Section 27. Ovation Remote I/O

27-1. Section Overview

This section describes the Ovation remote I/O subsystem.

Note

Ovation remote I/O is applicable for use in CE Mark certified systems except where noted.

The Ovation Distributed Control System provides modulating control, sequential control, and data acquisition for a variety of system applications. Although using local I/O is typically the most practical control solution (described in Section 26), a remote process might need to be controlled.

Remote I/O is typically used where a process requires that I/O modules be located near the process, even though the Controller is not. The remote I/O modules are connected to the Controller through long distance, serial media, such as fiber-optic cables

Typically, the Ovation remote I/O subsystem contains:

- Controller cabinet containing the redundant Ovation Controller, applicable I/O Interface Controller (IOIC) cards (PCRR), power supplies, and I/O modules as described in Section 27-3.
- Remote Node cabinet(s) containing the redundant Remote Node Controller module (described in Section 27-4), as well as I/O cards.
- Extended I/O cabinet containing additional I/O modules and power supplies (described in Section 27-5).
- Appropriate cable and connections between cabinets (described in Section 27-7 and in “Planning and Iinstalling Your Ovation System” (U3 -1000 and U 3-1005)).

Note

An optional Ovation Marshalling cabinet is also available. The rear of this 32 inch wide cabinet provides for halfshell wiring terminations, but has the same mechanical and electrical performance as the standard Ovation cabinet. Refer to “Planning and Installing Your Ovation System” (U 3-1000 and U 3-1005) for additional information.

27-2. Remote I/O Features

The Ovation remote I/O subsystem has the following features:

- Maximum number of Remote Nodes: 16 nodes, redundantly controlled (eight nodes for each PCRR card).
- Maximum number of I/O modules per remote node: 64 [1] (eight branches with eight modules for each branch).
- Maximum number of I/O modules per PCRR card: 512 [1] (eight nodes, eight branches for each node, eight modules for each branch).
- Maximum number of I/O modules per Controller: 1024 [1].
- Remote I/O Bus configuration: 10 BASE-FL Ethernet physical layer with a proprietary protocol.
- Remote I/O cycle time: <100µ sec (typical), double byte word access as seen by PCRR.
- Standard Remote communications media offered: Fiber-optic
- Maximum cable length for 850 nm fiber-optic media: 2 km (without repeaters) [2] (described in Table 27-1).
- Maximum cable length for 1300 nm fiber-optic media: 4 km (described in Table 27-1).
- Distances of 6 km can be achieved with repeaters (up to two repeaters) (Not applicable for CE Mark certified systems.).[2]
- Remote communication diagnostics can be performed in the Primary and Backup system without affecting I/O modules. The diagnostics available are:

  1. Simulation of all types of bus cycles (such as local I/O including statuses, bit corruption, message length faults, collision faults, and no response).

  2. Loopback of all messages from PCRR through the MAU.

  3. Connection check of AUI cable and remote node link.

- Status LEDs: Available on PCRR, MAU, and RNC modules.

1 These numbers represent hardware capabilities. Controller software limitations are not implied.

2 Repeaters are Third-party Ethernet devices that must be endorsed by Emerson design engineers.

27-3. Controller Cabinet Components (Remote I/O)

The Ovation Remote I/O Controller cabinet (see Figure 27-1) contains the following:

- Redundant Controller Chassis - This rack in the Controller cabinet provides the backplane for two separate Controllers (refer to Figure 27-2). For each Controller, the backplane interconnects the following components:

  — Pentium PC Processor Board - Third party functional processor for the Controller.

  — Power Supply Board Kit - Contains a PCPS power supply converting +24V to +5V and 12V to power all components in the Controller chassis.

  — Network Interface Card (NIC)- Provides the interface between the, Ovation Controller, and the other highway components of the system. FDDI/CDDI and Fast Ethernet versions are supported.

  — PCRR Board - IOIC (PCI) to remote Ovation or Q-Line I/O interface board, serving as the master of the remote I/O bus. Refer to "Remote Q-Line Installation Manual" (M0-0054) for remote Q-Line I/O installation information (only 850 nm optics, with 2 km maximum length, are available for remote Q-Line applications).

    A PCRR board has two Attachment Unit Interface (AUI) ports each of which may connect to an Attachment Unit Module using an AUI cable. Together, the two ports typically serve as the primary I/O bus master with another PCRR card providing the redundant pair (up to two PCRR cards per each Controller).

- Power Supply - DIN Rail Mounted. Generates +24V to power the electronics in the I/O Controller Cabinet, as well as +24V auxiliary power. Two are required for redundancy. An optional separate +48V auxiliary power supply is also available.

- Power Distribution Module (5A26304) - Provides connectors for cables used to distribute +24V to the Redundant Controller Chassis, and +24V and auxiliary power to branches of local I/O (refer to Figure 27-9).

- Standard I/O Modules and Bases - Standard Ovation I/O modules which interface to field devices (refer to Figure 27-10).

- Relay Output Module and Bases - Relay module base, 1.5 times larger than a standard I/O base unit, containing electronics module and relays to control field devices (refer to Figure 27-11).

- I/O Transition Panel (ROP - 4D33922) - Connects to two branches of I/O, providing a point to bring in +24V redundant power, auxiliary power, and the local I/O communications bus (refer to Figure 27-12).

  Connections are provided on the I/O Transition Panel to daisy-chain the local I/O communications bus from one ROP to the next (up to eight I/O branches **maximum** may be daisy-chained together).

- I/O Branch Terminator Board A or B (1B30023) - Connects to the A or B-side of a standard I/O base at the end of a branch having no Attachment Unit Module to terminate the local I/O bus (refer to Figure 27-1).

Caution

The I/O addressing for the Ovation database is determined from the positions of the bases installed in the cabinets.

We recommends that all possible bases (typically four) be installed in the right-most branch of each side of a cabinet, even if they are not all filled with I/O modules. This will prevent disruption of the database if additional I/O modules are installed in the future.

I/O modules should be installed in the right-most branch of each side of a cabinet from the BOTTOM UP.

I/O modules should be installed in the left-most branch of each side of a cabinet from the TOP DOWN.

If Relay Output modules are mixed with Standard I/O modules on the same branch, the Standard I/O module base must always start in an odd-numbered position on the branch (positions 1/2, 3/4, 5/6, or 7/8).

- Media Attachment Unit (MAU) - This module (see Figure 27-3) provides a point of attachment for fiber optic cables used to transfer messages over long distances between the PCRR and up to four remote nodes (see Figure 27-4). The module directs messages between the PCRR and one of the four remote nodes at a time as selected, converting signals readable by the PCRR to signals compatible with the fiber optic media and vise versa. The following components comprise the MAU:

  — Electronics Module (1C31179) - Houses the Attachment Unit Logic Board (LAU) which provides power for the module and displays LED indication that the fiber optic cables are connected and the Remote Node Controller Module has power.

  — Personality Module (1C31181) - Houses the Attachment Unit Personality Board (PAU) which translates signals between the PCRR and the fiber optic media and provides connectors for the fiber optic cables.

  Table 27-1 lists and describes the available MAU modules.

Table 27-1. MAU Subsystem

Electronic Module	Personality Module	Length of Optical Link[1]	Channels	Optics [2]
1C31179G01	1C31181G01	Up to 2 kilometers (6,560 ft)	2	850 nm
1C31179G02	1C31181G02	Up to 2 kilometers (6,560 ft)	4	850 nm
1C31179G01	1C31181G03	Up to 4 kilometers (13,120 ft)	2	1300 nm
1C31179G02	1C31181G04	Up to 4 kilometers (13,120 ft)	4	1300 nm

1 In order not to be required to select extended PCRR time-out periods, it is recommended that you do NOT exceed an optical length of 3.7 km.
2 An Ovation Controller cabinet MAU MUST use the same type of optics (850 nm or 1300 nm) for each of the remote nodes that it interfaces. An MAU cannot interface both 850 nm remote nodes (using 1C1204G01 Personality modules) and 1300 nm remote nodes (using 1C31204G01 Personality modules.)

  — Media Attachment Unit Base (1C31206) - This base holds a maximum of two modules and provides a connector for the AUI Cable which interconnects the PCRR and Attachment Unit Module. The backplane routes +24V to the Attachment Unit Modules for power. It also provides local I/O bus termination.

  Therefore, I/O branch terminator boards are not required at the end of branches where Media Attachment Unit modules are placed.

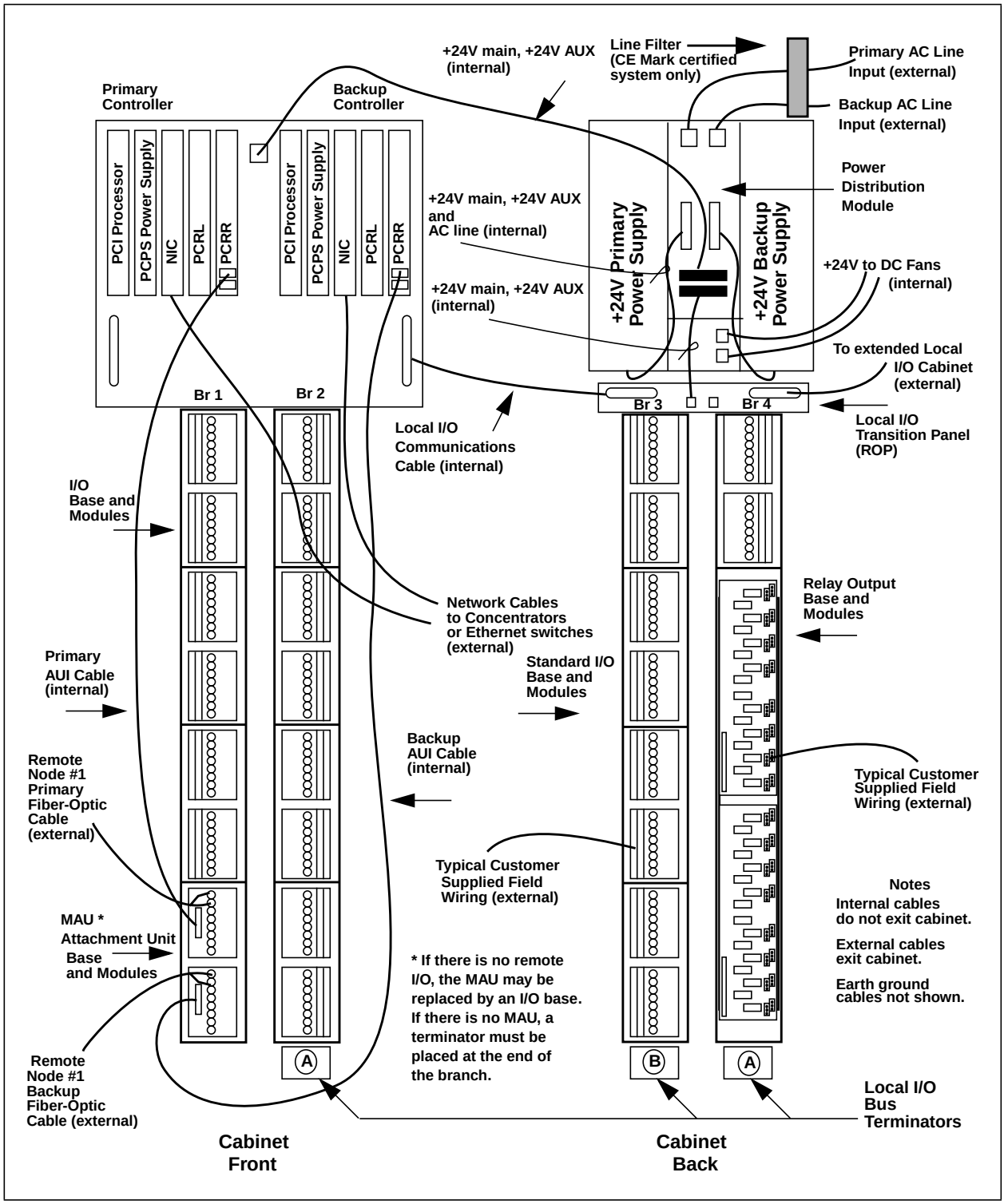

Figure 27-1. Controller Cabinet Components and Cabling (local and remote I/O)

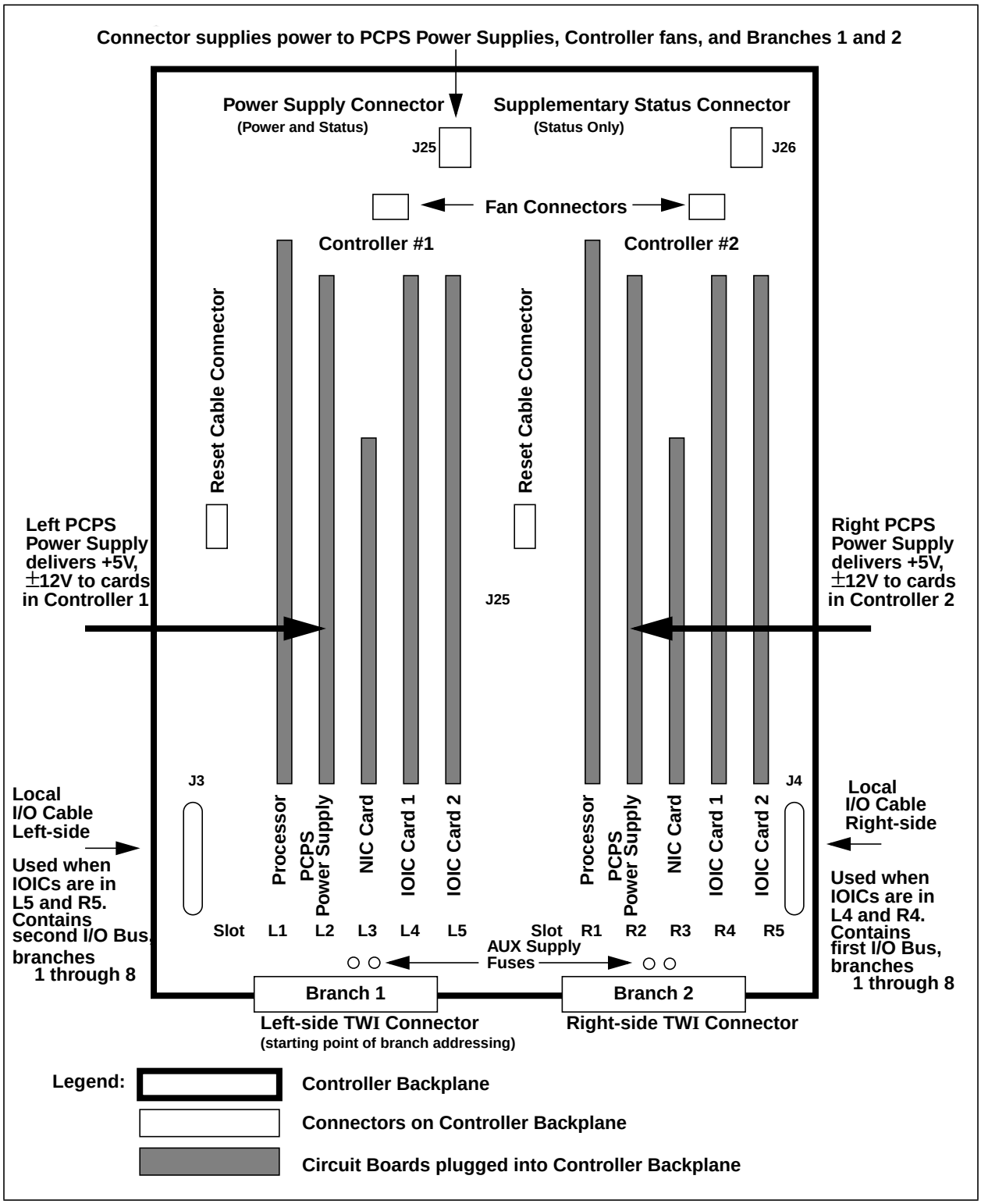

Figure 27-2. Controller Backplane (CBO)

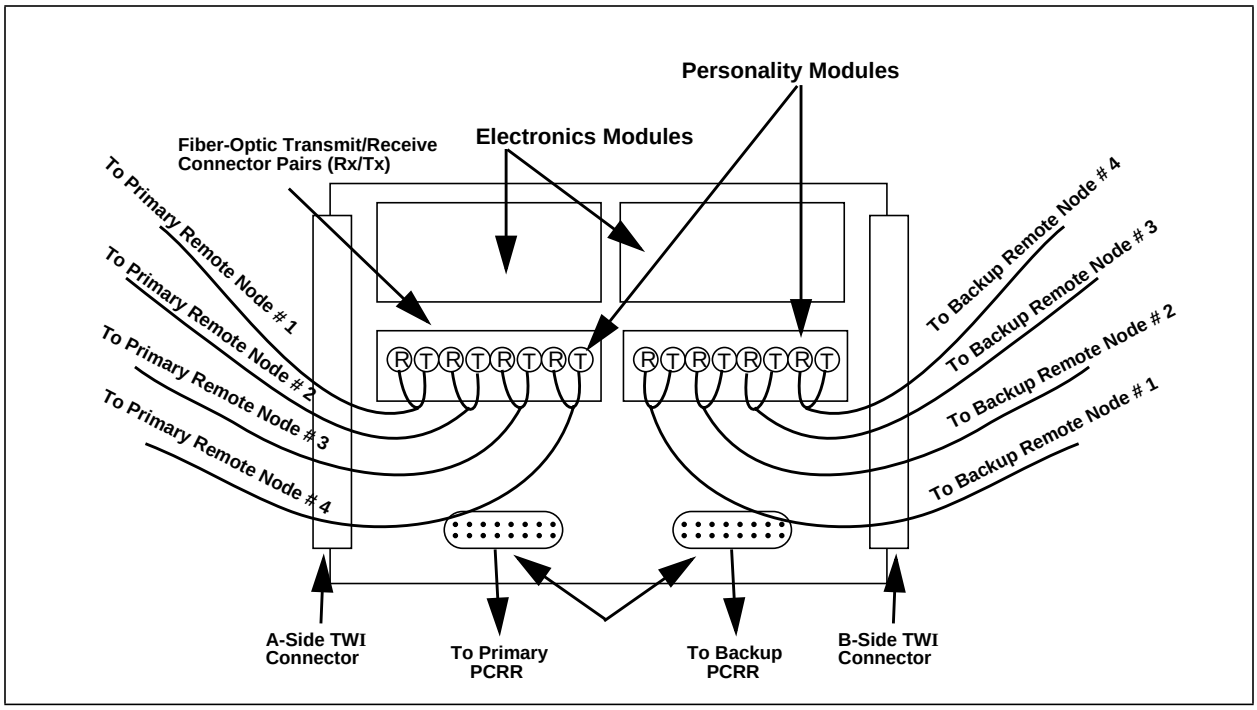

Figure 27-3. MAU with Typical Fiber-Optic Connector Pairs

Table 27-2. I/O Module Specifications

Description	Minimum Value	Maximum Value
Temperature	0°C (32° F) Operating - 40°C (-40°F) Storage	60°C (140°F) Operating 85°C (185°F) Storage
Humidity	0% Operating	95% Operating (Non-CE Mark) 90% Operating (CE Mark) Maximum wet bulb temp 35°C

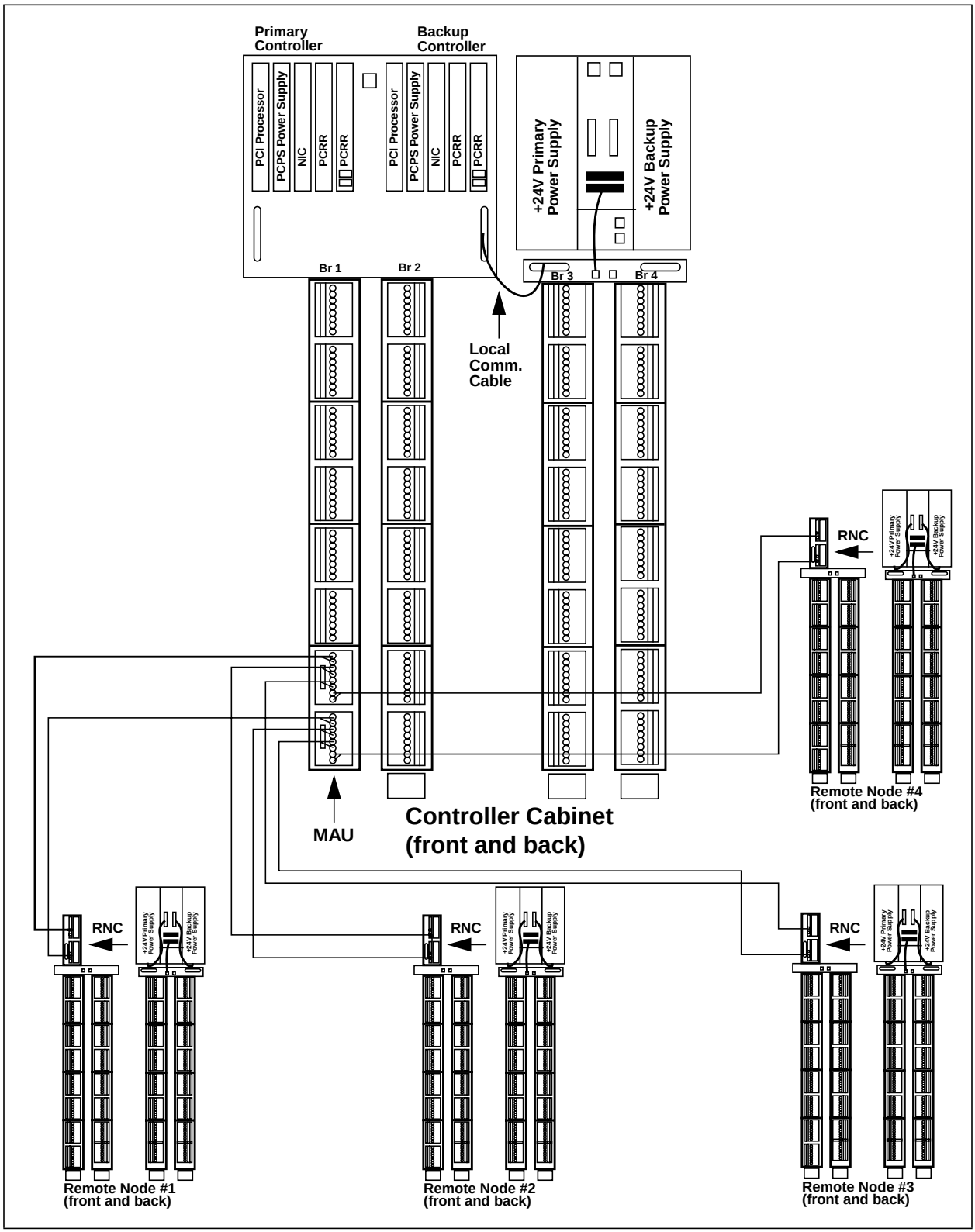

Figure 27-4. Example of Typical MAU Cable Connections to Remote Nodes

27-4. Remote Node Cabinet Components

The Ovation Remote Node cabinet, located remotely from the Controller cabinet (refer to Figure 27-5) contains the following:

- Power Supply - DIN Rail Mounted. Generates +24V to power the electronics in the Remote Node Cabinet, as well as +24V auxiliary power. Two are required for redundancy.
- Remote Node Controller (RNC) Module - Provides a point of attachment for remote I/O media used to transfer messages between the remote node and the MAU. There are only two Remote Node Controller Modules per remote node (one primary, one backup), regardless of the number of cabinets at the node. The module translates messages from the remote I/O bus into local I/O bus cycles that can be directed to as many as eight branches of local I/O modules (refer to Figure 27-6).

  The following components comprise the Remote Node Controller Module:

  — Remote Node Electronics Module (1C31203) - Houses the Remote Node Logic Board (LND) and the Remote Node Field Board (FND). The electronics module prepares messages received from the remote I/O Controller for the local I/O modules at the remote node. When an I/O module responds to the message, the module prepares the response to be sent back to the Controller over the fiber-optic media. The LND provides +5V power for the module.

  — Remote Node Personality Module (1C31204G01 for 850 nm optics/ 1C31204G03 for 1300 nm optics) - Houses the Remote Node Personality Board (PAU) which provides connectors for the media used to transmit and receive remote messages between the Controller and remote node. Group 1 modules provide fiber-optic connections; (future plans are that group 2 modules provide an AUI port used to connect to third party transceivers). Power supply monitoring circuitry of the +24V redundant supplies is located on this module and is reported back to the electronics module to flag failure of the primary or backup supply.

  — Remote Node Controller Base (1C31205) - This unique base holds a maximum of two Remote Node Modules and interfaces directly to two I/O branches. It provides a rotary switch for node addressing and a D-connector for interfacing to as many as six additional I/O branches using a local I/O communications cable. The RNC base unit is connected to the Remote Node Transition Panel described below.

- Remote Node Transition Panel (TND - 4D33924) - Interconnects the RNC base, Remote Power Supply Module (if used), and the branches of local I/O in a single Remote Node cabinet. The Remote Node Transition Panel (TND) also provides connectors for DIN Rail Mounted +24V Supplies or auxiliary supplies to be wired into the remote node (refer to Figure 27-7).

- Remote Node Electronics Module (1C31203G01) - Houses the Remote Node Logic Board (LND) and the Remote Node Field Board (FND). The electronics module prepares messages received from the remote I/O Controller for the local I/O modules at the remote node. When an I/O module responds to the message, the module prepares the response to be sent back to the Controller over the fiber-optic media. The LND provides +5V power for the module.

- Remote Node Controller Base (1C31205G01) - This unique base holds a maximum of two Remote Node Modules and interfaces directly to two I/O branches. It provides a rotary switch for node addressing and a D-connector for interfacing to as many as six additional I/O branches using a local I/O communications cable. The RNC base unit is connected to the Remote Node Transition Panel described below.

- Power Distribution Module (PDM - 5A26304) - Provides connectors for cables used to distribute +24V to the Redundant RNC, and +24V and auxiliary power to the branches of I/O (refer to Figure 27-9).

- Standard I/O Modules and Base - Standard Ovation I/O modules which interface to remote field devices when placed in the Remote Node cabinet (refer to Figure 27-10).

- Relay Output Module and Base - Relay Output I/O modules which interface to remote field devices when placed in the Remote Node cabinet (refer to Figure 27-11).

- I/O Transition Panel (ROP - 4D33922) - Connects to two branches of I/O, providing a point to bring in +24V redundant power, auxiliary power, and the local I/O communications bus (refer to Figure 27-12).

  Connections are provided on the I/O Transition Panel to daisy-chain the local I/O communications bus from one ROP to the next (up to eight I/O branches **maximum** may be daisy-chained together as described in Section 27-8.4).

- Relay Base Transition Panels
  (Top - RRP 3A99252; Bottom - RRB 3A99253) - Used with Relay Output modules for a single I/O branch of up to eight relay bases.

Supplies +24V redundant power, auxiliary power, and local communications bus to the branch. Mounted at the top/bottom of the extended cabinet (refer to Figure 27-13). Only one I/O branch is used and branches 2 through 8 are passed on.

- I/O Branch Terminator Board A or B (1B30023) - Connects to the A/B-side of a standard I/O base at the end of a branch to terminate the I/O bus. Refer to Figure 27-5 to identify the A/B-side of an I/O base.