wiring shown in Figure 3-37 for the RIM-16 connections may also be used with a RIM-8 board by installing an "AC/DR-SR" or "AC/BI-SR" type ZIM. The function table for the different resistance levels would operate the same. Although Figure 3-37 shows the correct connections to a RIM-16 board, the CIM and CIM-EXP modules are typically not used with the RIM-16. Check with the MDI Marketing Department prior to ordering.

Figure 3-38 below gives an overview illustration of a typical CIM-type card reader door configuration and hookup connections, showing both sides of the door.

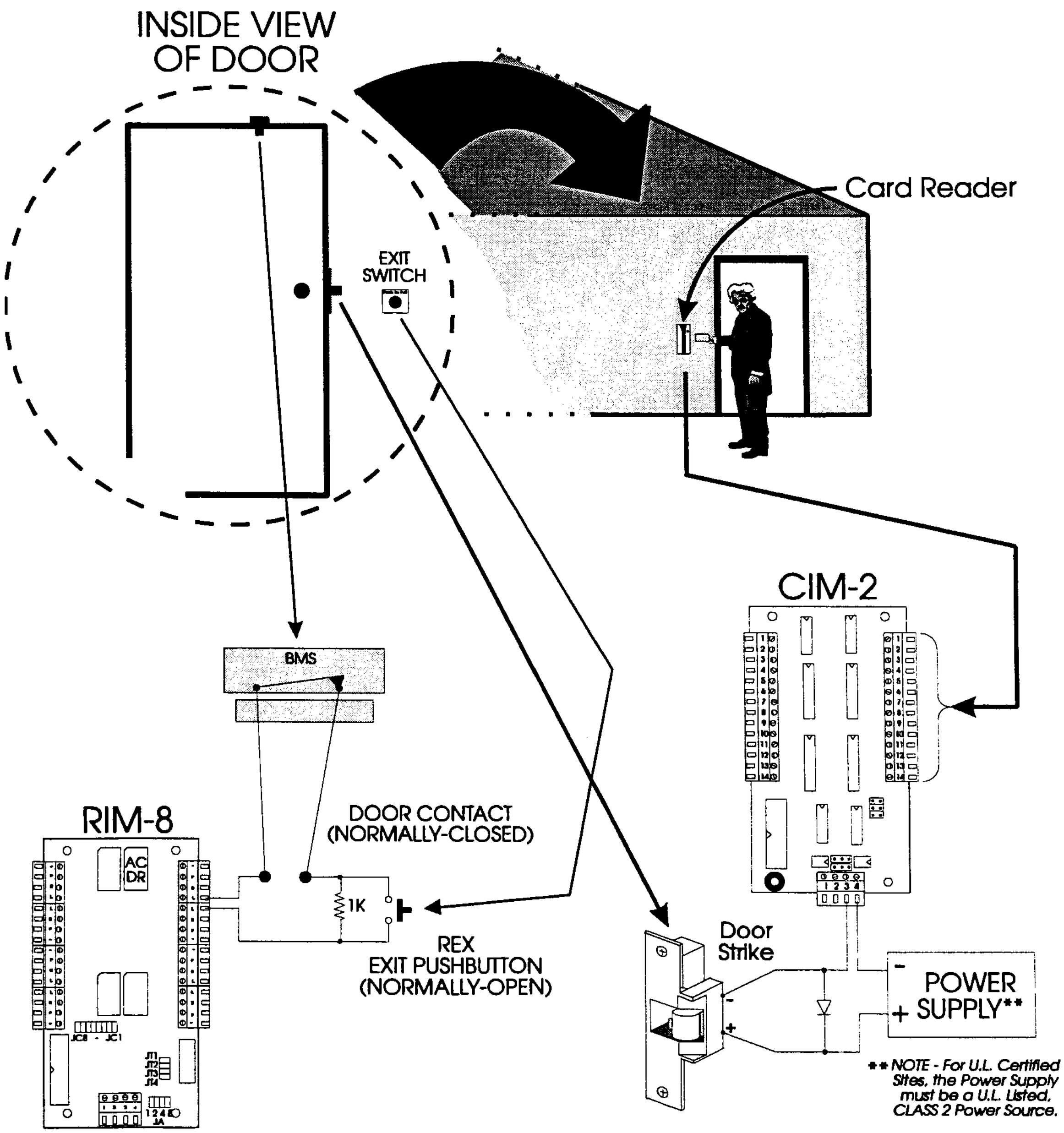


Figure 3-38. CIM-TYPE ACCESS CONTROL CONNECTION OVERVIEW

3.7.8 CIM-EXP, CIM Expander Module

The CIM Expander Module (CIM-EXP) is used to provide the connection of up to for (4) CIM-2 modules, and therefore support up to eight (8) Card Readers in the RTU. The CIM-EXP module connects directly to the RTU 175C Processor board via its J1 connector, with connectors J2, J3, J4 and J5 used for connections to each of the four CIM modules (see Figure 3-39). Any unused connectors must have a terminator installed (provided by MDI).

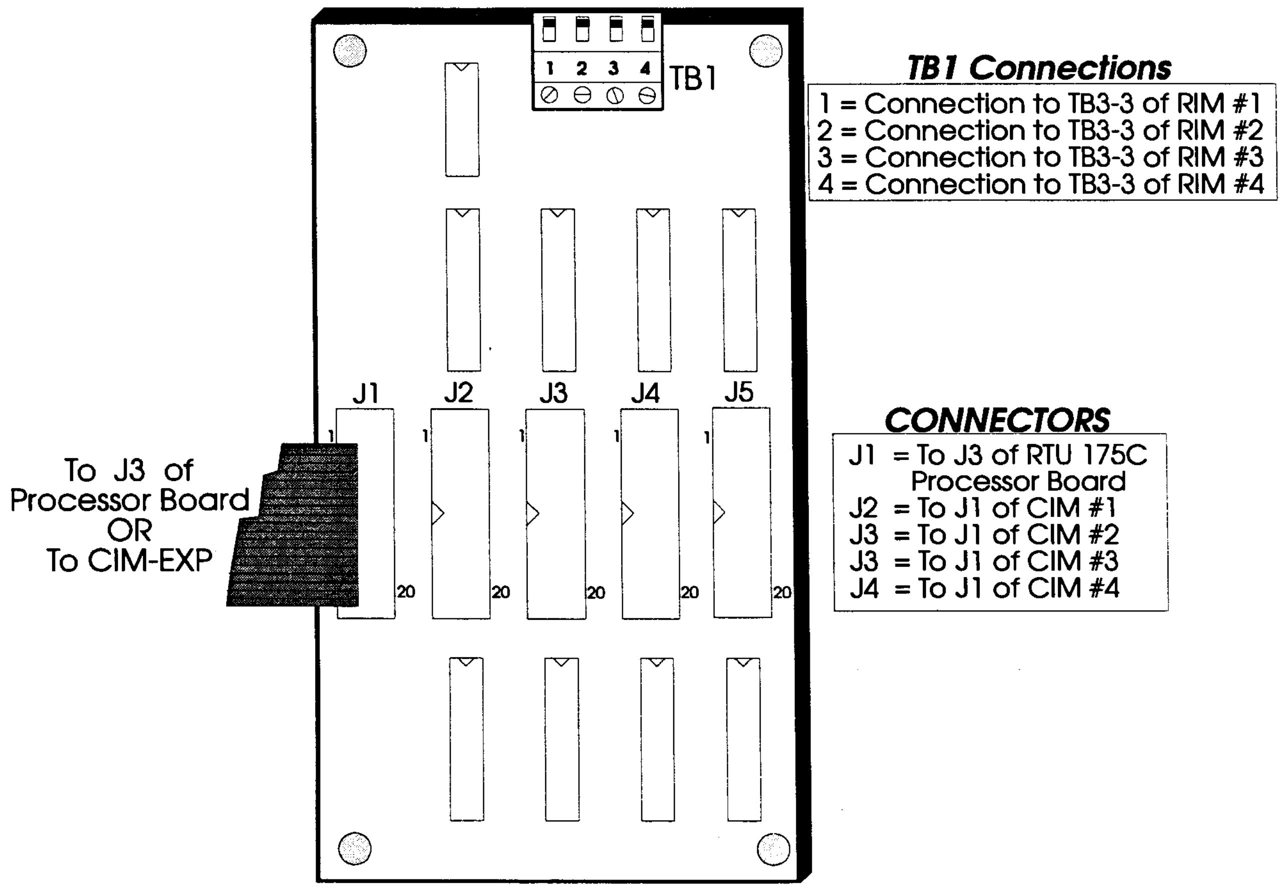


Figure 3-39. CIM EXPANDER BOARD, CIM-EXP

When using the CIM-EXP module, each CIM board must be linked to the appropriate RIM board via a single wire connection from TB3-3 of the RIM board to the TB1 of the CIM-EXP module (see Figure 3-40), with terminal 1 connected to the first RIM, terminal 2 to the second RIM, terminal 3 to the third RIM, and terminal 4 to the fourth RIM. This connection basically sets the CIM address in order for the 175C Processor board to recognize and process messages to and from each CIM and readers.

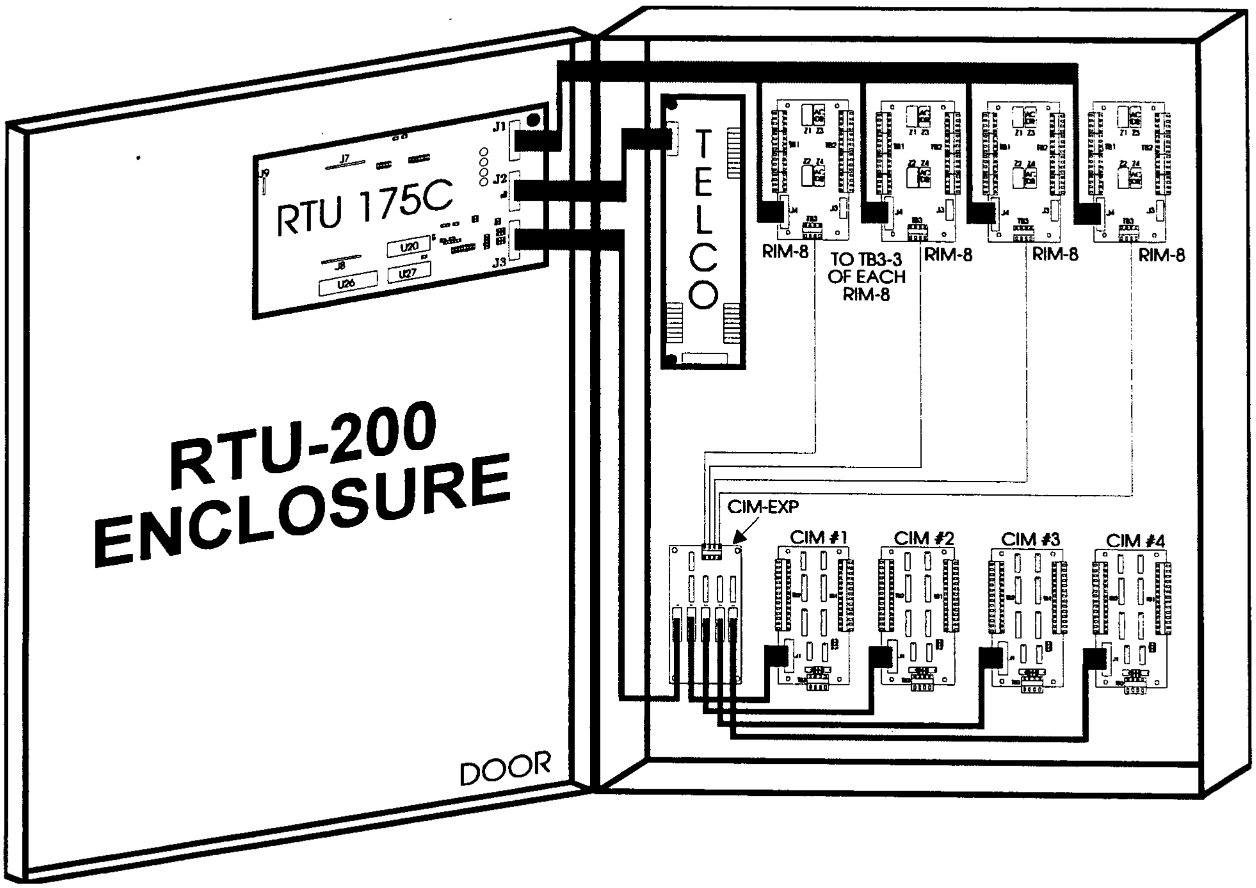


Figure 3-40. CIM-EXP MODULE RTU CONNECTIONS

Always ensure that the RIM boards used for the CIM access control are addressed sequentially, starting with a multiple of four (i.e. 4-7, 8-11, 24-27, 32-35, etc.). Additionally, verify that jumpers E1 through E12 of the 175C Processor board are set correctly for CIM Access Control, as shown in Figure 3-21, and always ensure that the RTU 175C Processor board firmware is correct for the reader configuration and type.

A basic card reader connection wiring may be a direct connection from the reader to the CIM board itself, provided the power requirements of the reader are +5 VDC, and the reader installation complies with distance and the RTU power limitations (maximum 450 mA, per Appendix 'C'). However, if the card reader voltage requirements are greater than +5 VDC, the reader will require an external power supply and the interface connection from the reader to the CIM board may need to be isolated, or buffered with an Optical Isolation Module (OIM). The OIM device is manufactured by MDI and is used to isolate the power and data signal levels between the CIM and the reader. Figure 3-41 shows a typical reader to CIM interface connection with a Universal OIM. For specific wiring of the more commonly used readers, see the wiring diagrams in Figures 3-42 to 3-47 in this manual.

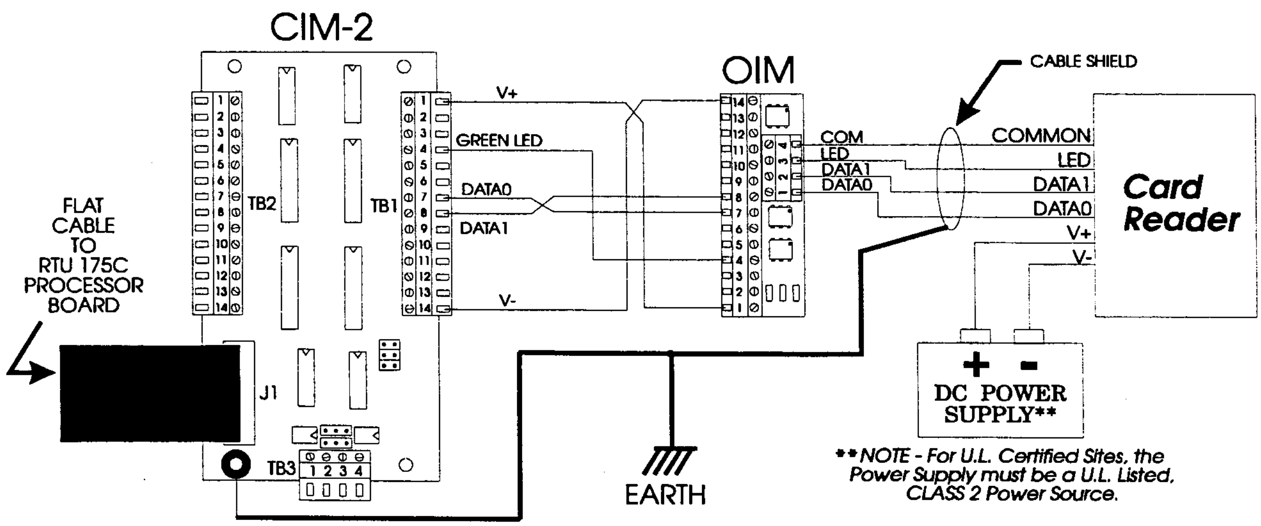


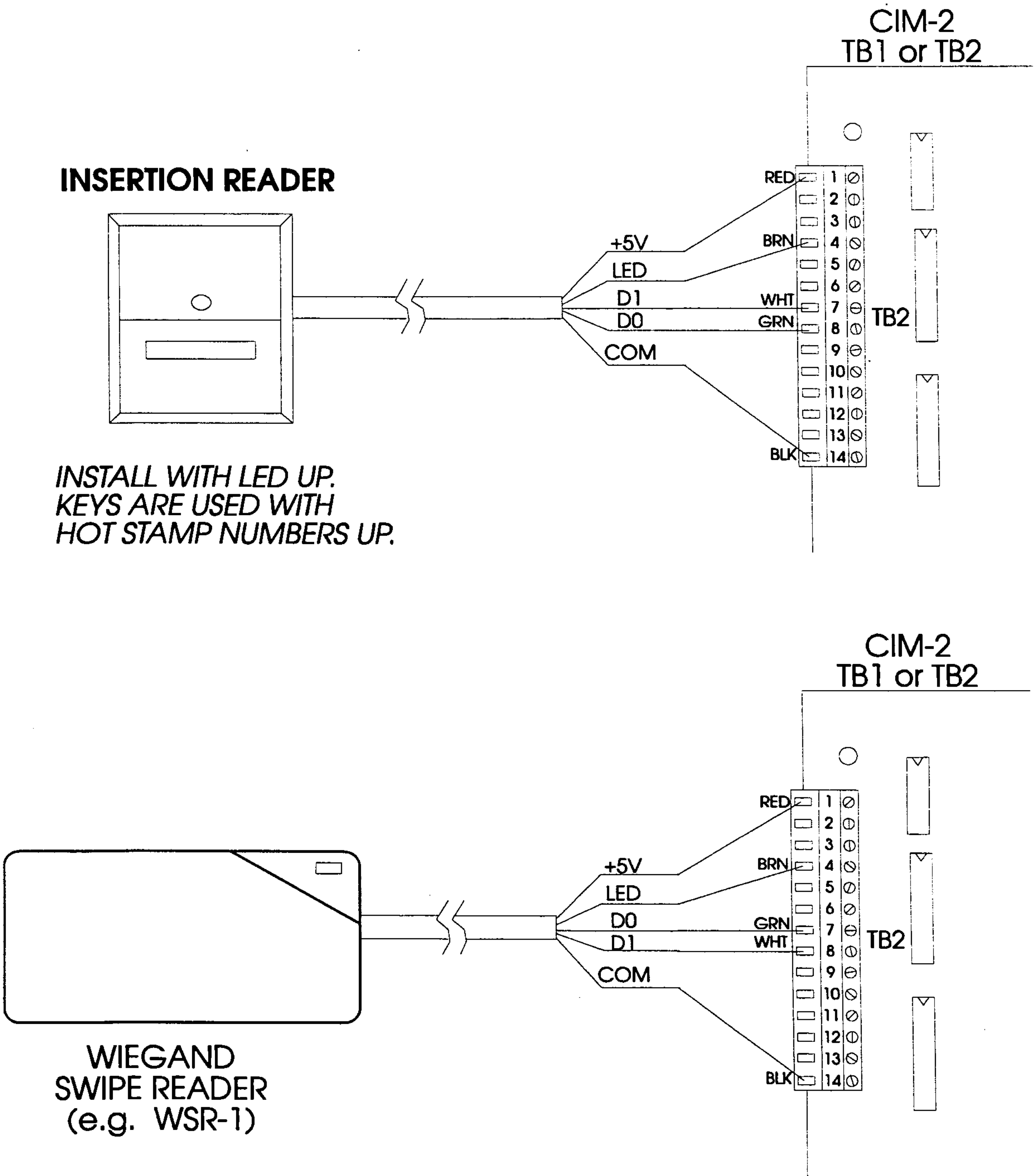
Figure 3-41. TYPICAL CARD READER to CIM CONNECTIONS W/OIM

Notice in Figure 3-41 that the cable from the card reader to the OIM must be a shielded cable with the shield connected to ground at the CIM. Also, it should be noted that the +5 VDC supplied by the CIM board is actually +2.5 VDC and -2.5 VDC. Therefore, if any reader is powered by a power supply with it's negative side tied to earth ground, the reader connection will definitely require an OIM. A floating ground is required for a direct connection to the CIM..

- - TO OIM, OR NOT TO OIM

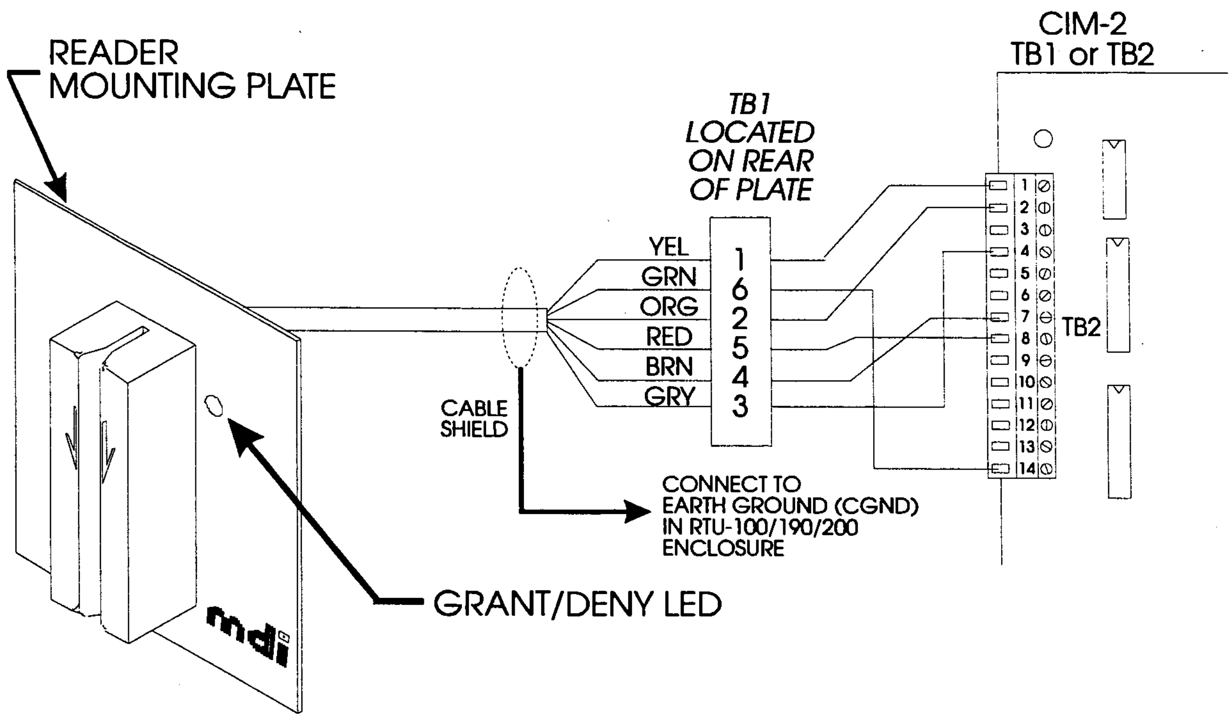
The figure above shows a general application of an OPTICAL ISOLATOR MODULE (OIM). The OIM is used to do two (2) things; 1) to isolate Card Reader power (which is greater than +5 VDC) from the RTU power, and 2) to convert reader data line signals voltage levels to the RTU voltage levels. The basic guidelines of when an OIM is required are:

If Reader Data0 & 1, and/or LED signal levels are greater than +5 VDC	**OIM**
If Reader power supply is NOT floating (uses earth ground)	**OIM**
If Reader power supply is floating ground, and data signals are at +5 VDC	**NOT TO OIM**



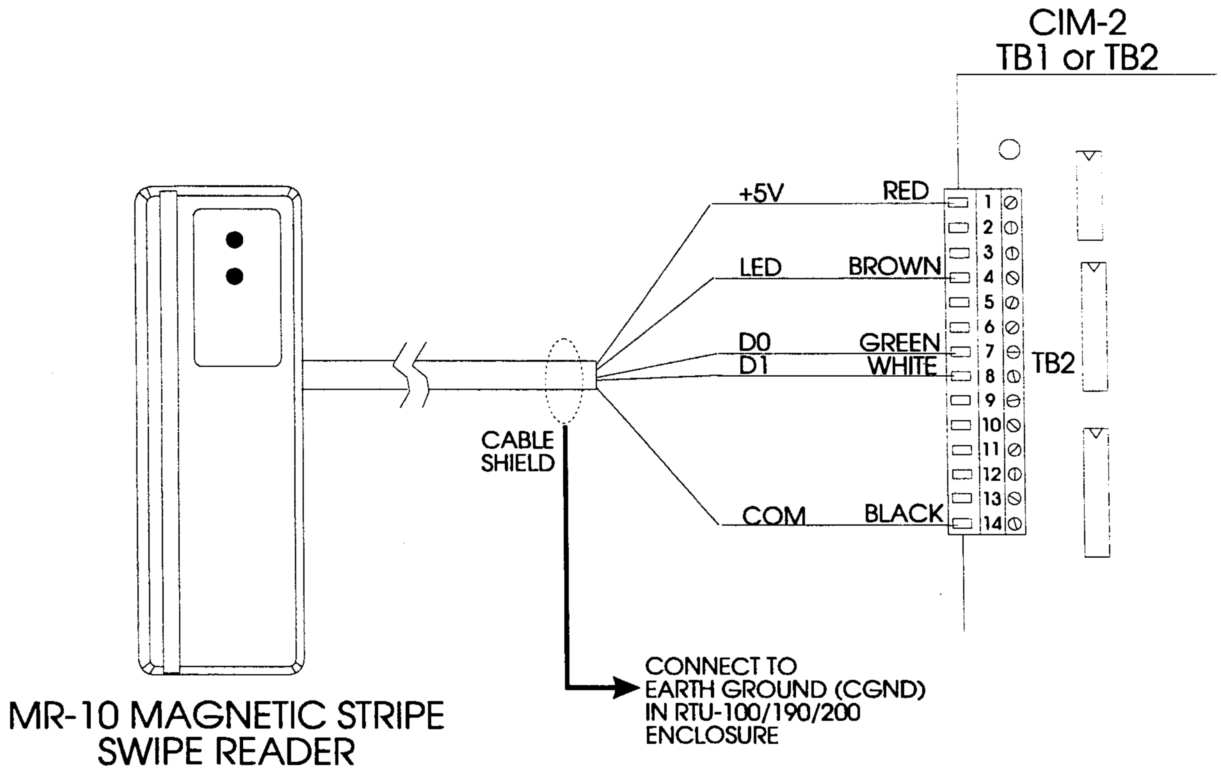
INTERCONNECT DIAGRAM
WIEGAND READERS
to CIM-2

Figure 3-42. CIM CONNECTIONS TO WIEGAND READERS



INTERCONNECT DIAGRAM
MDI MSR-1 MAGNETIC STRIPE to CIM-2

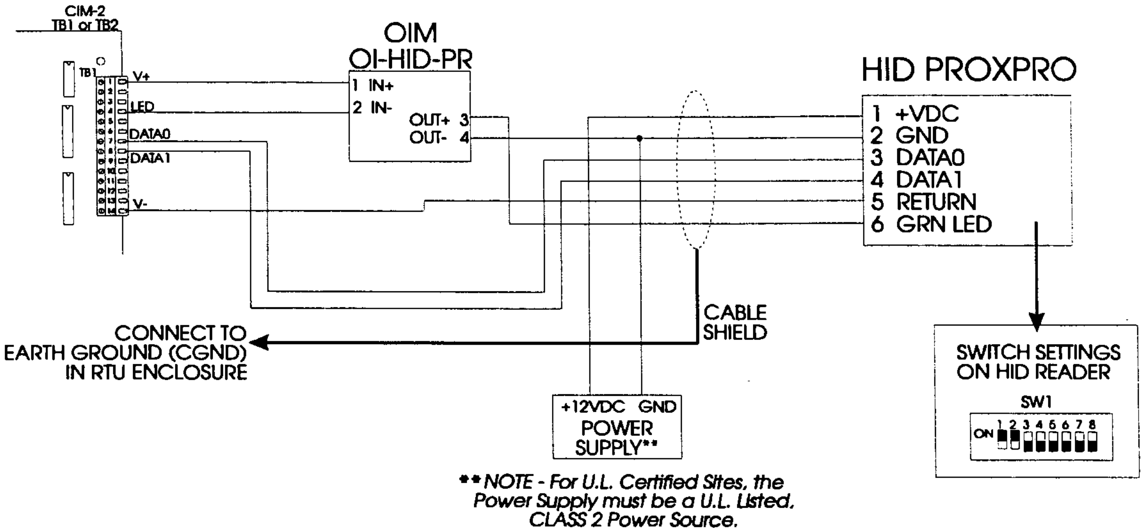
Figure 3-43. CIM CONNECTIONS To MDI MAGNETIC STRIPE READER



MR-10 reader is a +5 VDC device and can interface directly to the CIM-2 board. It draws approximately 25 mA, so the CIM-2 can supply power to it provided the overall RTU panel current does not exceed 450 ma.

INTERCONNECT DIAGRAM
MR-10 MAGNETIC STRIPE READER
to CIM-2

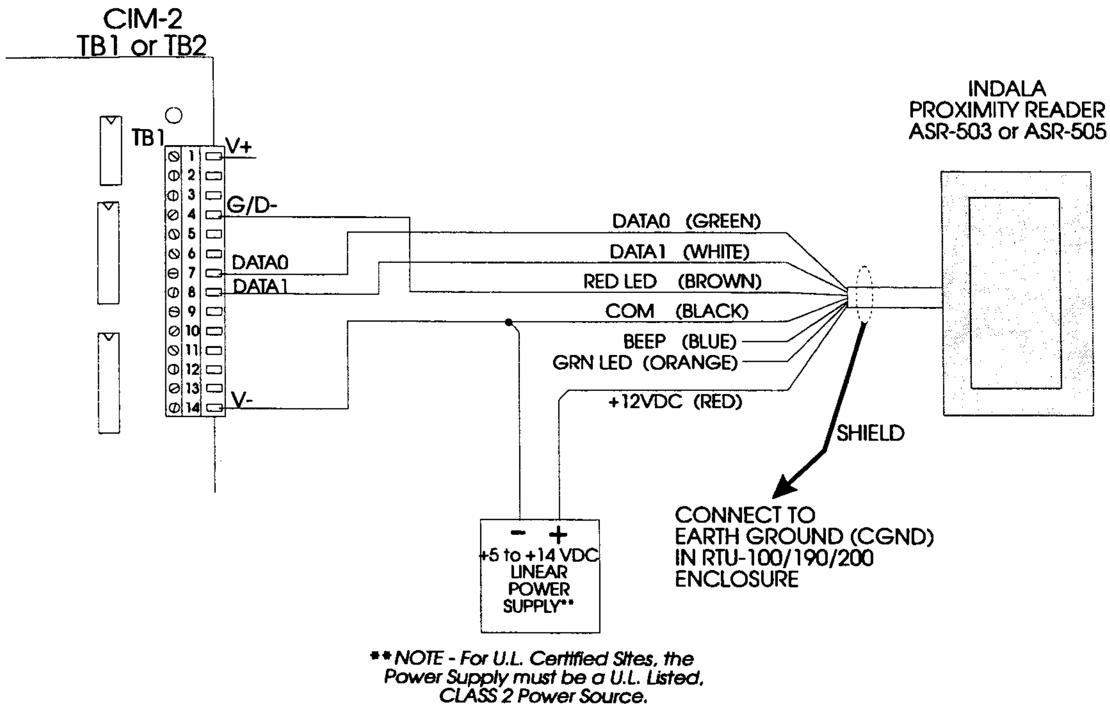
Figure 3-44. CIM CONNECTION TO MR-10/20 MAGNETIC STRIPE Rdr



1. THE OLD PROXPRO MODEL 5350 READER "GRANT/DENY" INDICATOR ("GRN LED") MUST BE ISOLATED WITH AN OIM IF CONTROL THROUGH THE CIM-2 IS REQUIRED. IF ONLY CARD "READ" AND "READER POWER ON" INDICATION IS REQUIRED THE READER "GRN LED" SIGNAL IS NOT CONNECTED AND THE OIM IS NOT REQUIRED..
2. THE PROXPRO MODEL 5350 READER SWITCHES ARE SET AS SHOWN.
3. THE NEW PROXPRO MODEL 5355 READER IS COMPLETELY COMPATIBLE WITH THE CIM-2 ELECTRONICS SO NO OIM IS REQUIRED.

INTERCONNECT DIAGRAM
CIM-2 to HID PROXPRO READER,
MODELS 5350 and 5355,
WIEGAND FORMAT

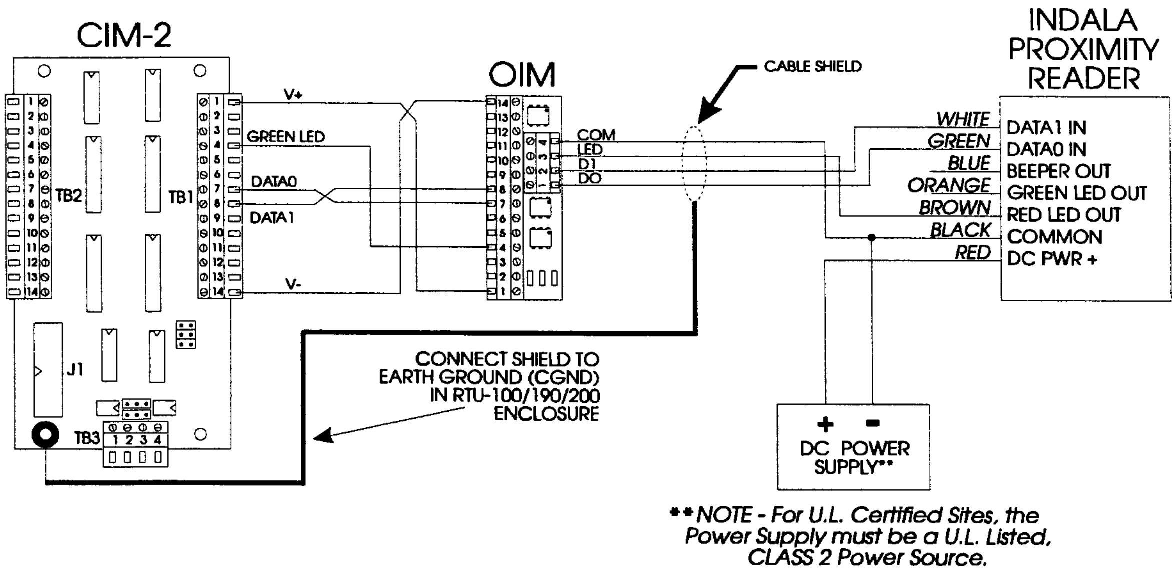
Figure 3-45. CIM CONNECTIONS TO HUGHES ID PROXIMITY READER MODELS 5350 and 5355



1. FOR APPROPRIATE WIRE SIZES AND RECOMMENDED CABLE, SEE INDALA PRODUCT SPECIFICATIONS.
2. GROUND SHIELD ONLY AT THE CIM-2 END OF THE CABLE.
3. POWER SUPPLY MUST BE ISOLATED FROM EARTH GROUND.
4. DO NOT USE TWISTED PAIR CABLE.
5. NO OIM IS REQUIRED.

INTERCONNECT DIAGRAM
CIM-2 to INDALA ASR-503 & ASR-505
WIEGAND FORMAT PROXIMITY READER

Figure 3-46. CIM CONNECTIONS TO INDALA PROXIMITY READERS MODELS ASR-503 and ASR-505

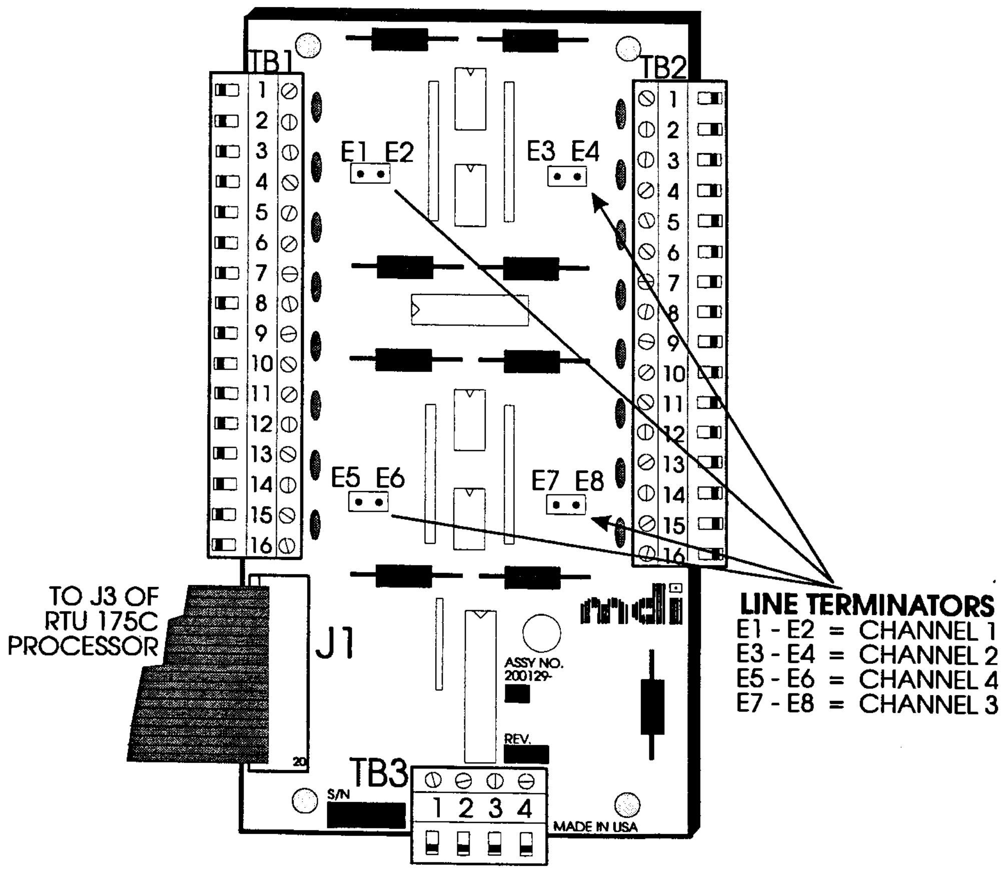


INTERCONNECT DIAGRAM
CIM-2 to INDALA ASR-110 & ASR-112
WIEGAND TYPE

Figure 3-47. CIM CONNECTIONS TO INDALA PROXIMITY READERS MODELS ASR-110 and ASR-112

3.7.9 FIM, Four-Wire Interface Module

The Four-Wire Interface Module (FIM) provides an RS-485, serial communicaiton interface with up to eight (8) MDI ACT card readers (ACT-4, ACT-5) or ACT reader interface devices (ACT-E, ACT-D). The FIM board provides four (4) separate RS-485 communication channels with connections for each of the four channels on both TB1 and TB2 (see Figure 3-48).



TB1 & TB2 CONNECTIONS**

Term 1	=	Rdr Power Output V+
Term 2	=	RS-485 DATA + Channel 1
Term 3	=	RS-485 DATA - Channel 1
Term 4	=	Rdr Power Output V-
Term 5	=	Rdr Power Output V+
Term 6	=	RS-485 DATA + Channel 2
Term 7	=	RS-485 DATA - Channel 2
Term 8	=	Rdr Power Output V-
Term 9	=	Rdr Power Output V+
Term 10	=	RS-485 DATA + Channel 3
Term 11	=	RS-485 DATA - Channel 3
Term 12	=	Rdr Power Output V-
Term 13	=	Rdr Power Output V+
Term 14	=	RS-485 DATA + Channel 4
Term 15	=	RS-485 DATA - Channel 4
Term 16	=	Rdr Power Output V-

TB3 CONNECTIONS

Term 1	=	Reader Power Supply V+ Input for TB1
Term 2	=	Reader Power Supply V - Input for TB1
Term 3	=	Reader Power Supply V - Input for TB2
Term 4	=	Reader Power Supply V+ Input for TB2

(READER POWER MUST BE PROVIDED BY AN EXTERNAL LOCAL POWER SUPPLY, WITH FLOATING GROUND, CONNECTED VIA TB3. For U.L. Certified Sites, Power Supply must be a U.L. Listed, CLASS 2 Power Source.)

**NOTE - TB1 and TB2 are identical parallel connections. Connect to either TB1 or TB2 or both.

Figure 3-48. FIM, FOUR-WIRE INTERFACE MODULE

The FIM board interfaces directly to the RTU 175C Processor Board connector J3 via a 20-conductor ribbon cable from the FIM J1 connector. The connections provided for each reader channel include connections for RS-485 Data + and -, as well as connections to distribute reader power directly from the FIM, if a local power supply is connected to the FIM via TB3 (see Figure 3-49). Door Contacts and Request-to-Exit devices are typically connected to, controlled and monitored by the ACT unit, however they can also be connected and monitored at the RIM board. RIM-8 or RIM-16 boards can be used with FIM-type Access Control. Door strike control is either from the ACT unit or via a ZPR-8F (ZPR-FIM) module installed in the RTU enclosure (see Paragraph 3.7.9.1 and Figure 3-52). Refer to the specific ACT unit manual for the particular connections and configurations.

The serial RS-485 communication provides the capability for multidropping numerous ACT readers and/or ACT interface devices on a single communication channel. Up to eight (8) access control ACT units can be connected on a single channel of the FIM board, or spread across two (2) channels or four channels of a single FIM, or each of the eight possible ACT units can be connected to a separate independent channel, in which case two (2) FIM boards will be required. Each of these possible configurations, or connection "Schemes", must be selected with jumpers on the 175C Processor board in order for the processor to properly communicate with each ACT unit. An example of each of these connection Schemes is shown in Figure 3-49. (For ACT-5 Stations, refer to the ACT-5 Manual for details of the connection Schemes.)

To properly utilize FIM communication to ACT readers and ACT interface devices, the following guidelines and configuration parameters must be applied:

1. The 175C Processor Board must be specified for FIM Access Control in order for it to be equipped with the necessary serial port for communication to the ACT units.

2. Properly configure the JP4 jumpers on the 175C Processor Board to select the connection Scheme to be used for the ACT units. See Figure 3-21 on Page 72 of this manual.

3. Ensure that jumpers E1 through E12 of the 175C Processor Board are correcly configured for FIM Access Control. Jumpers on left pair of pins. See Figure 3-21 on Page 72.

4. Ensure that each ACT unit is addressed correctly according to the FIM channel it is connected to and the connection Scheme selected.

5. Ensure that the RIM boards containing the Access Control ZIMS are properly addressed. The RIM corresponding to Reader #0 must have an address that is a multiple of 4 (i.e. 4, 8, 12, 16, 32, 48, 64, etc), with the other Access Control RIM's following in sequence. The address is based on the Supervisory address of the 175C Procesor Board. See Figure 3-21.

6. Ensure that the RTU 175C Processor Board firmware is correct for FIM Access Control and that the configuration parameters are set properly for the type of readers.

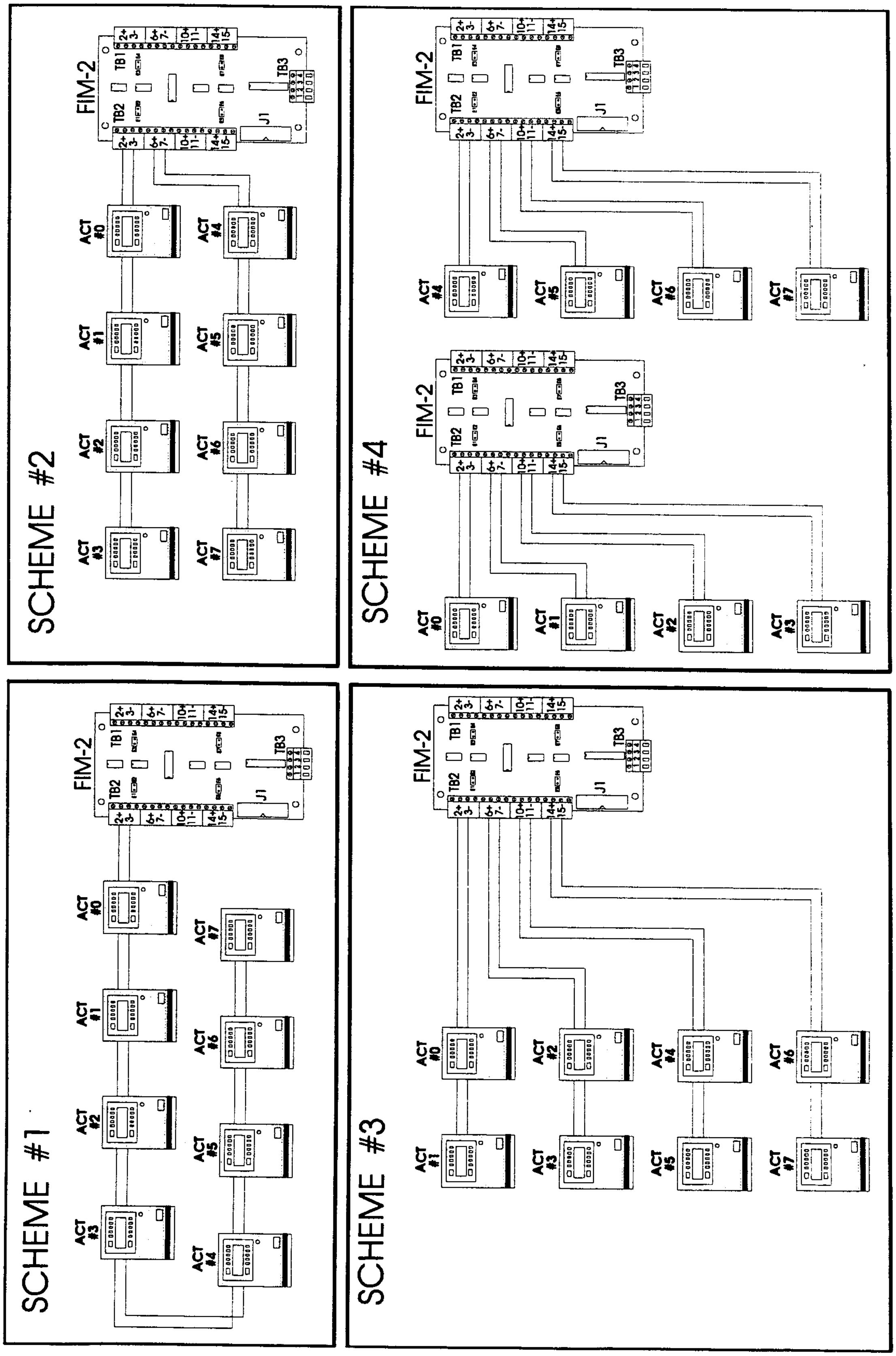


Figure 3-49. ACT-4/E/D READER CONNECTION SCHEMES

As previously stated, ACT reader/device power can be supplied directly from the FIM connections, if desired. A local 12 Vdc power supply must be installed at the RTU location (typically within 6-10 feet) and connected to the FIM board TB3, terminals 1 & 2 with a 2-conductor, 18 AWG cable, as shown in Figure 3-50 below. Each of the eight (8) reader connections on the FIM terminal blocks (4 connections each on TB1 & TB2) provides a Current Limited, reader power output connection, as shown in Figure 3-48. Each connection (i.e., TB1-1 & 4, TB2-1 & 4, TB1-5 & 8, TB2-5 & 8, etc.) provides a completely isolated power output that is current limited at a maximum of 250 mA, which is sufficient to power at least one ACT reader. If more than one ACT unit is to be multidrop connected and powered on the same channel, the power connection from other unused channels must be jumpered or strapped together to the channel being used in order to increase the current as required. Overall cable length for providing power on a single channel cannot exceed 1000 feet, with 16 or 18 AWG cable, from the FIM to the furthest ACT unit.

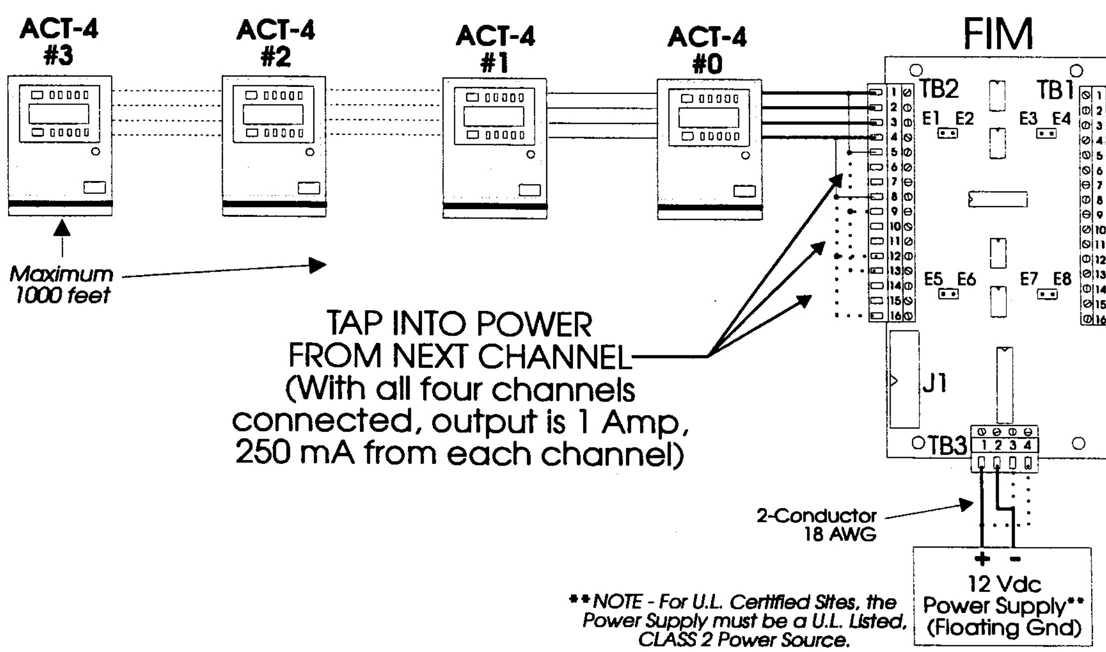


Figure 3-50. FIM SUPPLIED READER POWER CONNECTIONS

Calculations will be required to determine the power and current requirements for each channel used based on the number and type of ACT units to be connected and powered on that channel. Use the following typical values for your calculations:

ACT-4	=	150 to 175 mA, typical
ACT-2004	=	150 to 175 mA, typical
ACT Exit Reader	=	40 to 50 mA, typical
ACT-E	=	50 to 60 mA, typical
ACT-D	=	80 to 100 mA, typical

3.7.9.1 ZPR-FIM, Zero Power Relay, ZPR-8F

When using the MDI ACT type readers, such as the ACT-4 or ACT-E interface, the door strike/lock is wired to, and controlled by the ACT unit. However, in some installations, requirements exist for the door lock to be controlled at a location other than locally at the door. In these cases, a special Zero Power Relay (ZPR) for FIM applications can be added to the RTU to specifically control the door strikes/locks from the RTU instead of locally by the ACT unit. The relay module, refered to as the ZPR-8F or ZPR-FIM (Figure 3-51), provides eight (8) DPDT latching type relays, one for each of the possible eight card readers connected to the FIM. Relay contacts are rated for a maximum current of 2.0 Amps @ 24 Vdc or 0.5 Vac at 24 Vac.

When the ZPR-FIM is installed, each relay will automatically activate and deactivate in conjunction with the strike relay in the ACT unit with the corresponding address number. No other configuration or special setup is required. The necessary door strikes can then be wired back to the ZPR-FIM in the RTU, instead of to the ACT unit, thereby providing a secured door strike/lock installation (where required). This wiring technique could also be used to provide door strike power from a common battery-backed power supply. The relay in the ACT unit will still operate normally, but will have nothing connected to it, or it can be used for an auxiliary output for some other purpose.

ZPR-8F (FIM)

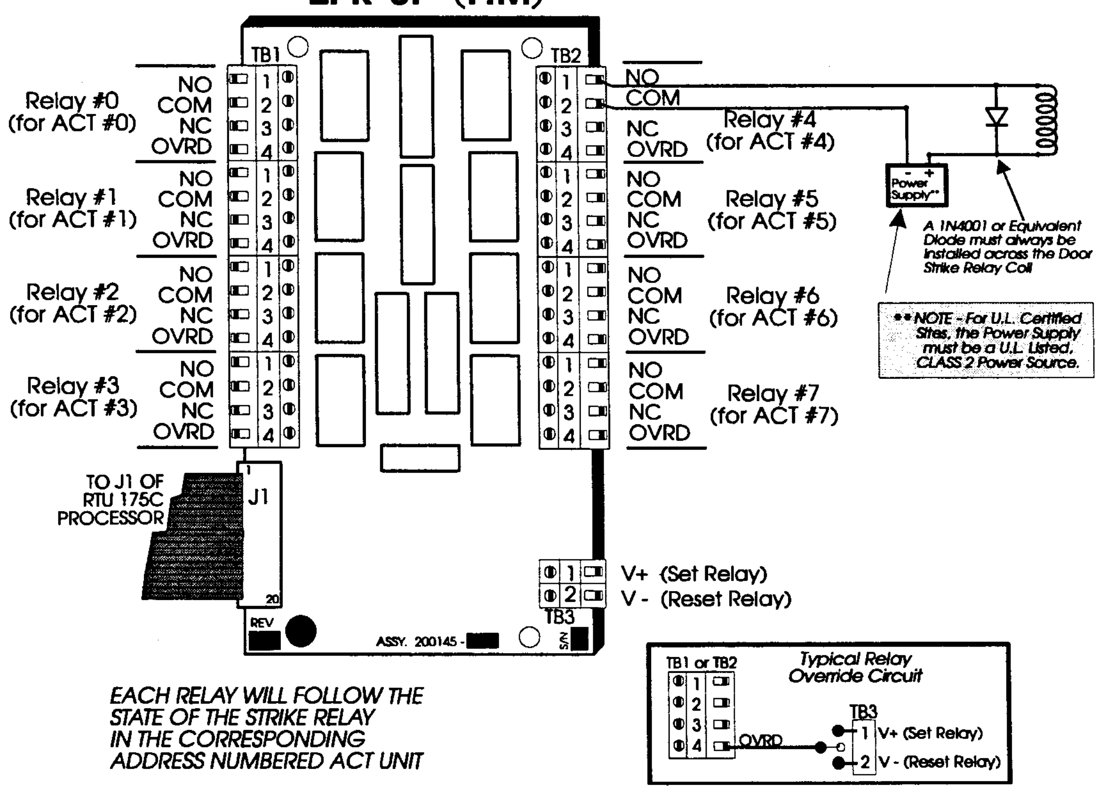


Figure 3-51. ZPR-FIM, ZERO POWER RELAY

The ZPR-FIM relay board also provides the connections for an override circuit on each individual relay which can lock the relay in the activated or deactivated state. An example of the override circuit wiring is shown in Figure 3-51. When in an override condition, the relay will ignore any other commands sent to it.

The ZPR-FIM is installed in the RTU enclosure next to the FIM board(s) and is connected to the 175C Processor Board with a 20-conductor ribbon cable from J1 of the ZPR board to J1 of the Processor Board (see Figure 3-52). When installed, the relays are automatically linked to the ACT units. The ZPR-FIM board is normally labeled as ZPR-03.

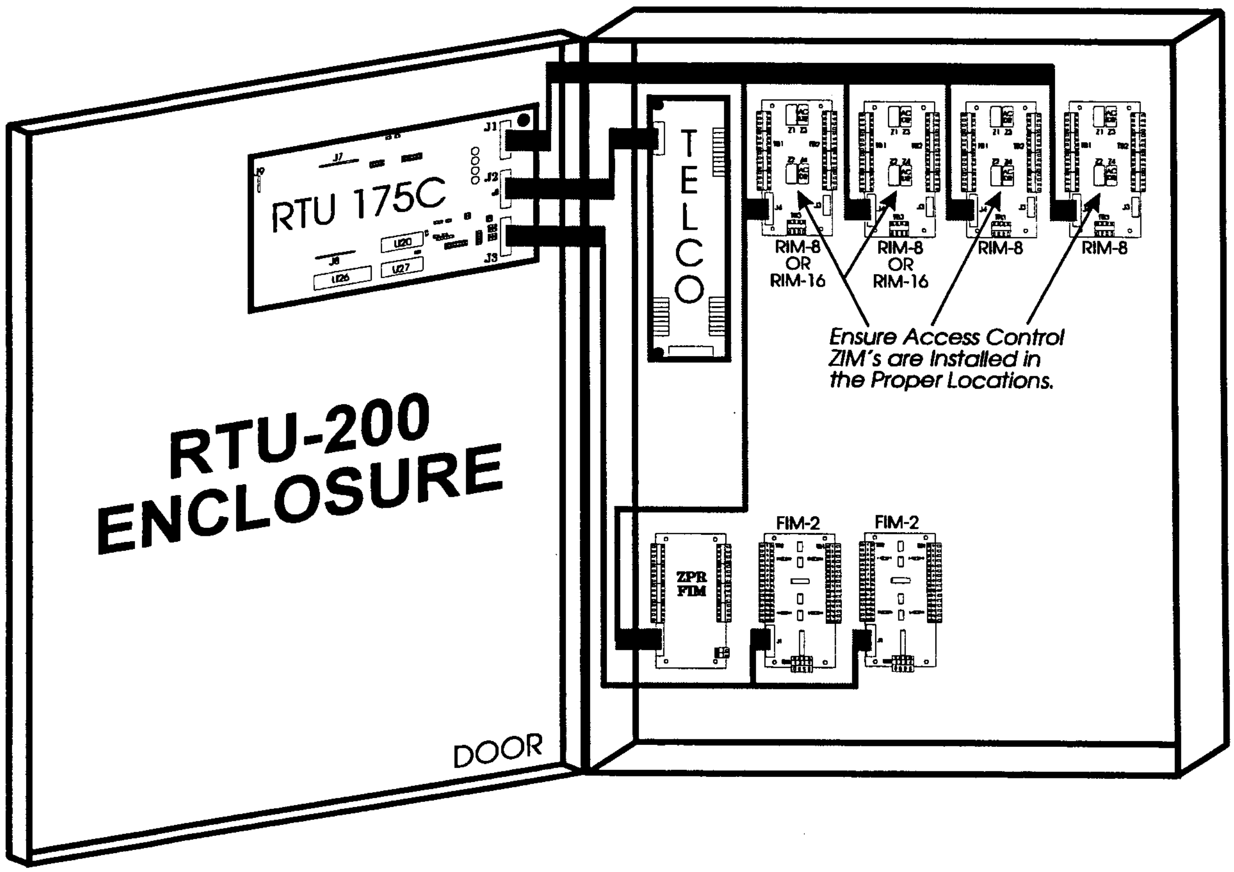
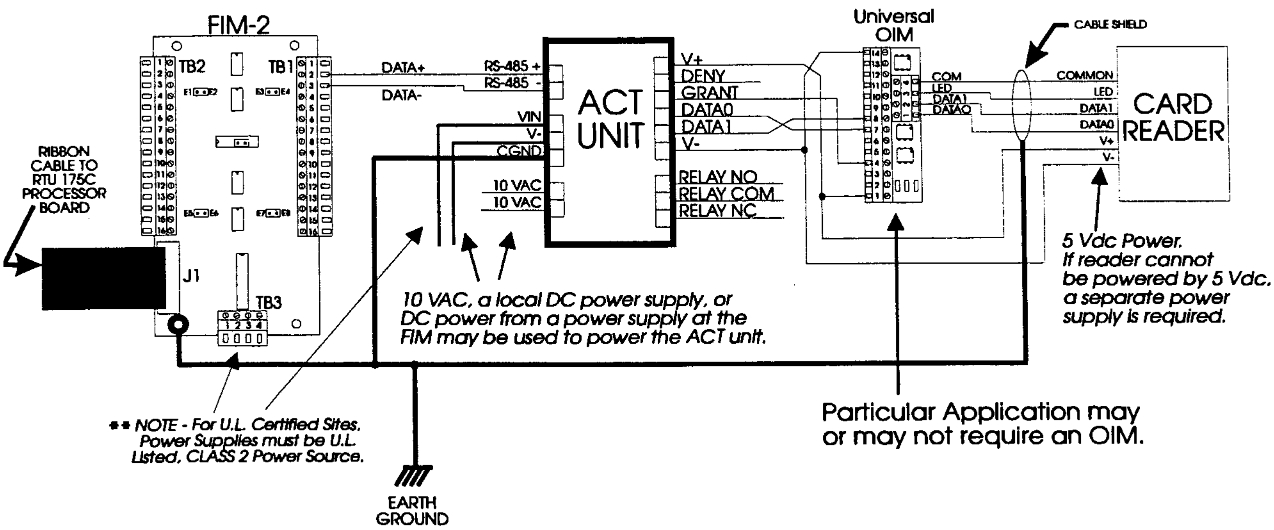


Figure 3-52. FIM AND ZPR-FIM RTU CONNECTIONS



ACT-4 & ACT-LP

FIM TB1/2	ACT TB1	READER	
	1 STRIKE NC		
	2 STRIKE COM		
	3 STRIKE NO		
	4		
	5		
	6		
V +	7 V In +		
V -	8 V In -		
RS-485 DATA+	9 DATA +		
RS-485 DATA-	10 DATA -		
	11 Door Loop +		
	12 Door Loop -		
	13 V+ Out	V+	EXIT
	14 DATA0	DATA0	
	15 DATA1	DATA1	
	16 DENY LED	DENY	
	17 V- Out	V-	RDR
	18		
CGND	19 CGND	CGND	
	TB2-3 GRANT LED	GRANT	

Input Power to ACT at TB1-7 and TB1-8 can be either DC power from FIM or DC Power Supply, or supply can be 10 VAC Transformer.

ACT-E

FIM TB1/2	ACT-E	READER
V+	TB5-1 VIN	
V-	TB5-2 V-	
CGND	TB5-3 CGND	
	TB5-4 10 VAC	
	TB5-5 10 VAC	
RS-485 DATA -	TB4-1 DATA -	
RS-485 DATA +	TB4-2 DATA +	
	TB4-3 DATA -	
	TB4-4 DATA +	
	TB3-1 V+	V+
	TB3-2 DENY	DENY LED
	TB3-3 GRANT	GRANT LED
	TB3-4 DATA0	DATA0
	TB3-5 DATA1	DATA1
	TB3-6 V-	V-

Input Power to ACT-E can be DC Power at TB5-1 and TB5-2 from FIM or external DC supply, or Supply can be 10 VAC Transformer connected to TB5-4 and TB5-5.

ACT-D

FIM TB1/2	ACT-D	READER
V+	TB1-1 VIN	
V-	TB1-2 VCOM	
RS-485 DATA +	TB1-3 RS485+	
RS-485 DATA -	TB1-4 RS485-	
	TB1-5	
	TB1-6	
	TB1-7 EGND	
CGND	TB1-8 CGND	
	TB2-1 VIN	V+
	TB2-2 +5V	
	TB2-3 DATA0	DATA0
	TB2-4 DATA1	DATA1
	TB2-5 LED G/D	GRANT LED
	TB2-6 LEDE	
	TB2-7	
	TB2-8 V-	V-

Input Power to ACT-D at TB1-1 and TB1-2 can be either DC power from FIM or DC Power Supply, or supply can be 10 VAC Transformer.

* *

DRAWINGS SHOW TYPICAL CONNECTIONS ONLY. REFER TO THE PERTINENT ACT UNIT MANUAL TO DETERMINE AND/OR VERIFY THE EXACT CONNECTS FOR EACH ACT DEVICE.

* *

Figure 3-53. TYPICAL FIM TO ACT UNIT CONNECTIONS

3.7.10 Memory Expansion/DES Encryption Modules

The basic RTU 175C Processor Board includes onboard memory for the processing and storage of up to approximately 1000 Access Control Cardholder Records. With the Cardholder information stored locally in the RAM of the Processor board, access requests at card readers are processed at a much faster rate (approximately 1 second) since the information can be looked up and accessed so much quicker. Once the 1000 record limit has been exceeded, the RTU Processor will store only the most recently used records, meaning some records will not be stored locally and will require downloading from the host computer system when making a access request. An access request by a cardholder whose record is not stored in the RTU processor memory could take up to 5 seconds or more to be processed since the information must be transmitted down to the RTU from the host computer. In a situation like this where more than 1000 card records are required, a Memory Expansion Module (MEX) should be installed onto the RTU Processor Board. The MEX modules (see Figure 3-54) add additional data base storage memory and install as a "Piggy-back" board onto the 175C Processor Board., connecting into the J7, J8, and J9 connectors of the Processor board (J1 of the MEX board connects to J9 of the Processor, J2 of the MEX to J7 of Processor, and J6 of the MEX to J8 of the Processor board).

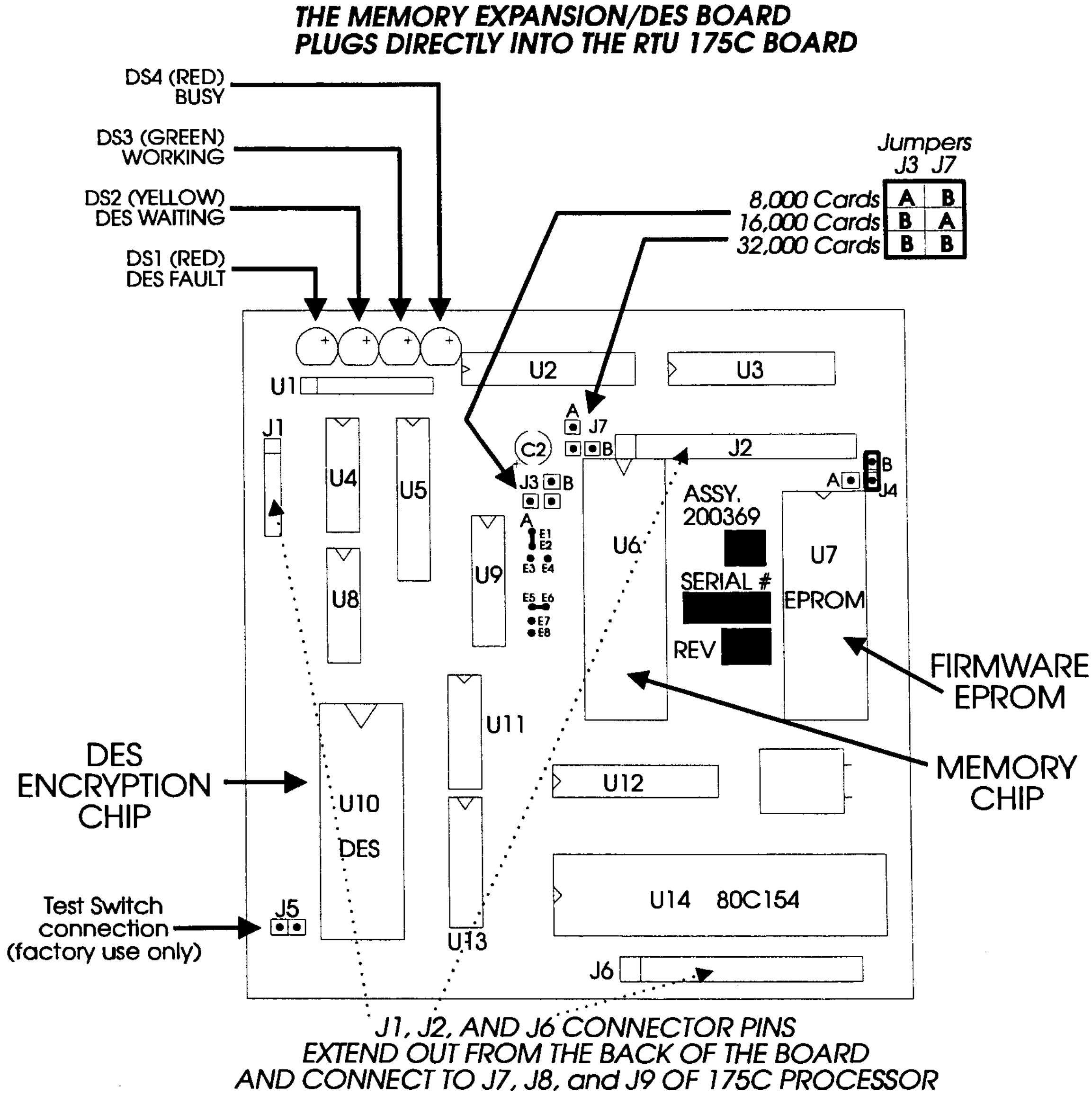
If the particular installation site also has specific requirements for Encrypted Communication between the Host/Central Station and the RTU, the MEX module also supports the addition of a DES Encryption Chip in order to provide encrypted communication. The Encryption chip is inserted into socket location U10 of the MEX board (see Figure 3-54). To use the DES Encryption function, special software options and parameters must be enabled and configured. Consult the MDI Factory for exact details.

The Memory modules are available in six (6) different version based on how many cardholder records will need to be stored at the RTU Processor and if DES Encryption is required:

MEX-8	= Storage for up to 8,000 Cardholders	DMX-8	= 8,000 Cards W/DES
MEX-16	= Storage for up to 16,000 Cardholders	DMX-16	= 16,000 Cards W/DES
MEX-32	= Storage for up to 32,000 Cardholders	DMX-32	= 32,000 Cards W/DES

Jumpers J3 and J7 of the MEX board must be set according to the memory size installed in the board and the number of cardholders to be supported (see Figure 3-54). The RTU Firmware Parameters must also be configured properly in order to specify the correct memory module option, or the RTU will not use the available memory properly, if at all. In the RTU Parameters, the first page "Main RTU Parameters", go to the 11th line, "Memory Module". The default for this parameter is "01" which corresponds to 1000 Cards. This parameter must be set according to the size of the data base and memory as follow:

01 = 1,000 Cardholder Records
04 = 4,000 Cardholder Records
08 = 8,000 Cardholder Records
10 = 16,000 Cardholder Records
20 = 32,000 Cardholder Records



FOR DES ENCRYPTED
COMMUNICATION

ENCRYPTION CHIP
WD20C02A-PH05
Socket Location U10

FOR 8,000 CARDS

MEMORY CHIP IS
128Kx8 SRAM
HM628128
Socket Location U6

FOR 16,000 CARDS

MEMORY CHIP IS
256Kx8 SRAM
MODWMS256008DPCA-70
Socket Location U6

FOR 32,000 CARDS

MEMORY CHIP IS
512Kx8 SRAM
MODWMS512008DPCA-70
Socket Location U6

Figure 3-54. MEMORY EXPANSION/DES ENCRYPTION MODULE

4.0 SYSTEM TEST & TROUBLESHOOTING

With the RTU Panel Enclosure and internal components now installed, wired and ready for system operation, some basic tests and checkout procedures should be performed to ensure that everything has been installed correctly and to verify proper RTU operation.

4.1 POWER-UP

As detailed at the beginning of Section 3 of this manual, the RTU-100/190/200 panels are operated from an MDI Model # T10V, U.L. Listed, 10 VAC, 16 VA class 2 transformer. The transformer is to be plugged into an unswitched, dedicated, tamper resistant AC outlet located within 10 feet of the selected location of the RTU enclosure. Prior to connecting and/or applying any form of supply power to the RTU, visually inspect the entire RTU enclosure to ensure that all power connections are in the correct positions, securely terminated with no stray wire strands hanging out of the connector, and that no wires have been left unterminated or dangling where damage may result from inadvertent contact to a power wire.

4.1.1 AC POWER & BATTERY CONNECTIONS

Connect and verify RTU system power and batteries by performing the following steps:

A. Disconnect the ribbon cable from connector J2 of the 175C Processor Board (Figure 3-20).

B. Pull in a 2-conductor, minimum 22 AWG cable and connect to terminals TB1-1 and TB1-2 of the TELCO board (See Figure 3-4). Connect the other end of the cable to the 10 VAC, 16 VA transformer to be used for powering the RTU. Ensure proper length of the cable allowing a service loop in the cable.

C. Plug in the 10 VAC transformer into the non-switched AC receptacle. With a multimeter, verify that there is 10 to 12 Volts AC across the TELCO board terminals TB1-1 and TB1-2. Check for 6.5 to 7.2 Volts DC on terminals TB1-6 and TB1-7 of the TELCO board.

D. Place the batteries into the enclosure and connect the battery cables. The battery cables provided attach to the battery with push-on connectors. The negative terminal connector has two (2) wires connected to it and has a black mark on it. The positive connector has only one (1) wire and not marks on it. Install the required number of batteries as determined by the Power Consumption Worksheet in Appendix 'C'.

E. After connecting to the batteries, connect the battery cables to JB1, JB2, and/or JB3 of the TELCO Board. ENSURE PROPER ALIGNMENT ON THE 3-PIN CONNECTOR AS IMPROPER ALIGNMENT ONTO THE CONNECTOR (miss a pin or one pin off) WILL RESULT IN BURNED TRACES ON THE TELCO BOARD VOIDING THE RTU WARRANTY.

F. With a multimeter, check for 6.5 to 6.8 Volts DC on terminals TB1-6 and TB1-7 of the TELCO board.

G. Connect the Ribbon cable to J2 of the Processor board, press the reset button. Verify that the "AC ON" LED indicator on the front of the RTU enclosure is illuminated, and that the "FAULT" LED is off.

4.2 BASIC OPERATIONAL CHECKOUT

Once the RTU has been completely installed and the power and batteries verified, a complete RTU System Checkout should be performed to verify proper system installation and operation. If a problem occurs in any of the following steps, refer to the troubleshooting section in Paragraph 4.4. It is suggested that any local bells that are connected be temporarily disconnected until those steps in this procedure for testing of the bells are encountered.

1. VERIFY AC POWER
   Ensure that AC power is applied with the 10 VAC transformer plugged into the AC outlet. Check the LED labeled "AC ON" on the front panel of the RTU enclosure to ensure that the LED is illuminated. This indicator verifies that the AC power is properly connected.

   ☐ *COMPLETED SUCCESSFULLY*

2. INITIALIZE RTU PROCESSOR
   Open the RTU enclosure door and press the RESET button located on the RTU Processor board (see Figure 3-20, page 71). This will force the microprocessor of the RTU to reinitialize and read all the address jumpers, clear its memory, initialize the hardware and begin RTU system processing.

   ☐ *COMPLETED SUCCESSFULLY*

3. VERIFY ENCLOSURE DOOR TAMPER CIRCUIT
   With the enclosure door open, push in or pull out the plungers on the door tamper switches (RTU-100 has only 1 switch) in order to close the contacts. Check the "TAMPER" LED on the front panel of the door to verify that the LED is off. One at a time, put each of the tamper switches into the open (center) or alarm position and verify that the TAMPER LED illuminates when either switch is activated. This also verifies that the Processor is running.

   ☐ *COMPLETED SUCCESSFULLY*

4. CHECK RTU TO HOST SYSTEM COMMUNICATIONS

A. Verify communication lines are properly connected to the TELCO board.

B. After setting the appropriate RTU addresses ON-LINE at the Host CPU, verify that "REPLY" LED on the front panel is rapidly blinking, indicating that the RTU panel is receiving messages from the Host CPU. The REPLY light will actually blink sequentially for each address of that RTU that is on-line, however, due to the speed of the blinking, it is extremely difficult to verify if a reply is received for each address. (If more than 1 RTU is connected on a communication line, the REPLY LED should rapidly blink the same number of times as there are valid addresses in that RTU and then pause momentarily. The pause time will vary depending on how many other RTU's are on that line.) To verify that each address of the RTU is on-line, check at the Host CPU to ensure that the system reports a "Mux Ret" for each address. Disconnect the ribbon cable from J4 of each RIM (J2 of a ROAM board), one at a time, and verify that the Host system reports a "Mux Fail" for that address. Re-insert the cable and the system should report "Mux Ret". Continuous "Mux Fail", "Mux Ret", Data Error, or erroneous alarm reporting all indicate that there are problems on the communication line.

C. Activate and deactivate and alarm input zone on each RIM and verify that the Host CPU system reports the change of state. The REPLY LED will also change its blinking pattern with the change of state of an alarm input, however, this is again extremely difficult to verify due to the rapid blinking of the LED.

Communications in both directions is verified if these steps are completed successfully.

☐ *COMPLETED SUCCESSFULLY*

5. VERIFY ALARM ZONE LED DISPLAYS ARE ACTIVE
If the RTU is equipped with LED status displays on the front door of the RTU enclosure (RDM-8R) or remotely located display panels (DEP or DCP), verify that the LED's indicate the status of each applicable alarm device. Alternately sequence some alarm points back and forth from alarm to secure and verify that the applicable LED follows the state of the alarm zone.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

6. SECURE ALL ALARM ZONES
Verify that each and every alarm input zone can be restored to the secured /normal mode. Use the LED status displays on the RTU (if applicable) and/or the status display and reporting at the Host CPU to verify the alarm zones to be secured.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

7. TEST EACH ALARM INPUT ZONE
Assign someone to monitor all activity at the Host CPU/Central Station and then sequentially test every alarm input zone, one RIM at a time. Sequence each alarm point to alarm and then back to secure and verify at the Host CPU that each and every change-of-state is reported, with the proper text description. If applicable, verify the local and/or remote LED displays, to ensure proper status displays for each zone. Create and utilize a check-off list of all installed alarm points for each RTU to ensure that all zones are verified.

☐ *COMPLETED SUCCESSFULLY*

8. TEST ARM/DISARM KEYPAD OR SWITCH
If applicable, configure the appropriate account information for the Arm/Disarm (Open/Close) Keypad Station or Switch, and verify the proper operation of each. Enter a valid keypad number, or activate the switch, and verify that the area/account is set to the OPEN condition by the report at the Host CPU as well as the LED display on the front panel of the RTU. Confirm that any Burglar/Intrusion alarm input zones applicable to the Arming Control ZIM are in fact disabled by attempting to activate and deactivate the alarm condition for those zones. Again enter a valid keypad number, or deactivate the switch, to set the area/account to the CLOSED condition. Verify the reports at the Host CPU, as well as the indications on the LED display, to confirm that the area is indeed closed. Verify that all alarms are now enabled and will report.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

9. VERIFY RELAY OUTPUTS AND COMMANDS
If the RTU is equipped with ZPR Relay Boards, verify the operation of each relay output by generating activate (set) and deactivate (reset) commands from the Host CPU. Manual commands can be generated at the Host CPU Workstation from the Monitor program by selecting 'F5-Ctl', followed by 'F2-Control', and enter the line number and RTU address number of the ZPR relay board to be tested, and then the SET or RESET command. Remember, the address of a ZPR-ROM is that of the RIM to which it is connected. A ZPR-ROAM has its own address set by onboard jumpers. Since the ZPR relay boards are dry-contact relay outputs, an Ohmmeter can be used to check the operation of each relay, measuring from the "Common" to either the "NO" or "NC" contact. One contact will measure a short and the other will measure an open. Sending a command to the relay will cause the measurements to reverse.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

10. BACKUP LINE TEST
If the RTU is equipped with a Backup Communication Line, whether it be Diff, Mux , or Dial, proper operation of that backup line must be verified. To test the backup line, remove the Primary Communication Line wiring from the TELCO Board. Switchover to the backup line will differ slightly based on the type of backup line.

If the backup line is Diff or Mux, a "Mux Fail" event will be immediately reported by the Host CPU system when the Primary line is disconnected. After approximately 25-30 seconds, the RTU should switchover communication to the backup line with the Host CPU reporting a "PRI>BACK" and "Mux Ret" events for that line # and applicable RTU #'s. Reconnect the Primary Line and communication should remain on the Backup line. Disconnect the Backup line, and the system will again report "Mux Fail" with the RTU switching back to Primary line after approximately 25 seconds. The Host CPU will report a "BACK>PRI" event for that Line # and RTU #'s.

If the backup line is a Dial backup, a "Mux Fail" will be reported immediately upon disconnecting the Primary line. After about 30 seconds, create an alarm condition which should initiate the dial-up process. When the Dial Connection is made, the Host CPU system will report a "Mux Ret" and "DIAL-ON" messages for the line # and RTU # along with the alarm zone report(s), followed by "DIAL-OFF" and "Mux Fail". A dial-up connection will be initiated with any alarm zone change of state.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

11. CHECK AC POWER FAIL OPERATION & REPORTING
If the RTU is equipped with backup batteries, ensure batteries are connected properly (see paragraph 4.1.1.D). Remove/disconnect AC Power to the RTU. The RTU should continue to operate normally. The "AC ON" LED on the enclosure front panel should now be OFF. The Host CPU system should report an "AC FAIL" event message for that RTU #. Restore the AC power and the AC ON indicator should be illuminated and the Host CPU should report the AC restored.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

12. CHECK FAULT LIGHT
If the local bells to be used were disconnected, as previously suggested, or none have been connected at all, the FAULT LED indicator on the front panel of the RTU may be illuminated. Terminate a 1000 ohm resistor across the Fire Bell output (bell output #4) of the TELCO board and the FAULT LED should go off. Another cause for the FAULT LED to be illuminated may be a supervised Dial Backup line. If a Dial Backup line is not connected or connected improperly, the FAULT light will turn on.

☐ *COMPLETED SUCCESSFULLY*

13. LOCAL BELL TESTS
If the RTU is to have local bells connected and operated from the TELCO Board, reconnect the bells at this time (if they were disconnected), ensuring first that any applicable alarm points are in the secure mode. Check each bell output one at a time, starting with the lowest priority (intrusion/burglary) and progress to the higher priority. Refer to paragraphs 3.4.3 and 3.4.3.1, as well as Figure 3-4, for details on the installation and operation of the Local Bell Outputs.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

14. ACCESS CONTROL OPERATION

A. Verify all connections to any installed card readers, as well as the associated devices such as door contacts, door strikes/locks, request-to-exit devices, etc. Verify that the card readers are assigned and configured in the Host CPU system data base.
B. Define some "Test" Cardholder Records into the cardholder data base, creating at least one for an access grant and another for an access denied. Present a card to each card reader and verify that the reader recognizes the card and downloads the correct cardholder information, resulting in an access grant or access denied.
C. Upon an access grant, verify that the Grant LED of the reader (if applicable) lights correctly and that the door strike/lock opens or activates to unlock the door.
D. Upon a valid access denied, verify that the LED indication is correct that the door does not unlock.
E. If the door has a request-to-exit device, activate the device and verify that the door unlocks and the proper indication is give on the controlling card reader.
F. With whatever means available, open the card reader controlled door without using the card reader or the REX device. Verify that the Host CPU system immediately reports a Protection or Intrusion alarm and that the reader shows the visual and/or audible indication of a door alarm. Close that door and ensure that all alarm conditions are restored to normal.
G. Create a valid access with either a valid card or the REX device. When the door unlocks, open the door and prop it open. Verify that after the preset period of time (default=30 seconds), a DOOR PROP alarm is reported at the Host CPU and that the reader shows a door alarm condition. Close the door and the alarm should clear.
H. If a door has reader on both sides of the door in a Shared Door application, ensure that both readers function properly and unlock the door properly without causing erroneous alarm conditions at time one of the readers is used or the door opened. The RTU Parameters in the Processor firmware must be configured properly for Paired Readers (entry and exit readers) and Shared Door application.

☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

15. MISCELLANEOUS TESTS
Determine, verify and/or test any other system devices and/or functions, or special software options which the system may contain that have not been covered by any other step of this procedure. Determine any operational parameters and/or data base requirements and perform, verify and record the necessary tests.

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☐ *COMPLETED SUCCESSFULLY* ☐ *NOT APPLICABLE*

16. MISCELLANEOUS RTU CLEANUP AND CLOSEUP
When all testing is successfully completed, inspect the RTU enclosure and components for any loose or stray wires, insulation or other debris. Correct any discrepancies and carefully clean out the interior of the RTU enclosure. Ensure all wiring is neatly routed and secured with tie-wraps and tie-downs as is necessary. Close and lock the RTU enclosure door and verify that the TAMPER LED on the front panel is off.

☐ *COMPLETED SUCCESSFULLY*

4.2.1 Periodic Maintenance and Testing

The RTU 100, RTU-190, and RTU-200 panels do not require an extensive Periodic Maintenance Program, however some basic system functions should be verified on a regular basis.

A. Gel Cell backup batteries should be checked at least every 6 months. AC power to each RTU should be temporarily removed for at least 50% of the specified backup time of the batteries, allowing the RTU to operate on battery power and partially discharge the batteries. Restore AC power and recharge the batteries. If the batteries are not periodically discharged, their serviceable life expectancy will be greatly reduced. Gel Cell batteries should be replaced at least every 3 to 4 four years, regardless of their serviceability.

B. (Every 3 months) Inspect and verify all connections within the RTU enclosure. Check all LEDs to ensure proper operation and illumination. Replace or repair any questionable situation. Ensure all RTU components are clean dry, and free of any corrosion.

C. (Every 3 months) If the system includes Card Access Control, inspect and verify the operation of each card reader. Inspect and clean the read heads and reader slots, as applicable, and verify door contact, REX, and door lock operation. Inspect all cables and connections. Replace questionable devices and/or components.

4.2.2 RTU LED Status Indicators

The front door of the RTU enclosure can include numerous LED indicators on to show the operational status of a various functions of the RTU panel. Below is a table showing the normal and abnormal indications of each LED.

LED INDICATOR	*NORMAL INDICATION*	*ABNORMAL INDICATION*	*CORRECTION IF ABNORMAL*
AC ON	LED on	LED off	Check AC Transformer
TAMPER	LED off	LED on	Check RTU Enclosure Door Check Tamper Switches
FAULT	LED off	LED on LED Blinking	Check Fire Bell Output Check TELCO Bd fuses Check Dial Backup Line Check or Replace Batteries
REPLY	Rapid Flashing	LED off	Check Communication Lines

The RTU may also include groups of LED's to indicate the status of alarm zones. RDM-8R modules are mounted on the RTU door to display the status of eight (8) alarm zones. At remote locations, DEP's or DCP's can also be connected to the RTU to display alarm zone status. The table below shows the meaning of the different flash sequences pertinent to alarm zones.

LED INDICATION	*STATUS INDICATION*
LED off	SECURE/NORMAL mode (alarm zone) Area OPEN, Open/Close Zone (Arming ZIM)
LED on solid	ALARM/OFF-NORMAL mode (alarm zone) Area CLOSED, Open/Close Zone (Arming ZIM)
LED rapidly flashing on/off (flashing 4 times/sec)	Active Intrusion Alarm Zone that is disabled via Arming Control (area open) Also indicates no ZIM installed for that zone
LED off with short flash on every 1.5 seconds	MASKED Alarm Zone in Secure/Normal mode
LED on with short flash off every 1.5 seconds	MASKED Alarm Zone in Active Alarm/ Off-Normal mode
LED <u>very</u> dim, very rapid flash	Control Output Point Activated (set)

4.3 TROUBLESHOOTING

Below is a list of potential operational problems and/or installation discrepancies that could occur with the RTU-100, RTU-190, and RTU-200 panels, along with possible causes for each problem and suggested troubleshooting tips or remedies for that particular problem. This listing is only a general guideline to assist a Trained and Experienced Security Systems Technician in locating the source of the problem and correcting it in an expeditious manner.

1. *THE HOST CPU/CENTRAL STATION MONITOR INDICATES THAT THE RTU IS IN COMMUNICATION FAILURE ON THE PRIMARY COMMUNICATIONS LINE.*

   A. **No power to the RTU.**

   - Check backup batteries (See para. 4.1.1).
   - Check if the AC power LED on the RTU front panel is on. If not check AC power source (See para. 4.1.1).

   B. **The reset button on the RTU Processor Board was not pressed after installation. (This could cause incorrect address information when RTU is powered up.)**

   - Push reset button on the RTU Processor Board. Hold for 3 seconds.

   C. **Loose or improper communication line or power connections in the RTU.**

   - Check all TELCO board cable and wire connections in the RTU.

   D. **Address jumpers on the RTU Processor Board are wrong.**

   - Verify for correct line number & supervisory address jumpers on RTU Processor Board.

   E. **PPU line card and/or line parameters configured improperly.**

   - At a dedicated PPU terminal, or using the PPUTERM program, check the PPU internal line and modem configuration settings to ensure the correct baud rate, line delays, etc., are defined.

   F. **2-Wire/4-Wire jumpers on RTU Processor Board incorrectly installed. (This is only applicable for MUX type communication.)**

   - Check JP3 on RTU Processor Board. JP3 jumper should be installed on 1-2 for 4-wire, and on 2-3 for 2-wire.

   G. **No Reply signal at the PPU from the RTU.**

   - Flashing REPLY LED on RTU indicates that RTU is transmitting in response to the PPU. Check communication line (TB3) to the PPU if REPLY LED is flashing.

   H. **No transmit signal from the PPU is being received at the RTU.**

   - If MUX or DIAL type communication, listen to the communication line with a telephone headset to see if the PPU XMIT signal is being received.
   - If DIFF type communications, an oscilloscope is required.

I. **TELCO Board failure.**

- Check fuses on TELCO Board.
- Check if battery cables are connected right.
- Replace TELCO Board.

J. **RTU Processor Board (e.g. RTU-175C) failure.**

- Replace RTU Processor Board and reset processor. Verify that the RTU Processor Board and Firmware is compatible with the communications format being used (e.g. MUX-MUX, DIFF-DIFF, DIFF-DIAL, etc.).

K. **Cable from TELCO Board to Processor Board J2 is defective.**

- Replace cable.

L. **PPU Line Card failure.**

- Replace the Line Card in the PPU. Ensure proper communication format/baud rate.

2. *DIALER WILL NOT DIAL WHEN PRIMARY LINE FAILS.*

A. **Faulty cable from TELCO Board to RTU Processor Board J2.**

- Replace ribbon cable.

B. **EPROMs U20 & U27 on RTU-175C Processor Board has wrong firmware program.**

- Replace U20 & U27 EPROMs with correct firmware programming.

C. **Dial telephone numbers programmed incorrectly.**

- Using EPROG program at the Host CPU, check RTU parameters in LO EPROM of firmware set to ensure dialup phone numbers properly configured.

D. **Telephone system will not support touch tone.**

- Pulse dial is available from factory upon request.

E. **RTU Processor Board failed.**

- Replace Processor Board.

F. **Improper phone line connection.**

- Swap tip and ring wires.

3. *DIALER DIALS, BUT CENTRAL STATION DOES NOT RECEIVE.*

A. **PPU not answering.**

- Check telephone number programmed into the RTU Processor Board firmware EPROM parameters.

B. **Dialer telephone lines not connected correctly.**

- Check dialer telephone line connections at TELCO Board.
- Check dialing functions with telephone test handset. Dial host PPU and verify proper ring latch operation.

C. **Telephone line problem.**

- Have telephone company check lines.

D. **Delay needed in telephone number dialing.**

- Program delays into EPROM with phone number.

E. **PPU Line Card failure.**

- Replace the Line Card in the PPU. Ensure proper communication format.

4. *NO RTUS ON ONE LINE ARE BEING RECEIVED. OTHER LINES ARE OK.*

A. **Faulty Dial line connection at Host/Central Station PPU.**

- Check line connections at the PPU. If MUX or DIAL type communication, listen to the communication line with a telephone headset to see if the PPU XMIT signal is being received. If DIFF type communications, an oscilloscope may be required. If connections OK but no signals, check with the telephone company on line status.

B. **Line Card jumpers set incorrectly.**

- Check PPU-50/100 manual for proper jumper configuration.

C. **RTU Processor Board Line Number jumpers are incorrect.**

- Verify correct line number address jumpers on RTU Processor Board.

D. **PPU Line Card failure.**

- Replace the Line Card in the PPU. Ensure proper communication format.

E. **PPU line card and/or line parameters configured improperly.**

- At a dedicated PPU terminal, or using the PPUTERM program, check the PPU internal line and modem configuration settings to ensure the correct baud rate, line delays, etc., are defined.

F. **Line Card failure**

- Replace Line Card at PPU-50/100

5. *ONE OR MORE RTUS ON THE SAME LINE SWING IN AND OUT OF COMMUNICATION FAIL.*

A. **Duplicate RTU Processor Board supervisory address on the same line.**

- Check the new RTU installed at the time the problem first occurred, and check supervisory address to ensure it is unique to the line. Remove power from the RTU with the swinging address and check if that address is still shown as on-line.

B. **Improper termination of Passive Matrix Bridge (MUX only).**

- Check connections at the bridge.

C. **Bad communications line.**

- Check line quality. Have Telephone Company check the lines.

D. **Earth ground (CGND) missing from the TELCO board TB1-8.**

- Install missing ground wires from TB1-8 to earth ground.

E. **PPU modem delay set incorrectly.**

- Check modem delay times in PPU standalone.

6. *RTU FAILS TO PROCESS, DISPLAY, AND/OR PERFORM A COMMAND SENT BY THE HOST CPU/CENTRAL STATION.*

A. **RTU is in communication failure.**

- Check solutions in item #1.

B. **RTU Processor Board or RIM board or ROAM board incorrectly addressed.**

- Check addressing on RTU Processor board, RIM board, or ROAM board.

C. **Command sent to the incorrect address.**

- Check command file data base to ensure correct address is selected.

D. **Cable from RIM to RDM, or from RIM to ZPR-ROM not connected or defective.**

- Check cable.

E. **RIM board defective.**

- Replace RIM board.

F. **ZPR-ROM or ROAM board defective (if command is to set/reset relays).**

- Replace ZPR board.

G. **RDM board defective.**

- Replace RDM board.

H. **RTU Processor Board not reset after line number address jumper change.**

- Push RTU Processor Board reset switch.

I. **RTU Processor Board failure.**

- Replace RTU Processor Board.

J. **PPU modem delay or baud rates set incorrectly.**

- Check modem delay times and baud rate settings in PPU standalone.

7. *RTU REPORTS INCORRECT ZONE INFORMATION TO CENTRAL STATION.*

A. **Incorrect or defective ZIM installed.**

- Verify correct ZIM or replace ZIM.

B. **Improper end-of-line device installed.**

- Check end-of-line resistor.

C. **RIM board failure.**

- Replace RIM.

D. **TELCO board Power Supply defective.**

- Replace TELCO board.

E. **RTU Processor Board failure.**

- Replace RTU Processor Board.

F. **Phone line defective.**

- Check for bad phone line.

8. *"FAULT" LED WILL NOT TURN OFF ON RTU FRONT PANEL.*

A. **Resistor missing from Fire Bell Output on TELCO Board.**

- Insert a 1K-ohm resistor across TELCO board TB2-7 and TB2-8.

B. **Blown fuse on TELCO Board.**

- Check and replace with 1 AMP fuse.

C. **Dial line supervision has detected no connection of the Dial Backup line.**

- Swap tip and ring wires on TELCO board. Connect dial line.

D. **RTU Processor Board firmware EPROM.**

- Check to see if the EPROM is installed correctly.

9. *CARD READER FAILS TO READ CARDS.*

A. **Reader wiring is incorrect.**

- Check wiring at reader. Verify connections from reader to CIM board, or from reader to ACT-E or ACT-D, or connections from ACT-E, ACT-D, or other ACT reader to the FIM board. Verify correct polarity on data connections.

B. **Incorrect Address setting on the ACT-E, ACT-D, or ACT Reader (FIM access).**

- Verify address jumper setting on the ACT unit.

C. **Wrong ZIMs or ZIMs in wrong location.**

- Verify that the appropriate Access Control ZIM's are installed in zones 5/6 and 7/8 of the RIM-8, or in the bottom 4 ZIM locations of the RIM-16. (all 8 ZIM location of the RIM-16 can be used for access control if the Firmware parameters are used to set the RIM-16 board to operate as a TYPE 5 board.)

D. **RIM board JT jumpers wrong.**

- Verify the jumper is in the JT2 position for access control operation.

E. **If FIM access control, access Schemes jumper settings may be incorrect.**

- Verify jumpers JP4 on the 175C Processor Board are set for the correct connection Scheme for the readers in use.

F. **Bad RIM, CIM, CIM-EXP, or FIM board.**

- Replace defective board.

G. **Defective Card Reader or Read Head within card reader.**

- Replace defective reader or reader head.

H. **Defective or incompatible cards.**

- Verify the data format of the access cards being used. Replace if not compatible.
- Verify if all cards fail to read or only certain ones. Replace the defective cards.

I. **Wrong firmware EPROM and/or EPROM Parameters in RTU Processor Board.**

- Verify that the EPROM is correct, and configured properly for your access control application.

J. **Database at Central Station is configured incorrectly.**

- Have Host CPU/Central Station administrators verify access control database.

K. **RTU won't accept download from Host CPU.**

- Check modem delays in PPU standalone. Verify account number in RTU Processor Board EPROM firmware parameters.

L. **12 VDC Reader connected directly to CIM.**

- Add an OIM between CIM and Reader to match voltage differences.

M. **Reader shorting CGND to CIM or FIM V-.**

- Add an OIM between CIM and Reader to isolate CGND from V-.

4.4 RIM/ZIM CIRCUIT VOLTAGE CHECKS

This section serves to provide additional troubleshooting information by providing RIM and ZIM circuit voltage level measurements which can be verified by the Systems Technician with a normal digital multimeter. Voltage levels for both the RIM-8 and the RIM-16 are provided. All measurements are based on the combination of the ZIM and the protection wiring technique being used, and are given as a troubleshooting guide to assist a trained Security System Technician in correctly identifying system faults.

4.4.1 RIM-8/ZIM Circuit Voltages

The following are voltage level measurements for protection wiring connected to the RIM-8 module input zones. These voltage levels are determined by a combination of which ZIMs are used in the RIM-8 module, and whether the protection wiring is class A, B, or BA.

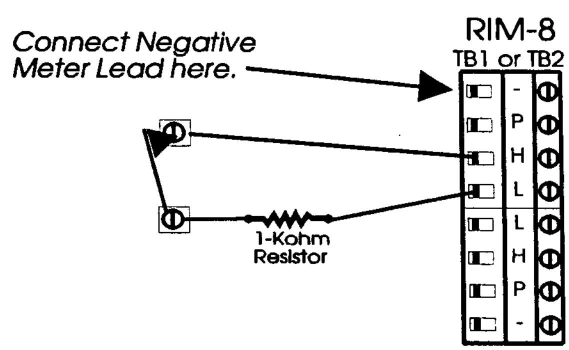
Tolerances of electrical components, the power supply level, and the meter used to measure will cause deviance's from these voltages. Generally, the tolerance of the voltage values given below can range from 5% for classes BA and B to 8% for class A and 4-State Class B. Your should normally read voltages within ±2%, unless a specific tolerance level is given below.

Connect the meter negative lead to any of the TB1 or TB2 negative, V- terminals (any terminal point labeled with " - ", right next to a "P" terminal connector).

With the Positive lead, measure the voltage at the following points:

1. *POWER SUPPLY* At Chassis Ground (CGND) 2.5 ±0.1 VDC
   At TB3-1 2.5 ±0.1 VDC
   At U1 or U2, pin 16 5.0 ±0.1 VDC

2. *CLASS BA (2-WIRE)*



Applicable ZIMs:

HI HS
ED BI
PI PS
MS

Measured at Terminal H:

With Circuit Normal/Secure	+3.33 VDC
With Circuit Open	+5.00 VDC
With Term H shorted to CGND	+2.50 VDC
With Term L shorted to CGND	+3.75 VDC
With Term H shorted to L	+2.50 VDC

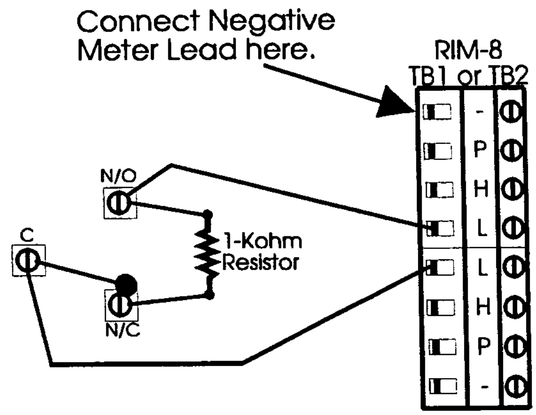
Measured at Terminal L:

With Circuit Normal/Secure	+1.67 VDC
With Circuit Open	+0.00 VDC
With Term H shorted to CGND	+1.25 VDC
With Term L shorted to CGND	+2.50 VDC
With Term H shorted to L	+2.50 VDC

3. *CLASS B (2-WIRE).*

Applicable ZIMs:

TW/FD	TW/FI
TW/HI	TW/HS
TW/ED	TW/BI
TW/PI	TW/PS
TW/MS	
AC/DR	AC/BI
AC/DR-SR	AC/BI-SR
AC/DR B	AC/BI B
TW/S1	



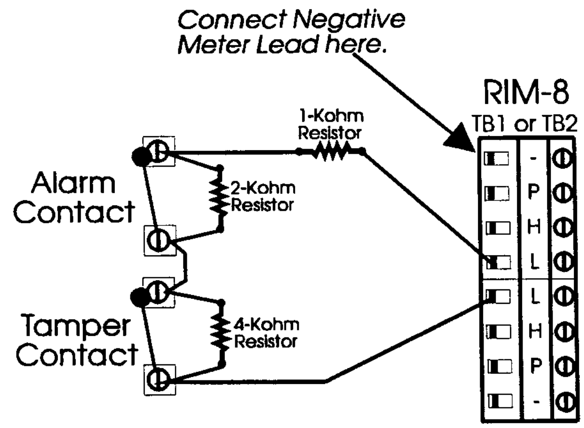
Measured at Terminal L, Upper:

With Circuit Normal/Secured	+3.33 VDC
With Circuit Open	+5.00 VDC
With Circuit in Alarm/Shorted	+2.50 VDC
Upper Term L shorted to CGND	+2.50 VDC
Lower Term L shorted to CGND	+3.75 VDC

Measured at Terminal L, Lower:

With Circuit Normal/Secured	+1.67 VDC
With Circuit Open	+0.00 VDC
With Circuit in Alarm/Shorted	+2.50 VDC
Upper Term L shorted to CGND	+1.25 VDC
Lower Term L shorted to CGND	+2.50 VDC

4. CLASS B (2-WIRE), 4-STATE



Applicable ZIMs:

TS/FI	TS/PI
TS/HI	TS/MS
TS/ED	TS/BI

Measured at Terminal L, Upper:

With Circuit Normal/Secured	+3.75 VDC
With Circuit Open	+5.00 VDC
With Tamper Switch Contact Open	+4.58 VDC
With Alarm Device Contact Open (Alarm)	+4.38 VDC
With Tamper & Alarm Contact Open	+4.69 VDC
With Upper Term L shorted to CGND	+2.50 VDC
With Lower Term L shorted to CGND	+4.16 VDC
With Upper Term L shorted to Lower Term L	+2.50 VDC

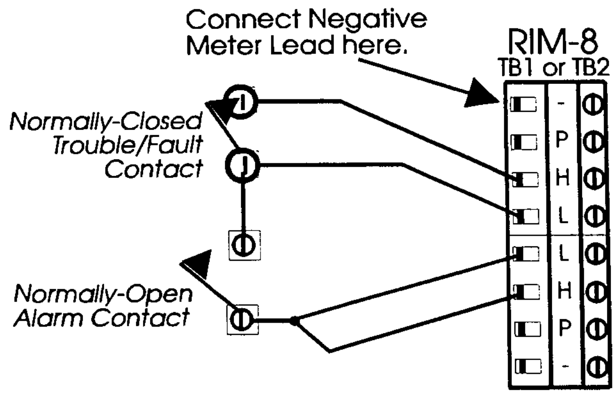
Measured at Terminal L, Lower:

With Circuit Normal/Secured	+1.25 VDC
With Circuit Open	+0.00 VDC
With Tamper Switch Contact Open	+0.42 VDC
With Alarm Device Contact Open (Alarm)	+0.62 VDC
With Tamper & Alarm Contact Open	+0.31 VDC
With Upper Term L shorted to CGND	+0.84 VDC
With Lower Term L shorted to CGND	+2.50 VDC
With Upper Term L shorted to Lower Term L	+2.50 VDC

5. CLASS A (4-WIRE).

Applicable ZIMs:

FW/FD	FW/FI
FW/HI	FW/HS
FW/ED	FW/BI
FW/PI	FW/PS
FW/MS	



Measured at Terminal H, Upper Loop:

With Circuit Normal/Secured	+3.33 VDC
With Open Circuit in Upper Loop	+4.00 VDC
With Open Circuit in Lower Loop	+4.00 VDC
With Circuit in Alarm (Short Loops Together)	+2.50 VDC
With Upper Loop shorted to CGND	+2.50 VDC
With Lower Loop shorted to CGND	+3.75 VDC

Measured at Terminal L, Upper Loop:

With Circuit Normal/Secured	+3.33 VDC
With Open Circuit in Upper Loop	+2.00 VDC
With Open Circuit in Lower Loop	+4.00 VDC
With Circuit in Alarm (Short Loops Together)	+2.50 VDC
With Upper Loop shorted to CGND	+2.50 VDC
With Lower Loop shorted to CGND	+3.75 VDC

Measured at Terminal H, Lower Loop:

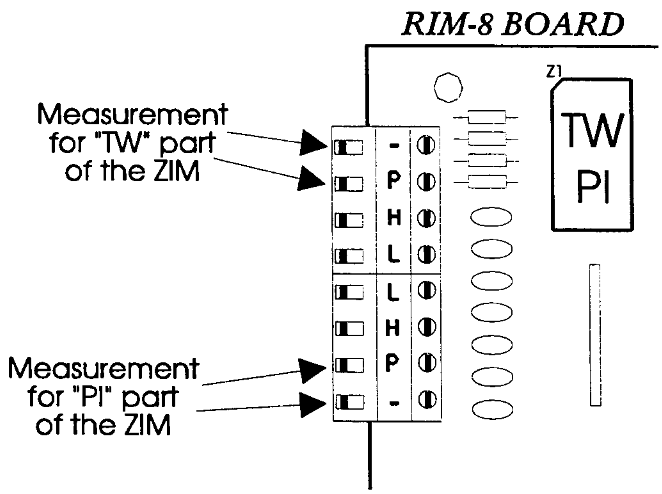
With Circuit Normal/Secured	+1.67 VDC
With Open Circuit in Upper Loop	+1.00 VDC
With Open Circuit in Lower Loop	+3.00 VDC
With Circuit in Alarm (Short Loops Together)	+2.50 VDC
With Upper Loop shorted to CGND	+1.25 VDC
With Lower Loop shorted to CGND	+2.50 VDC

Measured at Terminal L, Lower Loop:

With Circuit Normal/Secured	+1.67 VDC
With Open Circuit in Upper Loop	+1.00 VDC
With Open Circuit in Lower Loop	+1.00 VDC
With Circuit in Alarm (Short Loops Together)	+2.50 VDC
With Upper Loop shorted to CGND	+1.25 VDC
With Lower Loop shorted to CGND	+2.50 VDC

6. ***ZIM Priority Level Voltages of the RIM-8, measured from " - "terminal, to TB1 or TB2 "P" terminal of that ZIM. Measured voltages are ±0.05 VDC.***

ZIM TYPE	VOLTAGE
TW	+0.78 VDC
FW	+1.09 VDC
TS	+0.47 VDC
AC	+2.34 VDC
FD	+4.53 VDC
FI	+4.85 VDC
HI	+4.24 VDC
HS	+3.90 VDC
ED	+3.59 VDC
BI	+3.29 VDC
PI	+2.98 VDC
PS	+2.68 VDC
MS	+2.02 VDC
DR	+2.68 VDC
S2	+1.72 VDC
S5	+1.72 VDC
N1	+1.41 VDC
N2	+1.41 VDC
SP	0.00 VDC



4.4.2 RIM-16/ZIM Circuit Voltages

The following are voltage level measurements for protection wiring connected to the RIM-16 module input zones. These voltage levels are determined by a combination of fixed resistors on the RIM-16 board and the state of the protection wiring with the monitoring devices. Again, these voltage levels are given as a troubleshooting guide, with tolerances of electrical components, the power supply level, and the meter used to measure possibly causing some deviance's from these voltages. Since the RIM-16 supports only one type of wiring and monitoring technique, the ZIM type makes no difference to the voltage measurements. The ZIM type only effects the Priority Voltage measurements.

Generally, the tolerance of the voltage values given below can range ±5%. Your readings should normally read voltages within ±2%, unless a specific tolerance level is given below.

Connect the meter negative lead to a V- location on the RIM-16 module.
(A convenient point is the left side of the transorb X18.)

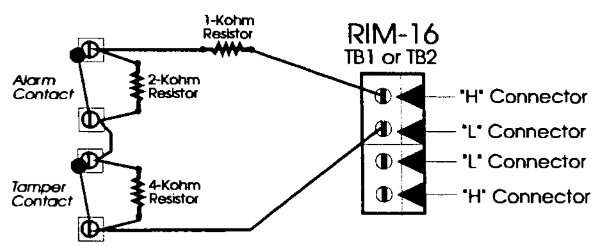
With the Positive lead, measure the voltage at the following points:

1.	*Power Supply.*	Chassis Ground (CGND)	2.5 ±0.1 VDC
		TB3-1	2.5 ±0.1 VDC
		V+ at U1 or U2 pin 16	5.0 ±0.1 VDC

2. *2-Wire Supervised Protection Circuit*

Applicable RIM-16 ZIMS

- ALL -



Measured at "H" Terminal Connection:

With Circuit Normal/Secured	+1.11 VDC
With Circuit Open	+5.00 VDC
With Tamper Switch Contact Open	+2.76 VDC
With Alarm Device Contact Open (Alarm)	+2.13 VDC
With Tamper & Alarm Contact Open	+3.15 VDC
With "H" Terminal shorted to CGND	+2.50 VDC
With "L" Terminal shorted to CGND	+0.48 VDC
With "H" & "L" Terminals shorted together	+0.23 VDC

Measured at "L" Terminal Connection:

With Circuit Normal/Secured	+0.18 VDC
With Circuit Open	+0.00 VDC
With Tamper Switch Contact Open	+0.11 VDC
With Alarm Device Contact Open (Alarm)	+0.13 VDC
With Tamper & Alarm Contact Open	+0.09 VDC
With "H" Terminal shorted to CGND	+0.42 VDC
With "L" Terminal shorted to CGND	+2.50 VDC
With "H" & "L" Terminals shorted together	+0.23 VDC

APPENDIX 'A'

RTU 180 PROCESSOR BOARD

The RTU 180 Processor Board is an optional replacement board for the 175C Processor Board, used to provide higher speed RS-232, Network-type communication techniques from the RTU panels to the Host Computer system. In many system applications and installations, requirements will exist for the RTU to be installed in locations using special modems and network communication equipment that require synchronous or asynchronous RS-232 communication protocols.

The 180 Processor Board (See Figure A-1) performs all of the same basic functions as the 175C Processor Board, such as control of the RTU operating system firmware, database management, field equipment monitoring and control processing as well as communication management. It provides processing and data base storage RAM, dual Host communication channels, and card reader/access control communication port.

Some of the enhanced features and capabilities of the RTU 180 Processor Board include:

- Jumper selectable Synchronous or Asynchronous communication.
- Jumper selectable Internal or External communication clock signal.
- Integrated Watchdog Timer Circuit.
- Optional integrated digital Calendar Clock Circuit.
- On-board Battery backup for Data Base RAM and Calendar Clock.
- Configurable communication speeds up to 4800 standard, or 9600 baud optional.
- Standard compatibility with V.24 RS-232, and optional compatibility with X.3 and 'Frame Relay' communication protocols. An MDI RS-232 compatible VCM unit may be added for interfacing to Fiber optics or to provide a multidrop connection.

The standard 180 Processor board provides a Primary and a Secondary communication channel to the Host CPU/PPU. The Primary channel is standard RS-232 communication, with Secondary channel being Dial-up communication on standard voice grade, analog telephone circuits. The 180 Processor is also optionally available in an RS-485 Differential communication version with the Primary and Secondary lines both RS-485 communication (DIFF/DIFF).

In order to support the enhanced communication and operational capabilities, the 180 Processor must be paired with an upgraded TELCO board that is compatible with communication protocols. Figure A-2 shows an illustration of the RS-232/Dial TELCO board, and Figure A-3 gives a drawing of the compatible DIFF/DIFF version TELCO board. Aside from the obvious circuitry differences, the main difference to the installer in these TELCO boards compared to 175C-compatible TELCO boards is the Host communication cable connections on the upper half of the board. The power, battery, tamper and output bell connections on the lower half of the board are exactly the same as the TELCO boards detailed in paragraph 3.4 of this manual.

Figure A-1 shows the RTU 180 Processor Board, which should be used along with information on the following pages to locate and verify the board jumper settings as well as to locate other major components and connectors. Figures A-2 and A-3 show the compatible TELCO Boards with cable connections.

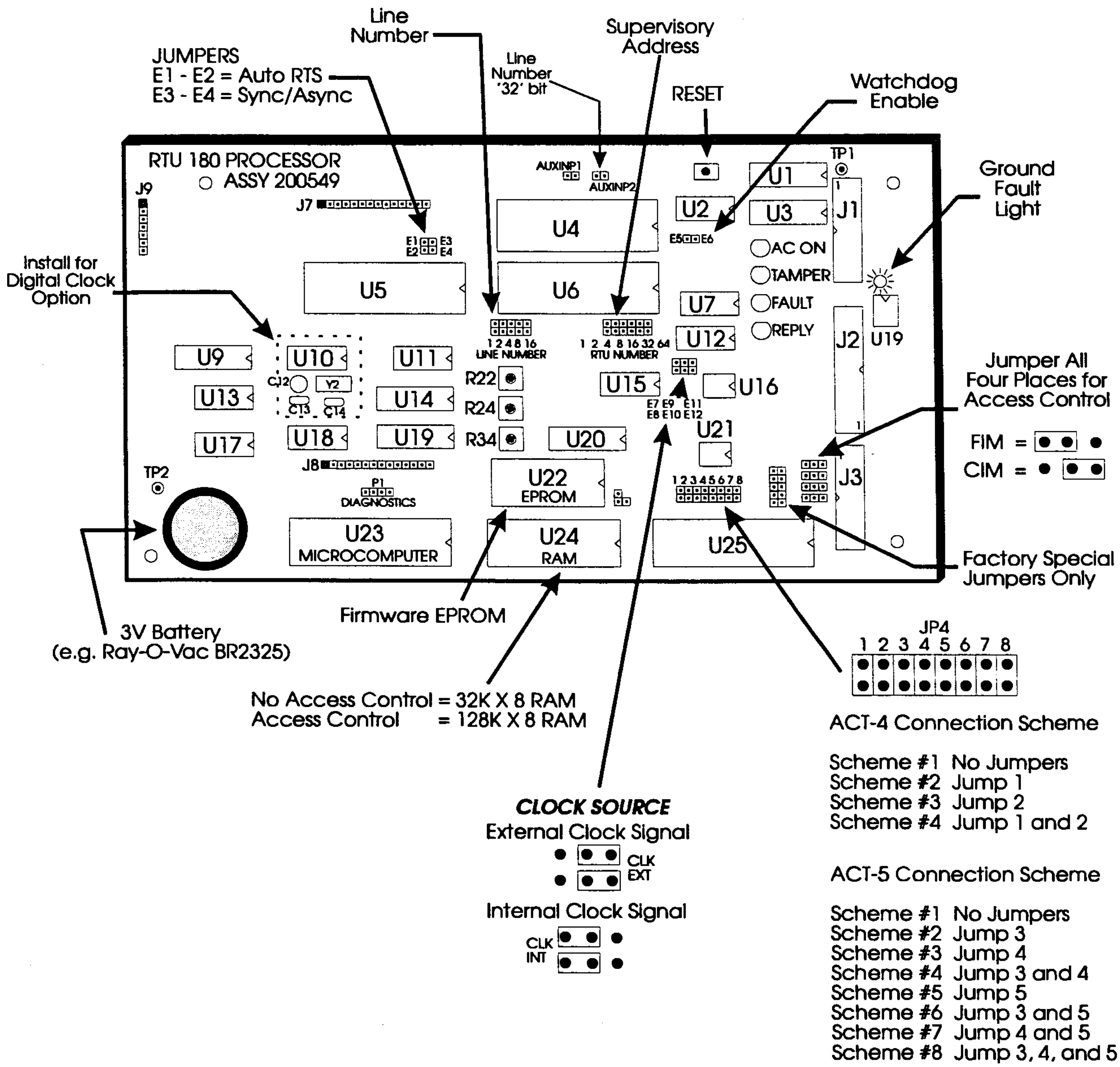


Figure A-1. RTU 180 PROCESSOR BOARD AND SETTINGS

The following information will serve to assist in verifying and setting the necessary jumpers of the 180 Processor Board.

Processor Board Address Jumpers

Addressing of the RTU panels is discussed at length in paragraph 2.5 of this manual and is basically the same with the 180 Processor and with the 175C Processor. Using this information and the site survey data, determine the Line Number and Supervisory Address for each RTU and set the respective jumpers accordingly, or verify the correct setting if the address determinations have already been made and set at the factory. Use the address settings descriptions in Table 2-10 and Table 2-11 to help determine the exact jumper configurations.

Processor Firmware (EPROM)

Verify the EPROM located at U22. Ensure that it is inserted correctly into the socket with Pin 1 in the upper right position and all of the legs are inserted into the socket, not sticking out or bent. If the parameters in the EPROM ever need to be changed, ensure that the new EPROM is labeled properly. ALWAYS be aware of Electrostatic Discharge (ESD) when handling IC's and circuit boards.

Access Control, FIM or CIM Jumpers

If the RTU will be used for controlling and monitoring Access Control Card Readers and/or Keypads, the board must be set as to whether the readers will interface to the RTU via FIM boards (RS-485 serial communication) or CIM boards (direct data wiring). This is done in the same manner as with the 175C Processor, with the jumpers in the lower right portion of the Processor Board (see Figure A-1). Insert a jumper on left two pins of each set to configure the board for FIM type access control. Insert the jumper on the right two jumpers of all four sets to configure the board for CIM access control. These jumpers, again, will typically be set at the factory

Clock Source Jumpers

Jumpers E7 through E12 are used to set whether the communication clock timing signals will be internally self-generated, or if the timing signals from an external source will be used. Normally, Asynchronous operation will use an INTERNAL clock source, and Synchronous will typically use an EXTERNAL clock source. Set the jumpers to the left for INTERNAL Clock, and to the right for EXTERNAL Clock.

Sync/Async and Auto RTS

Jumpers E3 and E4 are used to select Synchronous or Asynchronous operation. Install the jumper for Asynchronous and remove the jumper for Synchronous. Install a jumper on E1 to E2 to select Automatic RTS control, which enables RTS-CTS recognition for communication.

Other Jumpers and Components

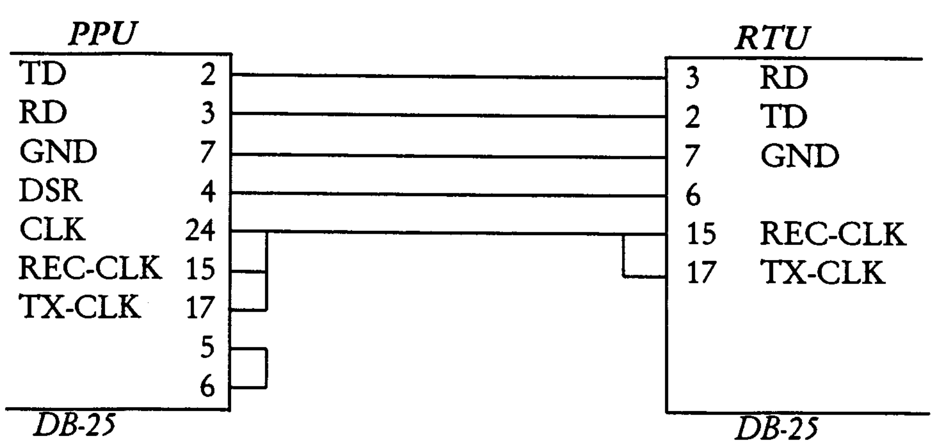
A. Watchdog Timer Enable - The 180 Processor Board includes a watchdog timer circuit that, when enabled, is continuously reset by the operating system programs so that, if the processor or programs stop running for any reason, the watchdog timer circuit will eventually time-out and reinitialize the Processor board. To enable the Watchdog timer circuit, install a jumper on E5 to E6.

B. ACT Reader Wiring Schemes - The MDI ACT Series of card readers, card reader interface modules, and arming stations, such as the ACT-4, ACT-5, ACT-D and ACT-E, communicate to the RTU via FIM boards (with exception of the ACT-3, which uses the CIM). This communication interface is serial RS-485 and uses the same various connection schemes to interface these readers and reader modules back to the RTU. These jumpers set the wiring technique and are set in the same manner as the 175C Processor. Diagrams of the different schemes are shown in Figure 3-42 of this manual.

C. If expanded cardholder memory or DES Encryption is required, a MEX-8, MEX-16, or MEX-32 module, with or without DES, can be attached to the Processor Board. These modules interface to the Processor board with insert connections to J7, J8 and J9 connectors.

D. The Processor Board contains a Reset Switch which, when momentarily depressed, will perform a hard reset and restart the processor board and operating system firmware programs.

Communication Cable connections to the TELCO board will vary somewhat depending on the modem or network communication equipment to be use, as well as whether communication will be synchronous or asynchronous. For local testing of an RTU with RS-232 communication to a PPU, a cable, MDI part number 100924, can be ordered from MDI, or created based on the connections shown below.



Contact MDI Field Engineering for further information, if required.

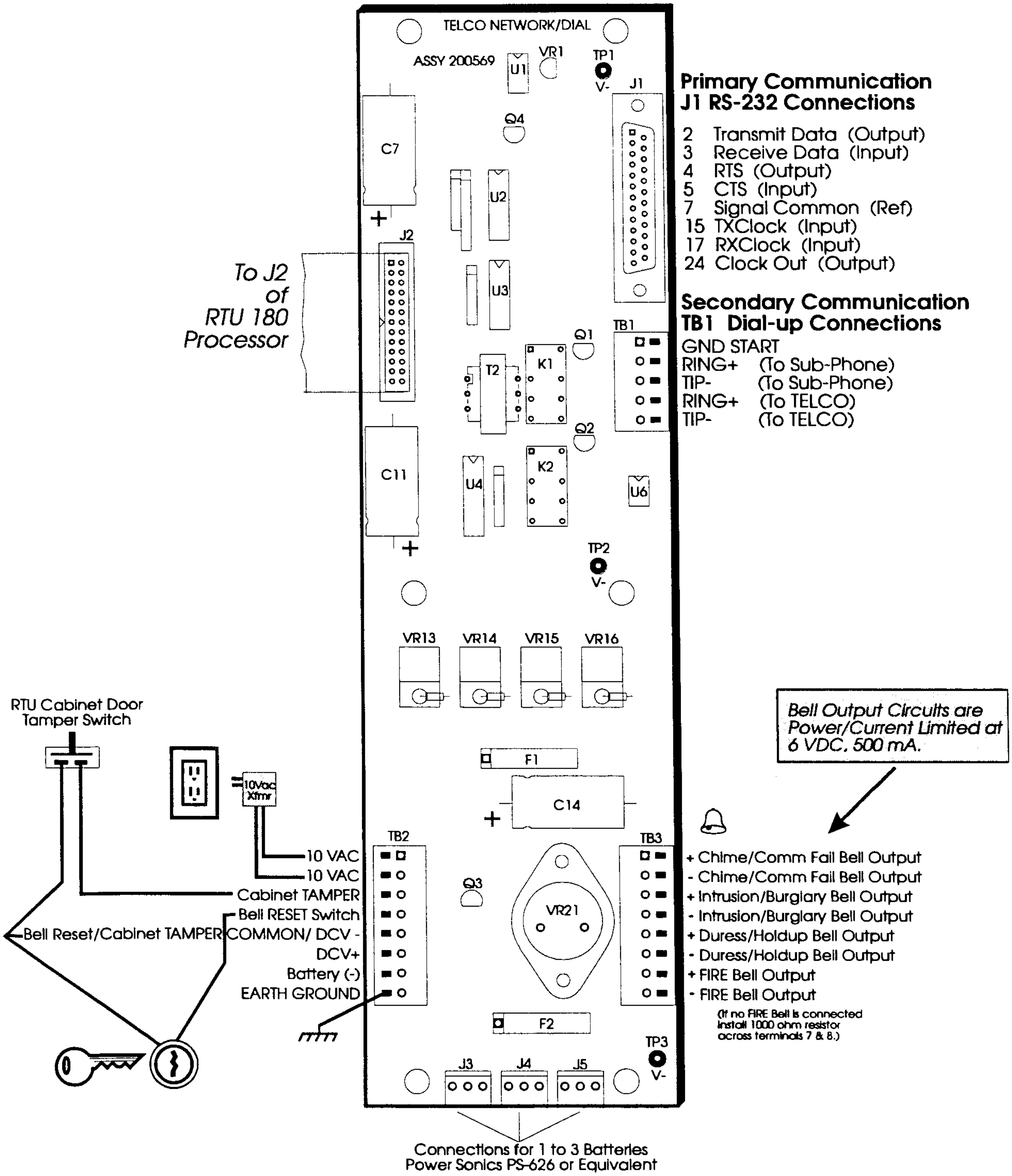


Figure A-2. RS-232/DIAL TELCO BOARD (for 180 Processor Bd)

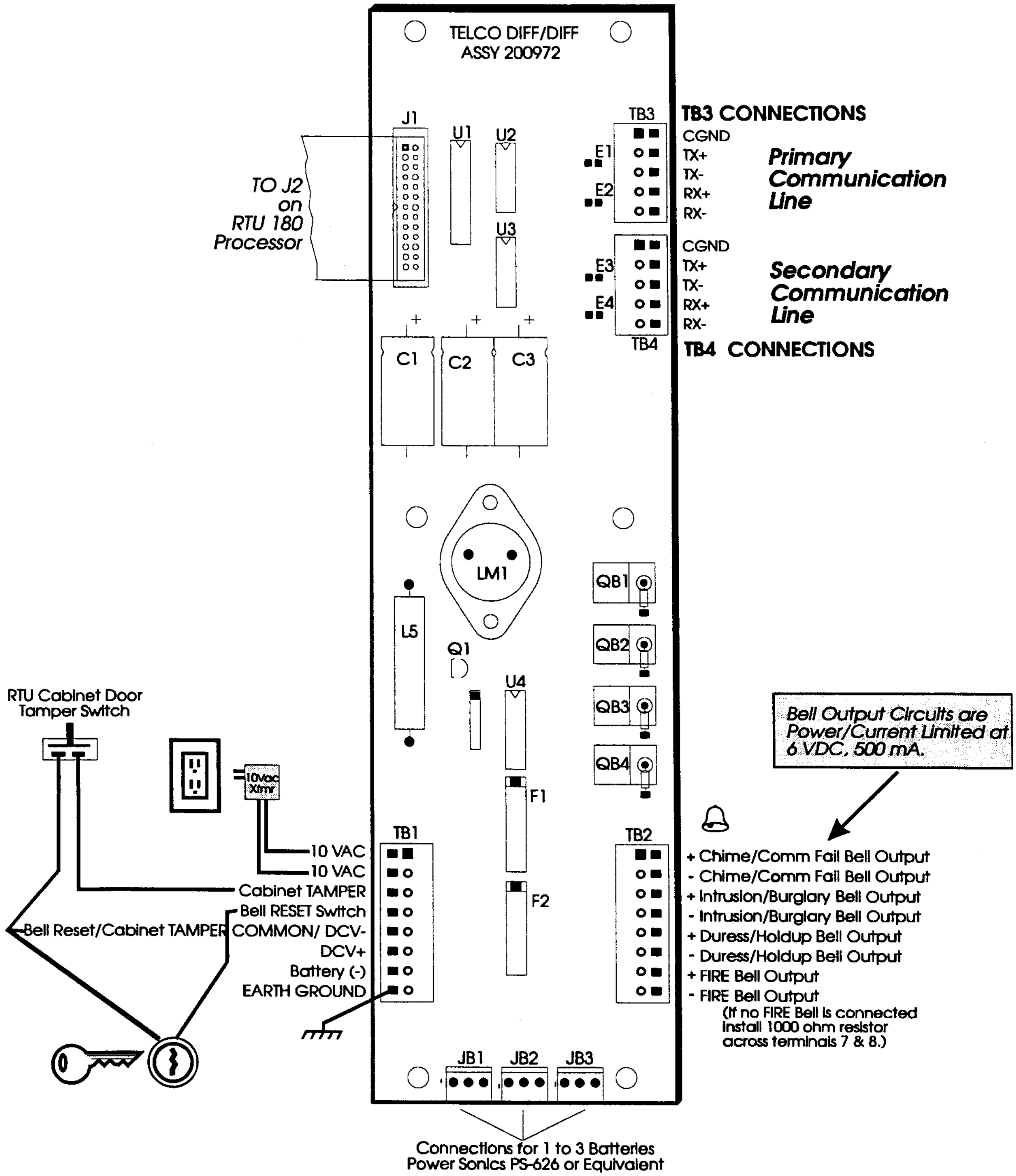


Figure A-3. DIFF/DIFF TELCO BOARD (for 180 Processor Bd)

APPENDIX 'B'

ADDITIONAL RTU FUNCTION MODULES

The RTU-100, RTU-190, and RTU-200 panels support some additional special purpose function modules which are used in specific applications, as indicated below and in the drawings on the following pages of this section.

FIM-BF (FIM-02) – This is a SPECIAL Four-Wire Interface Module (FIM) used specifically for interfacing RUSCO and SCSI 20-ma loop card readers and for the MDI ACT-4BF Barium Ferrite card readers. Figure B-1 shows an illustration of the circuit board and connectors. Figure B-2 shows hookup connection for the ACT-BF readers with the **FIM-ID** interface. Figure B-3 shows hookup connections for the RUSCO and SCSI readers.

OPTICAL ISOLATOR MODULES (OIM) - The Optical Isolator Modules are used with card readers requiring an electrical isolation from the RTU, CIM, or ACT interface unit due to power supply voltage or ground differences. Typical OIM units are needed any time the Card Reader's DATA0, DATA1, and/or LED signals use greater than that +5Vdc, and/or if the Reader's power supply is not a "Floating" supply (i.e., the ground, or negative side of the power supply is hard connected to earth ground).

The **OIM-R** (to TB1) and **OIM-L** (to TB2) connect directly to the CIM board with the card reader then connecting to the TB1 connector of the OIM. The Universal OIM **(OIM-U)** can be used in any location for multiple applications, with it's P1 terminal connecting to the CIM, or to the ACT-E or ACT-D, and TB1 connecting to the reader. An **OI-HID-PR** type OIM can also be used for the Hughes ID Proximity readers, or for any application requiring the isolation of only the reader LED circuit. Figure B-4 shows illustrations each of these types of OIM's.

The FIM-02 (also refered to as the FIM-BF) is used to provide a hardware interface for Rusco and SCSI current loop card readers, as well as MDI ACT-4BF Readers.

The FIM-02 connects directly to the RTU 175C Processor Board J3 connector via a 20-conductor ribbon cable. It supports up to two (2) RUCSO or SCSI readers connected to the TB1 terminal, or up to two (2) MDI ACT-4BF Barium Ferrite readers connected to via the TB2 terminal of the board. Four FIM-02 boards are required to support eight (8) RUSCO, SCSI, or ACT-4BF Readers..

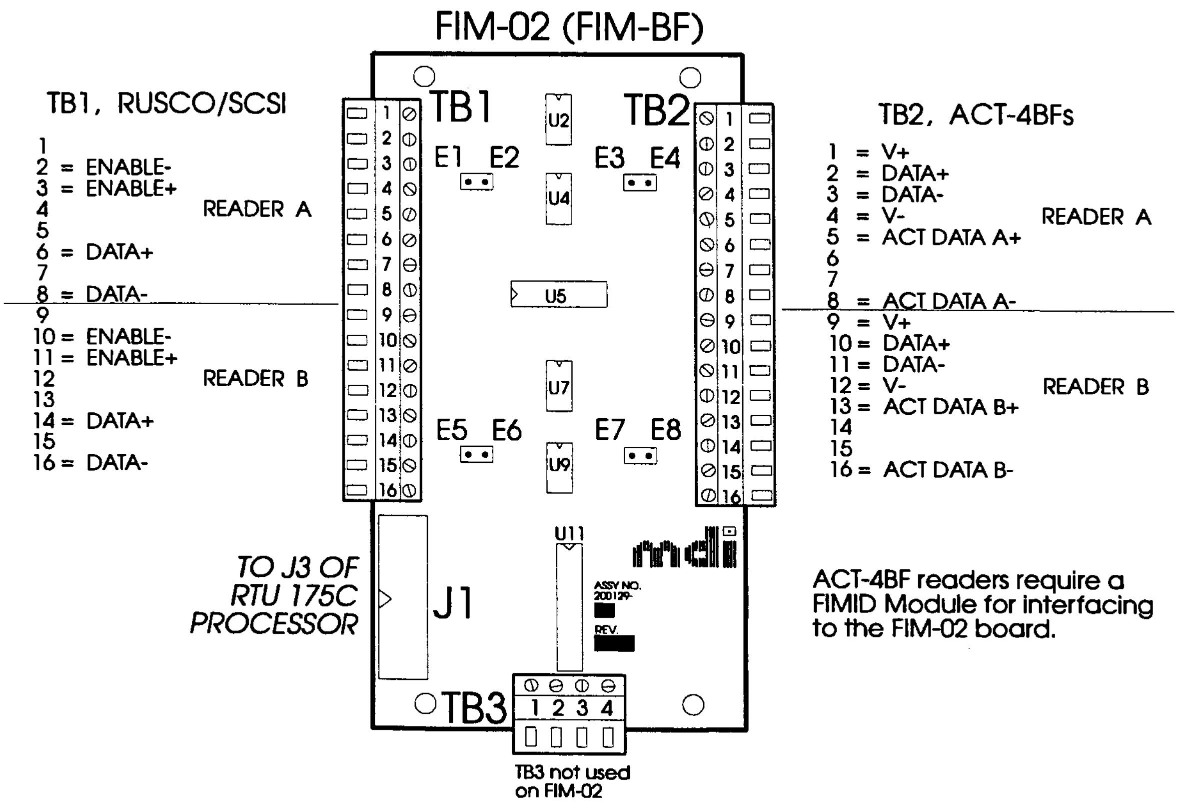
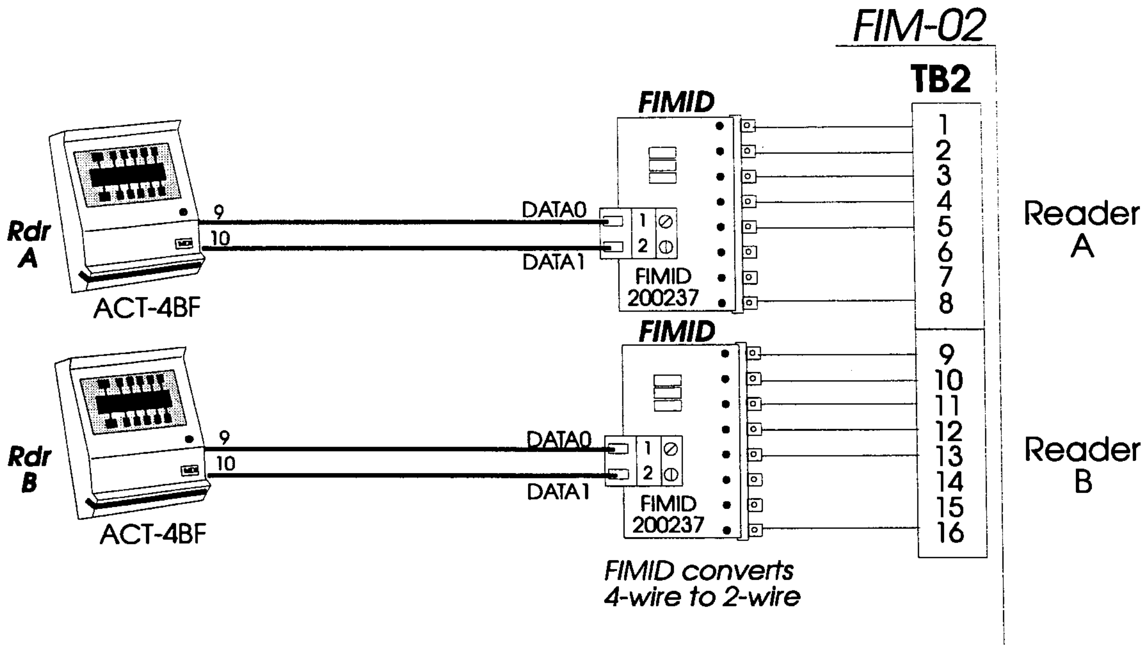


Figure B-1. FIM-BF (FIM-02) BOARD & CONNECTIONS



The FIMID Module is a daughter-type board that plugs into TB2 of the FIM-02 board to provide an interface to an ACT-4.

Refer to the ACT-4BF Installation and Operations Manual for specific installation information on the ACT-4BF.

Figure B-2. FIM-BF (FIM-02) CONNECTIONS TO FIMID & ACT-4BF

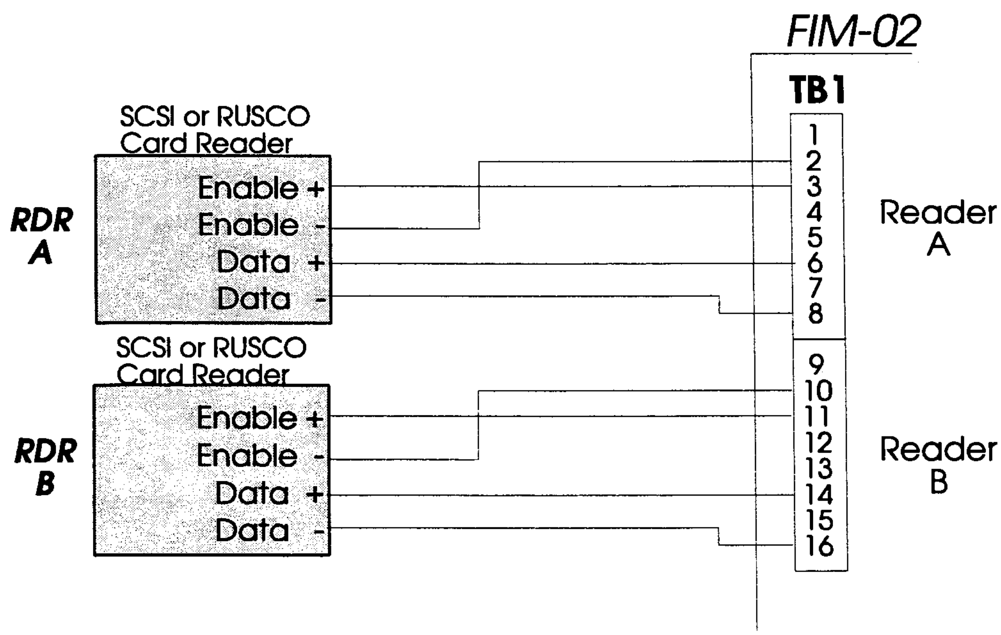
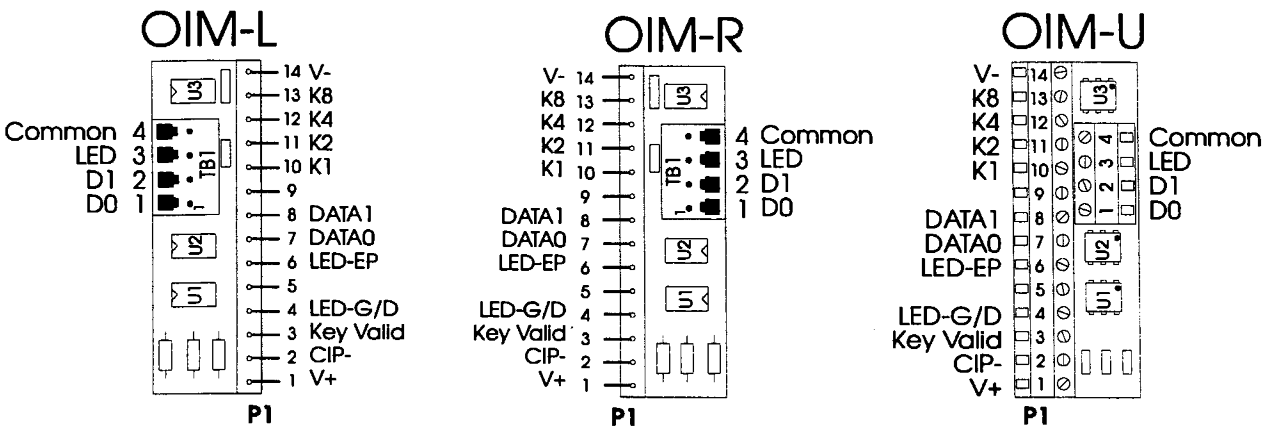


Figure B-3. FIM-02 (RUSCO) CONNECTIONS TO SCSI or RUSCO READERS

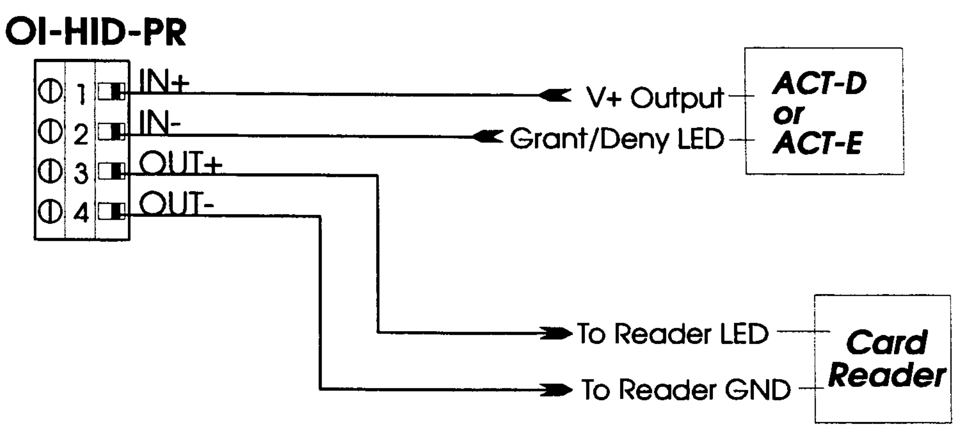
OPTICAL ISOLATOR MODULES (OIM)

An OIM is used to isolate the reader power supply from the RTU V+ and V- power.
Any of these OIM's will interface a +12V reader to the CIM and its +5V system.
Each OIM will isolate the reader ground from the V- (which is actually -2.5 volts DC).



The P1 terminal connects to the CIM board, specifically TB1 for the OIM-R, and TB2 for the OIM-L. P1 of the Universal OIM (OIM-U) can connect to either TB-1 ot TB-2 of the CIM, or to an ACT interface device (ACT-E/ACT-D).

The OIM TB1 terminal provides the connection out to the card reader.



The OI-HID-PR Optical Isolator is used to isolate only the Card Reader Grant/Deny LED on a +12 Vdc reader whose data lines are already internally isolated.
This OIM is typically used with some models of the Hughes ID proximity readers.

Figure B-4. OPTICAL ISOLATOR MODULES

APPENDIX 'C'

RTU POWER CONSUMPTION WORKSHEETS

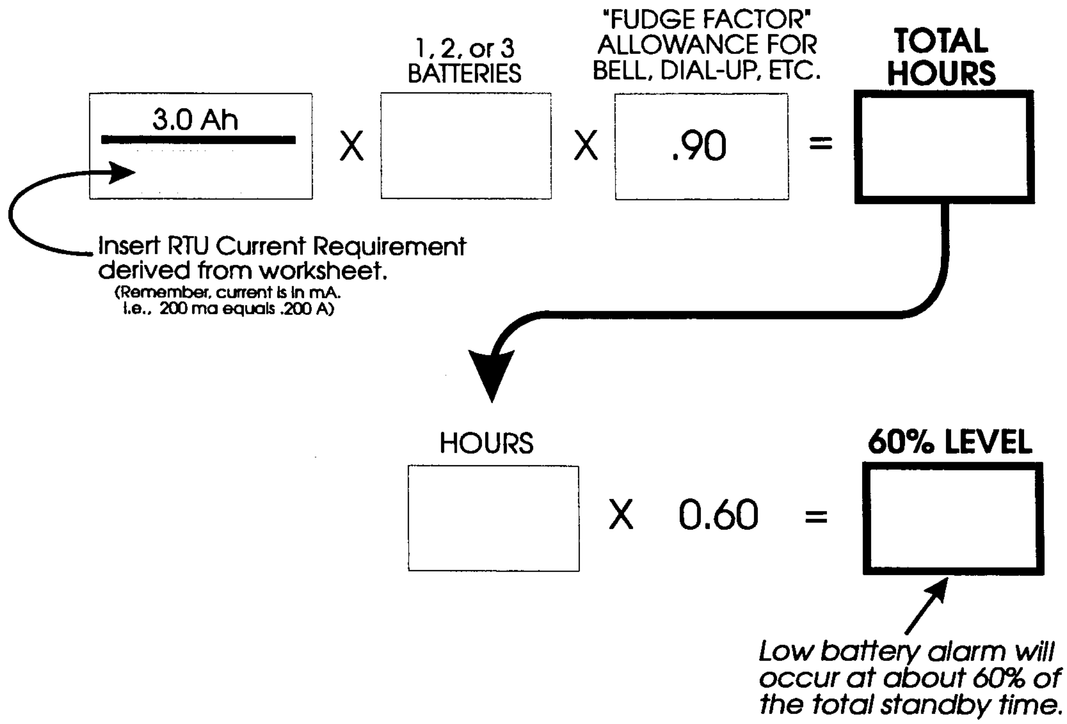
MODULE	CURRENT (AT +5VDC)	NUMBER OF BOARDS	CURRENT SUBTOTAL	NOTES
RTU 175C Processor Board	30 mA			With two LEDs on.
RTU 180 Processor Board	30 mA			With two LEDs on.
TELCO MUX/MUX	30 mA			
TELCO MUX/DIAL	30 mA			
TELCO DIFF/DIFF	80 mA			
TELCO DIFF/DIAL	90 mA			
TELCO DIAL/DIAL	30 mA			
RIM-8 Remote Input Module	16 mA			
RIM-16 Remote Input Module	20 mA			Power loss includes relays cycling once per 60 minutes.
ZPR Zero Power Relay	1 mA			
MEX Memory Expansion	50 mA			
PMB Passive Matrix Bridge	5 mA			Only power loss is through 600 ohm termination resistors.
CIM Cardreader Interface	15 mA			Value shown is for CIM board only. Does not include readers powered from the CIM. Consult Factory.
FIM Cardreader Interface	15 mA			Value shoen is for FIM board only. ACT units powered through FIM by an external supply.
RDM Remote Display (on RTU)	10 mA			With 10% of LEDs on.
RDD, DCP, DEP Remote Display (off RTU)	20 mA			With 10% of LEDs on.
VCM Communications Module	50 mA			
OIM Optical Interface Module	2 mA			
TOTAL CURRENT CONSUMPTION:				

TOTAL RTU-100/190/200 CURRENT NOT TO EXCEED 450mA

MAXIMUM BACKUP POWER AVAILABLE FOR 24 HOURS WITH:

1 BATTERY	125mA
2 BATTERIES	250mA
3 BATTERIES	375mA

BATTERY BACKUP TIME



NOTES: Fire applications typically require 24 hours of standby battery power.

Batteries must have 36 hours of charging time to gain 100% charge.

Remember that off-normal alarm zones cause an extra drain on power due to LED indicators, if LED displays are in use.

If using Bell Outputs, Allocate a reserve of 15 Minutes for BELL Power at 100mA. (This takes less than 1% of one battery's power.)

Local Bells are disabled under LOW-BATT alarm condition (under 5.7 V).

RTU enclosure size does not effect power usage. Only the modules used!

APPENDIX 'D'

WIRE AND CABLE DEFINITIONS

	MAXIMUM DISTANCE (FEET)	*# of WIRES*	*WIRE GAUGE*	*Belden Wire P/N*
1. Ethernet LAN, 10 BASE 5 File Server to Wrkstn, Workstation/File Server to Hub - **(THICK NET)**	1600	50-OHM COAX	12	9880
2. Ethernet LAN, 10 BASE 2 File Server to Workstation, Workstation/File Server to Hub - **(THIN NET)**	650	RG-58/U Type 50-OHM COAX	20	9907
3. Ethernet LAN, 10 BASE T File Server to Workstation Workstation/File Server to Hub - **(TWISTED PAIR)**	300 300	4 OR 8	24 24	1227A (10Mbit, CAT 3) 1583A (100Mbit, CAT 5)
4. Ethernet, Fiber Optics File Server to Workstation Workstation/File Server to Hub	Variable	2	62.5/125 micron 850 nm Multimode Fiber	

5. File Server/CPU to PPU-50 (Connection via CPU Monitor Board) — Standard MDI Cable #B12-220 (Max. 50 feet, if extended)

6. File Server/CPU to PPU-100 (Connection via CPU Monitor Board) — Standard MDI Cable #B12-190 (Max. 50 feet, if extended)

7. PPU-100 to PPU-100 (Dual PPU) — Standard MDI Cable #B12-230

8. PPU to CRT Terminal, RS-232 — Standard MDI Cable #B12-050

9. Parallel Printer Cable, File Server or Workstation — Standard MDI Cable #08-240 (6 ft.)

	MAXIMUM DISTANCE (FEET)	# of WIRES	WIRE GAUGE	Belden Wire P/N
10. PPU to RTU TELCO Board RS-485 (DIFF) Communication	4000	4	24	9842
11. PPU to RTU TELCO Board DIAL-UP Communication	2000	2	24	9502
12. PPU to RTU TELCO Board MUX Communication	6000	2 or 4	24	9502
13. PPU to PMB-16	6000	2	24	9502
14. PMB-16 to RTU	6000	4	24	9502
15. CIM to Wiegand Reader (Standard Swipe or Insertion)	1000	5	22	9942
16. CIM to Magnetic Stripe (MSR-1)	1000	6	22	9942
17. CIM to MR-10/20 Magnetic Stripe	1000	5	22	9942
18. CIM to Hughes ID Proximity Rdrs Prox-Pro, Mini-Prox, Maxi-Prox (may require OIM)	500	6	22	9942
19. CIM to Indala Proximity Rdrs (ASR-503 & 505)	500	6	22	9942
20. CIM to Indala Proximity Rdrs (ASR-103, 105, 110, 112, etc.) (OIM is required)	500	6	22	9942
21. CIM to Indala PR10/12 w/OIM	500	5	24	9942
22. FIM to ACT-E	2000	2	24	9841
23. FIM to ACT-D	2000	2	24	9841
24. FIM to ACT-4	2000	2	24	9841
25. FIM to ACT-2004	2000	2	24	9841
26. FIM to ACT-5	2000	2	24	9841

	MAXIMUM DISTANCE (FEET)	# of WIRES	WIRE GAUGE	Belden Wire P/N
27. FIM to ACT-LP	2000	2	24	9841
28. FIM to ACT-4BF	2000	2	24	9841
29. FIM to ACT-4BC	2000	2	24	9841
30. RUSCO/SCSI to FIM-02	1000	4	24	9842
31. RDD to DCP	1000	12	24	9541
32. RDD to DEP	1000	12	24	9541
33. RTU Control Outputs to Control Device (TELCO or ZPR Board Outputs)	500	2	18	8760
34. RTU Output to Door Strike	1000	2	18	8760
35. Door Contact/Exit Request Button to RTU or ACT Input.	1000	2	22	8442
36. Alarm Sensor to RIM Input 2-Wire Monitoring	1000	2	22	8442
37. Alarm Sensor to RIM Input 4-Wire Monitoring	100	4	22	8444
38. 120-10VAC Transformer to TELCO terminals TB1-1 and TB1-2	6	2	22	8442
39. TELCO to Local Bells	200 to 500	2	18	8760

(distance depends on current draw of connected bell)

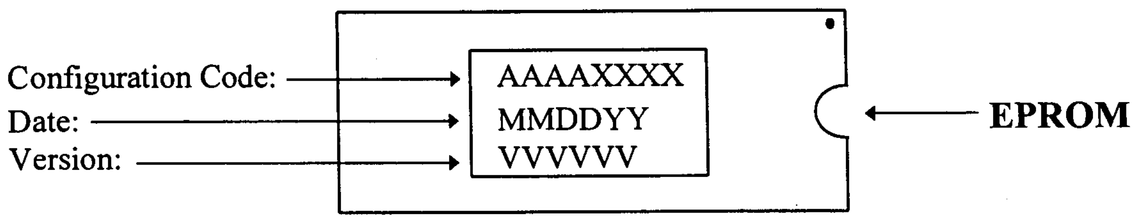
The Belden cables and wires noted herein are the MDI recommended installation cabling, and should be used to insure proper system operation. Any substitute cables and/or wiring used must be equivalent in quality and electrical properties or operational descrepancies may occur. MDI cannot be held responsible for system failures due to an improper equipment installation.

Belden 1227A is 24 AWG, solid, 2 twisted pairs, unshielded, Category 3 LAN cable
Belden 1583A is 24 AWG, solid, 4 twisted pairs, unshielded, Category 5 LAN cable
Belden 8442 is 22 AWG, stranded 7X30, 2 conductor, unshielded
Belden 8444 is 22 AWG, stranded 7X30, 4 conductor, unshielded
Belden 8760 is 18 AWG, stranded 16X30, 1 shielded twisted pair, overall foil shield
Belden 9502 is 24 AWG, stranded 7X32, 2 shielded twisted pairs, overall foil shield
Belden 9541 is 24 AWG, stranded 7X32, 15 conductor, overall foil shield
Belden 9841 is 24 AWG, stranded 7X32, 1 shielded twisted pair, overall aluminum-polyester shield
Belden 9842 is 24 AWG, stranded 7X32, 2 shielded twisted pairs, overall aluminum-polyester shield
Belden 9880 is Coaxial LAN cable, 12 AWG solid center, (10 BASE 5 Ethernet, Thicknet)
Belden 9907 is RG-58/U type Coaxial LAN cable, 20 AWG center, (10 BASE 2 Ethernet, Thinnet)
Belden 9942 is 22 AWG, stranded 7X30, 6 conductor, overall foil shield

APPENDIX 'E'

RTU FIRMWARE DEFINITIONS

The RTU Processor firmware is factory configured to be specific to the application of a particular RTU-100/190/200 panel. This firmware EPROM's are then labeled with codes showing the pertinent information about the firmware, as follows:



Where "A" is a 4-digit configuration code designating operational parameters set in the firmware options, "X" is the base version of the firmware programmed in the EPROM, "MMDDYY" is the date the firmware EPROM's were created in the form of month (MM), day (DD), and year (YY), and "V" is a 6-digit code designating the exact firmware Series, Version, Type and Revision Level.

Configuration Code (AAAA above)

RTU Type: (First character to the left)

A = Standard
B = Parameter Change
C = Operational Change
D = Energy
E = Elevator

Communications Type: (Second character)

0 = 300 Baud Mux-Mux
1 = 300 Baud Mux-Dial
2 = 1200 Baud Diff-Diff
3 = 1200 Baud Diff-Dial
4 = Dial-Dial
5 = 300 Baud Mux-Dial with Dial Line Monitoring
6 = 1200 Baud Diff-Dial with Dial Line Monitoring

Access Control Types: (Third character)

N = No Access
S = ACT5
C = No PIN
D = With PIN

Readers: (Fourth character)

0 = No Access	6 = CIM 30 bit Wiegand
5 = CIM Magnetic Stripe	8 = CIM 37 bit Wiegand
A = ACT Access Control (FIM)	9 = CIM 26 bit Wiegand
X = Any Other Bit Pattern	

(1, 2, 3, 4, and 7 are no longer used with the recent Firmware.)

Exception to above: "--S5" = ACT 5 ('S' = ACT5 and the '5' = Magnetic Stripe)

Base Firmware Version (XXXX above)

Following the Configuration code will be a 4-digit code designating the basic Firmware Series and Revision being used (i.e., 9748 indicates 900 series firmware, version 748).

Date Code (MMDDYY above)

The EPROM label will always include the date on which the Firmware EPROM's were created, in the format of Month, Day, Year.

Configured Firmware Version and Revisions (VVVVVV above)

The third line of the label will be a 6-digit code to designate the specific "as configured" firmware series, version, access control (if applicable) and revision level

- 700 and 900 Series Firmware

The first character of the 6-digits will be either a "C" for CIM-based access control system, an "F" for FIM-based access control system, or a "G" for general system operation. This is followed by either a "7" for 700 series code, or a "9" for 900 series firmware code. The next three characters will designate the actual firmware version with the sixth and last character designating the revision level of the firmware version..

- 1000 through 4500 Series Firmware

The 1000 through 4500 Series Firmware are the latest versions of the firmware used in the newest RTU panels. The basic 6-digit label designation guidelines detailed above in the 700 and 900 series also apply here, although, in this case, the series number applies to specific RTU types (i.e., Processor Board type).

F1000x Series	for RTU-60	F2000x Series	for RTU-175C Processor
F3000x Series	for RTU-180 Processor	F3500x Series	for RTU-180 X.3 protocol
F4000x Series	RTU-175C Proc. w/SAM	F4500x Series	for 175C w/SAM & X.3

(x = Revision Level)

RTU FIRMWARE REQUEST/RELEASE FORM

Dealer Name					
End User					
Job Number		**Order Date**		**PPU Version**	
RTU PROM		**RTU Version**		**RTU Version Date**	

RTU Type (Circle one) RTU-60 RTU-100 RTU-190 RTU-200

RTU Processor Type (Circle one) RTU-175C RTU-180 RTU-175B

Communications Type:

Select "A" through "E" for: PRIMARY ☐ SECONDARY ☐

A. MUX
B. DIFF
C. DIAL (DTMF)
D. RS-232
E. X.3 Network (Frame Relay)

DIAL Line Phone Number(s): ______ ______

MUX, Multiplex 3002 Type 300 BAUD
DIFF, Differential RS-485, 1200 BAUD
DIAL, DTMF 300 BAUD

Dial Line Monitoring Y/N ☐

Other Modules Memory Expansion / DES Module

☐ MEX-8 = 8,000 Cards
☐ MEX-16 = 16,000 Cards
☐ MEX-32 = 32,000 Cards
☐ DMX-8 = 8,000 Cards w/DES Encryption
☐ DMX-16 = 16,000 Cards w/DES Encryption
☐ DMX-32 = 32,000 Cards w/DES Encryption

ACCESS CONTROL

Reader/Card Format: (Circle one) **Wiegand** **Magnetic Stripe** **Proximity** **ACT**

Reader Types: (Consult factory for up to date list) ______

ACT-4 ACT-2004 MSR-1 MR-10/20 WSR-1/2 HUGHES INDALA ACT-D ACT-E

Card Format ______ Data Bits/Length ______

RDR #	RIM Address	PIN	1or2 Man	Access Mode	APB	P-Access	Area #
1		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
2		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
3		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
4		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
5		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
6		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
7		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	
8		Y / N	1 / 2	Normal / In / Out	Y / N	Y / N	

Relock Door on: **Door Open / Door Close** Door Close Time (default=30 sec.) ☐

Door Open Time (default=10 sec.) ☐ Door Prop Warning (def=10 sec.) ☐

SPECIALS ______

APPENDIX 'F'

REPLACEMENT/SPARE PARTS

1.	RTU-175C Processor Board (Consult Factory for specific part number based on required options)	B70-4xx
2.	RTU-180 Processor Board (Consult Factory for specific part number based on required options)	B75-xxx
3.	TELCO Telephone Interface Board (Diff/Diff)	B70-012
4.	TELCO Telephone Interface Board (Diff/Dial)	B70-013
5.	TELCO Telephone Interface Board (Mux/Mux)	B70-010
6.	TELCO Telephone Interface Board (Mux/Dial)	B70-011
7.	TELCO Telephone Interface Board (Dial/Dial)	B70-014
8.	TELCO Telephone Interface Board (RS-232/Dial for 180 Proc.)	B70-020
9.	TELCO, Telephone Interface Board (Diff/Diff for 180 Proc.)	B75-012
10	RIM-8, Remote Input Module	B30-000
11.	RIM-16, Remote Input Module	B30-002
12.	ZIM, Zone Identification Module (Refer to page 27 of this manual for ZIM listings. Consult MDI for specific part numbers)	Z01-xxx
13.	Zero Power Relay, ZPR-ROM	B30-110
14.	Zero Power Relay, ZPR-ROAM	B30-111
15.	PMB-16, Passive Matrix Bridge Module	B30-045
16.	RDM-8R, Remote Display Module	B30-030
17.	RDM-8KUD, Remote Display Module w/User ID Keypad	B30-038
18.	RDD, Remote Display Driver	B30-040
19.	DCP-8UD, 8-Zone Display Control Panel w/Keypad	A500-017
20.	DCP-16UD, 16-Zone Display Control Panel w/Keypad	A500-018
21.	DEP, Display Extension Panel (up to 32 zones)	A500-020
22.	CIM-2, Card Reader Interface Module	B30-020

23.	CIM-EXP, CIM Expander Module	B30-025
24.	FIM, Four Wire Interface Module	B30-050
25.	ZPR-FIM, Zero Power Relay Module-FIM	B30-112
26.	FIM-02 (FIM-BF), Four Wire Interface Module for RUSCO, SCSI and ACT-4 Barium Ferrite Readers	B30-053
27.	FIM ID, FIM Interface Device (for ACT-4BF readers)	B30-120
28.	AC Transformer, 10 Volt AC, 16VA	30-060
29.	BAT-2.6, Battery, 6 Volt, 3.0 Ah	30-055
30.	BAT-7, Battery, 6 Volt, 7 Ah	30-064
31.	OIM-U, Optical Isolation Module-Universal	B35-105-03
32.	OIM-R/OIM-L, Optical Isolation Module Right /Left for CIM	B35-105/B35-106
33.	OI-HID-PR, Optical Isolator for Grant LED (Hughes ID readers)	B35-107
34.	MEX-8, Memory Expansion Module - 8,000 Cards	B55-137-8
35.	MEX-16, Memory Expansion Module - 16,000 Cards	B55-137-16
36.	MEX-32, Memory Expansion Module - 32,000 Cards	B55-137-32
37.	DMX-8, DES Encryption/Memory Expansion - 8,000 Cards	B55-135-8
38.	DMX-16, DES Encryption/Memory Expansion - 16,000 Cards	B55-135-16
39.	DMX-32, DES Encryption/Memory Expansion - 32,000 Cards	B55-135-32
40.	DES-RTU, DES Encryption Module (No Memory Expansion)	B55-136
41.	Ribbon Cable, 175C Processor to TELCO	08-125
42.	Ribbon Cable, 175C Processor to RIM/ROAM boards (8 connectors)	08-131
43.	Ribbon Cable, 175C Processor to RIM/ROAM boards (4 connectors)	08-129
44.	Ribbon Cable, 175C Processor to FIM board	
45.	Ribbon Cable, 175C Processor to CIM board	
46.	Ribbon Cable, 175C Processor to CIM-EXP board	
47.	Ribbon Cable, CIM-EXP board to CIM board	
48.	Ribbon Cable, RIM board (-8 or -16) to ZPR-ROM board	
49.	Cable Assembly, Backup Batteries to TELCO board	
50.	RTU Firmware Upgrade	U75-100

Product Documentation Change Request Form

Requested by: ______________________________

Company/Department: ______________________________
Address: ______________________________
Phone: (   ) ______________________________

Title of Document/Manual: ______________________________
Revision #/Date: ______________________________

Reason for Change Request:

- ☐ Discrepancy / Error
- ☐ Feature / Operational Change
- ☐ New Feature / Enhancement
- ☐ New Product
- ☐ Other (Explain Below)

Description of discrepancy or changes required:
(Please include Page Numbers/Paragraphs/Figures as applicable)

____
____
____

Signature ______________________________ **Date:** ______________

'ease attach marked up copies of applicable pages and return with this form to:

Monitor Dynamics, Inc.
9518 Ninth Street
Rancho Cucamonga, CA 91730
Attn: D. Valentine - Documentation