

System Cabling (GigaRing I/O Systems)

HMM-367-B
CRAY T90 Series Systems
Last Modified: August 1997

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Record of Revision

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Revision A: February 1997

This revision incorporates changes to Figure 8, Figure 9, Figure 16, and to the connector destinations of the MC01 harness assembly in Table 3. All other versions of this document are obsolete.

Revision B: August 1997

This revision incorporates changes and additions to Tables 1, 2, and 4. All other versions of this document are obsolete.

Overview

Each CRAY T90™ series mainframe contains numerous internal cable connections as well as bulkhead cable connections for I/O, maintenance, control, and intermachine communications. This document provides information about the cable connections for the CRAY T90 series mainframes with IO02 modules and subsequent IO modules that support GigaRing™ I/O or node architecture. This document does not describe all of the cables in the peripheral cabinet (PC-10) or in the system workstation (SWS). It describes cables that connect the PC-10 and SWS to the CRAY T90 series mainframe only.

This document describes cabling for a CRAY T90 series system according to the following areas:

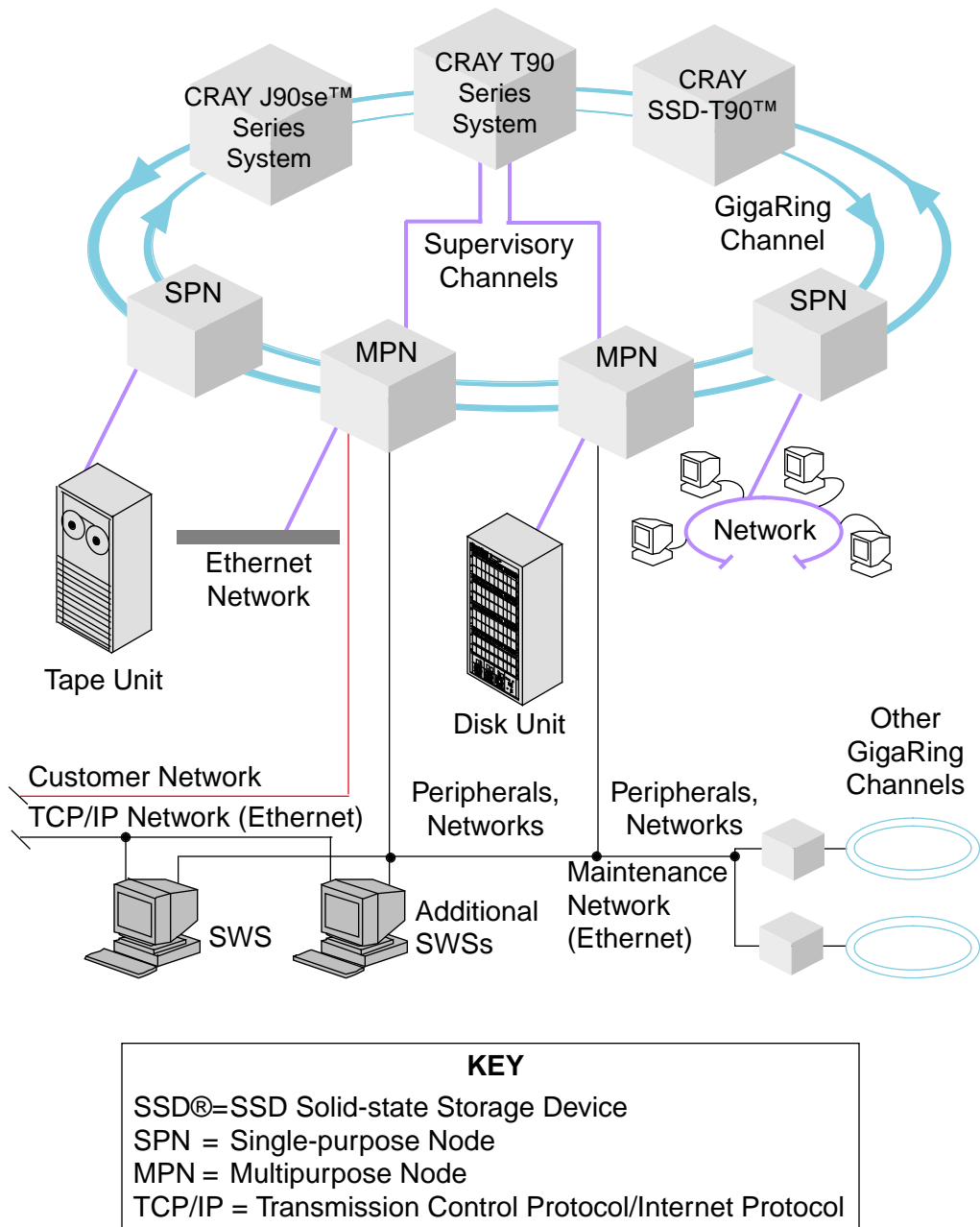
- I/O bulkhead cabling
- IO module cabling
- Supervisory channel cabling
- PC-10 and SWS cabling
- Control system cabling

For cabling information about CRAY T90 series systems without GigaRing I/O connections, refer to the *System Cabling (CRAY T90 Series)* document, Cray Research publication number HMM-078-A. For information about the

IO02 module used in the mainframe of CRAY T90 series systems with GigaRing I/O, refer to the *IO02 Module* document, Cray Research publication number HTM-323-0. For information about power wiring and power supply harnesses, refer to the applicable system documents in the CRAY T90 Series *Power, Cooling, and Control System* kit, HTK-084-0.

Figure 1 provides a block diagram of a CRAY T90 series system with GigaRing I/O channels.

Figure 1. Block Diagram, CRAY T90 Series System with GigaRing I/O



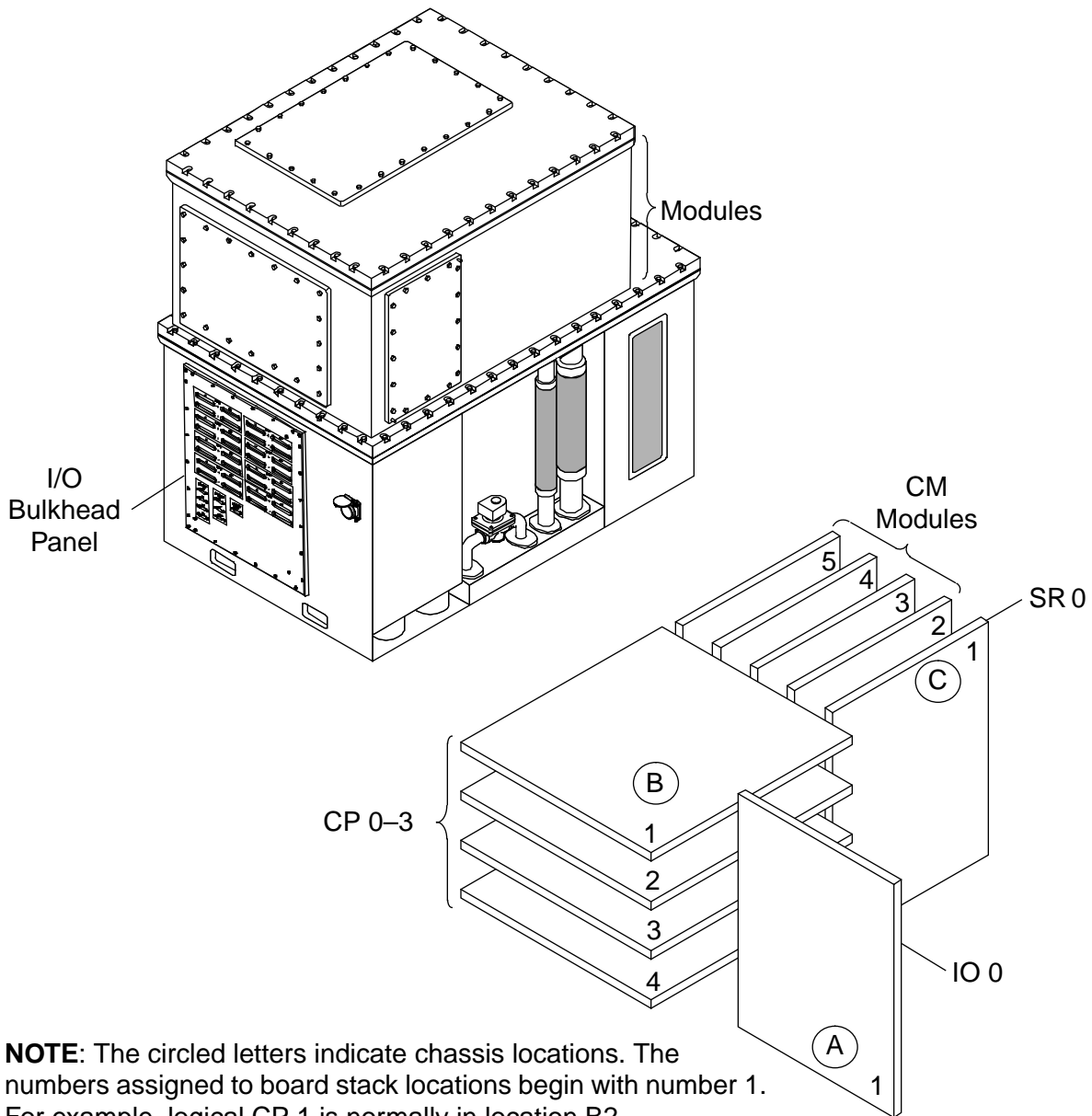
I/O Bulkhead and IO Module Locations

Each CRAY T90 series mainframe contains at least one IO module that provides the interface between the mainframe CPUs and the GigaRing I/O. The CRAY T94™ mainframe contains one IO module, the CRAY T916™

mainframe contains a minimum of one and a maximum of two IO modules, and the CRAY T932™ mainframe contains a minimum of two and a maximum of four IO modules. Each IO module requires an I/O bulkhead panel, which provides the cable interconnections.

In the CRAY T94 mainframe, the IO module occupies chassis Location A, and the I/O bulkhead panel attaches to the side of the chassis. Figure 2 illustrates the location of the IO module and the I/O bulkhead in the CRAY T94 mainframe.

Figure 2. IO Module and I/O Bulkhead Locations, CRAY T94 Mainframe

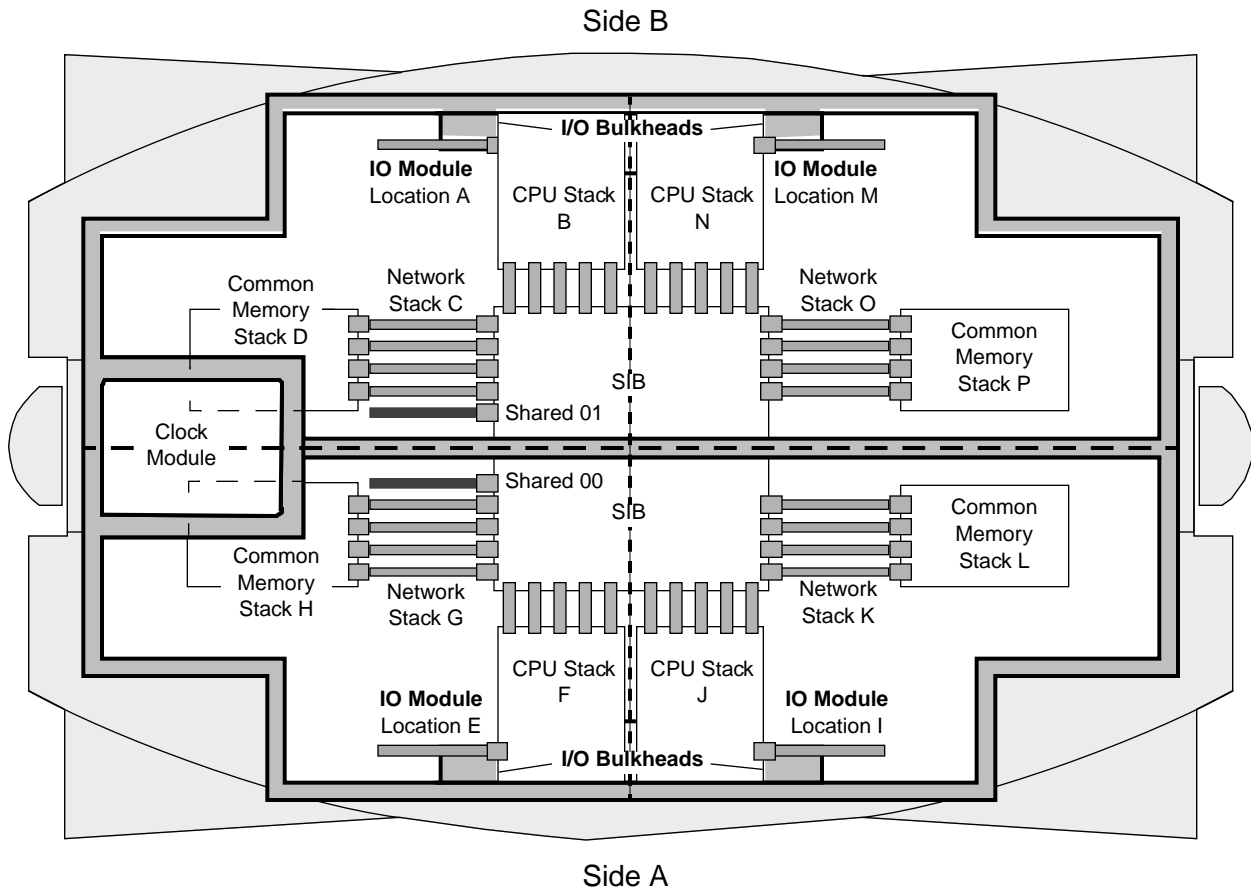


NOTE: The circled letters indicate chassis locations. The numbers assigned to board stack locations begin with number 1. For example, logical CP 1 is normally in location B2.

In the CRAY T916 mainframe, IO modules can occupy Location E and Location I. In the CRAY T932 mainframe, IO modules can occupy Location E, Location I, Location M, and Location A. Figure 3 illustrates the locations of the IO modules and the I/O bulkheads in the CRAY T916 and CRAY T932 mainframes.

NOTE: IO modules in chassis locations A and I are in an upright position.
IO modules in chassis locations M and E are in an inverted position.

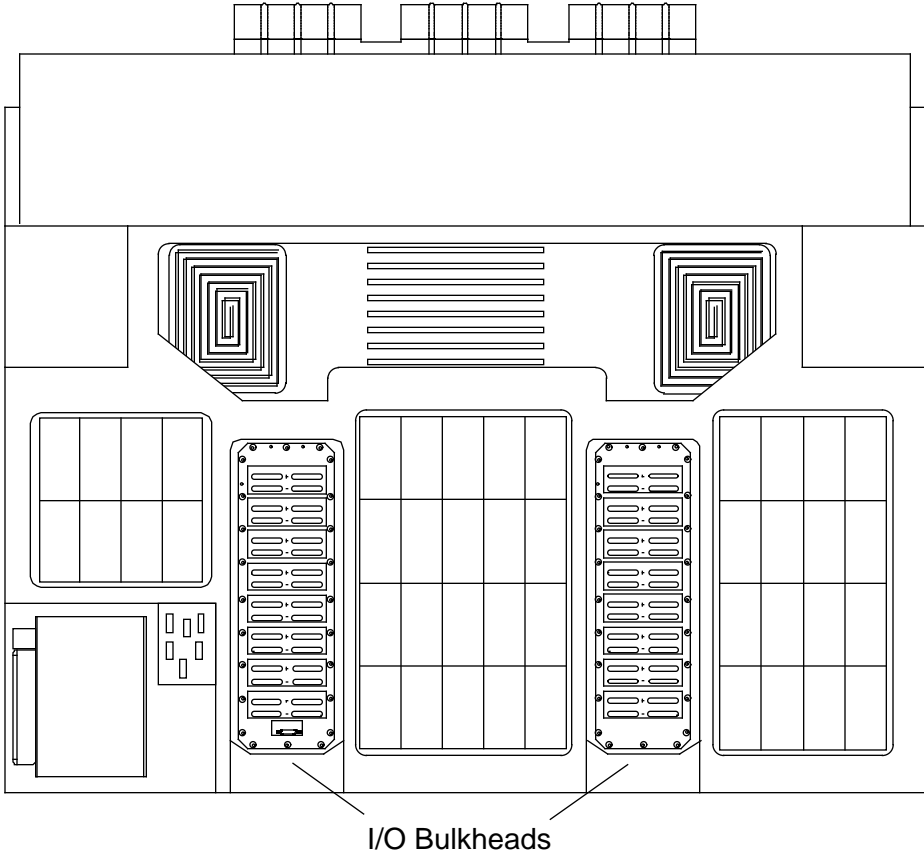
Figure 3. IO Module and I/O Bulkhead Locations, CRAY T916 and CRAY T932 Mainframes



NOTE: The CRAY T932 mainframe contains modules in both side A and side B, but the CRAY T916 mainframe contains modules in side A only.

Figure 4 illustrates the I/O bulkheads in side A of the CRAY T916 and CRAY T932 mainframes. Because the CRAY T916 mainframe contains no modules in side B, it contains blank panels instead of I/O bulkheads in side B. If side B of a CRAY T932 mainframe contains IO modules, then it may also contain I/O bulkheads.

Figure 4. I/O Bulkheads, CRAY T916 and CRAY T932 Mainframes, Side A



I/O Bulkhead and IO Module Cabling

Each I/O bulkhead panel provides the cable interconnections between the CRAY T90 series mainframe and the PC-10 cabinet. Harness assemblies connect each mainframe IO module to the I/O bulkhead and to the other mainframe modules. The following subsections describe the I/O bulkhead connections, the I/O harness assemblies, and the IO module connections in detail.

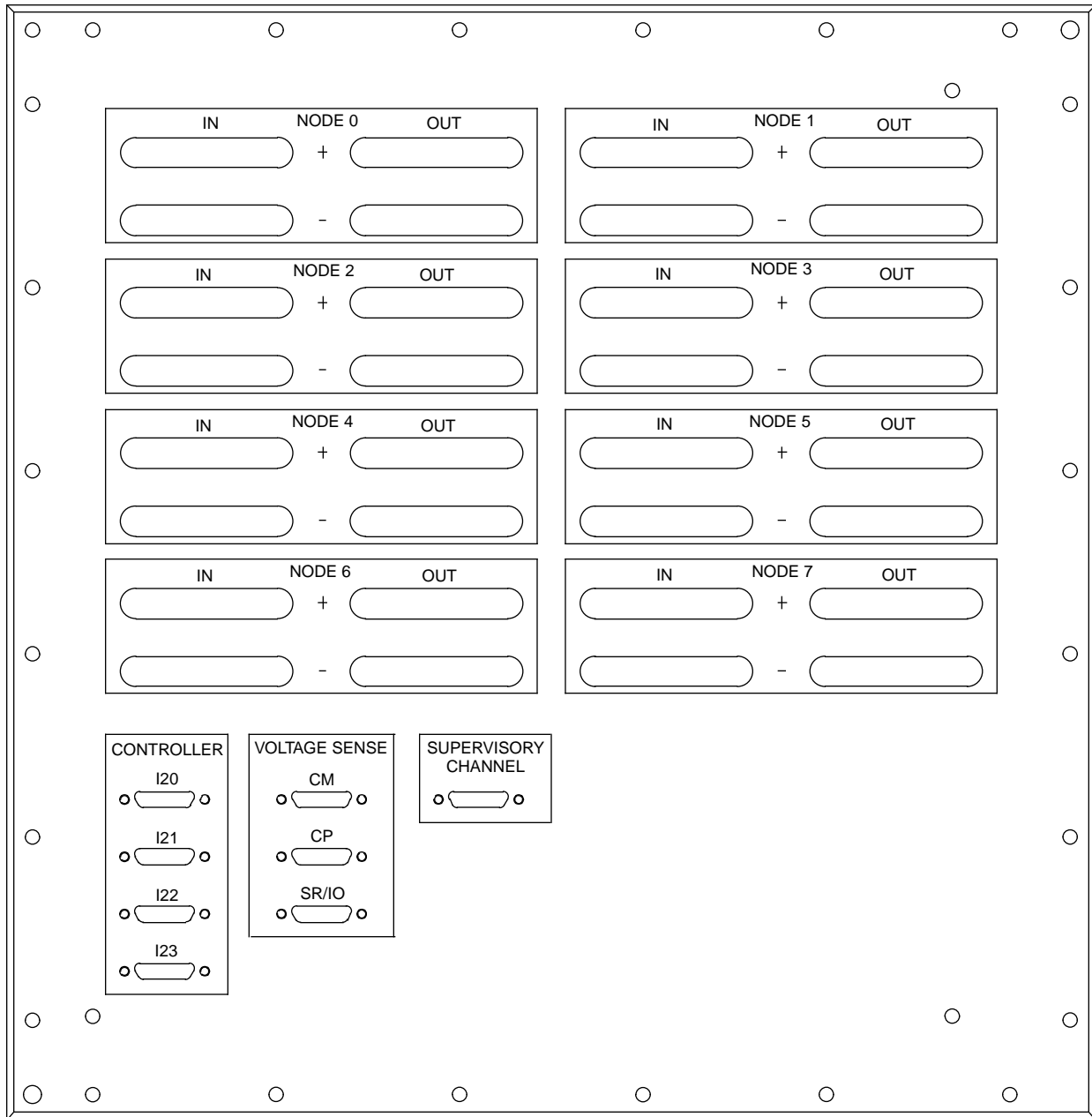
I/O Bulkhead Connections

Each I/O bulkhead panel contains the interconnections between the GigaRing cables that attach to the nodes in the PC-10 cabinet and the I/O harness assemblies that attach to the mainframe IO module. The I/O bulkhead panel in the CRAY T94 mainframe contains the following forty connections:

- Thirty-two node connections (four for each node)
- One supervisory channel connection
- Four controller connections
- Three voltage-sense probe connections

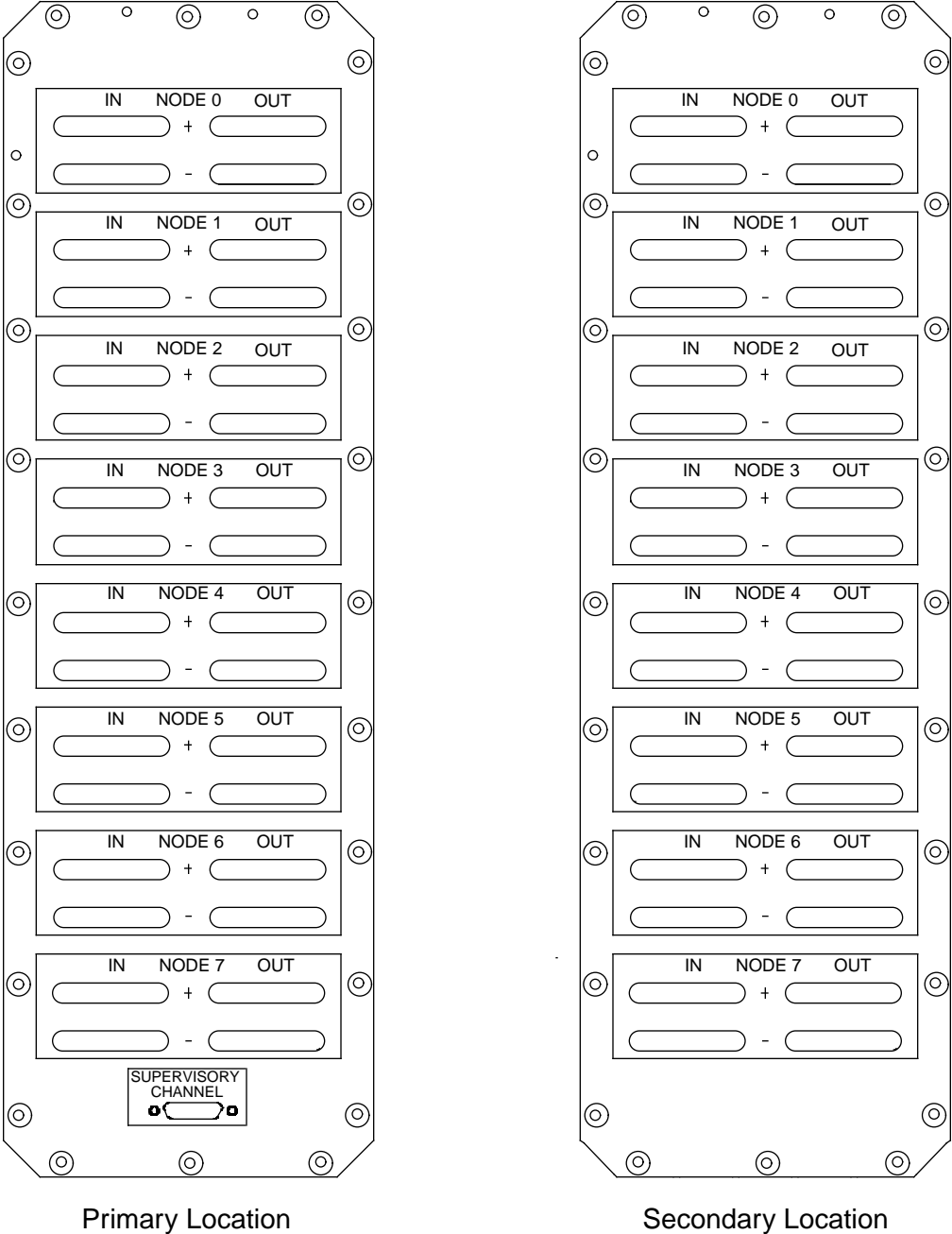
Figure 5 illustrates the CRAY T94 I/O bulkhead panel.

Figure 5. CRAY T94 I/O Bulkhead



The CRAY T916 and the CRAY T932 mainframes use two different I/O bulkhead panel designs, one for an IO module in the upright position and one for an IO module in the inverted position. The bulkhead panels in primary locations (Location E and Location M) each contain 32 node connections and 1 supervisory channel connection. The bulkhead panels in secondary locations (Location I and Location A) each contain the 32 node connections, but they do not contain a supervisory channel connection. Figure 6 illustrates the CRAY T916 and CRAY T932 I/O bulkhead panels.

Figure 6. CRAY T916 and CRAY T932 I/O Bulkhead Panels



I/O Harness Assemblies

The I/O harness assemblies connect the node circuits on the IO module to the I/O bulkhead panel. Each I/O harness assembly contains a 514-position (YT) connector on the module end and six 80-pin (YU) connectors on the bulkhead end. Table 1 provides information about the module and node connections for each I/O harness assembly. Figure 7 illustrates the I/O harness assembly.

Table 1. Module and Node Connections, I/O Harness Assembly

Upright I/O Module							
Module Connector Location	Rack Label	YU-0	YU-1	YU-2	YU-3	YU-4	YU-5
EA Board 1	Input L1, H0, H1	Node 0 – Neg. Out	Node 0 – Pos. In	Node 0 – Pos. Out	Node 0 – Neg. In	Not Used	Not Used
EB Board 1	Input H2, H3, L3	Node 2 – Neg. Out	Node 2 – Pos. In	Node 2 – Pos. Out	Node 2 – Neg. In	Node 4 – Neg. Out	Node 4 – Pos. In
ED Board 1	Input H6, H7, L0	Node 4 – Pos. Out	Node 4 – Neg. In	Node 6 – Neg. Out	Node 6 – Pos. In	Node 6 – Pos. Out	Node 6 – Neg. In
EA Board 2	Output H0, H1, L0	Node 1 – Pos. Out	Node 1 – Neg. In	Node 1 – Neg. Out	Node 1 – Pos. In	Not Used	Not Used
EB Board 2	Output H2, H3, L2	Node 3 – Pos. Out	Node 3 – Neg. In	Node 3 – Neg. Out	Node 3 – Pos. In	Node 5 – Pos. Out	Node 5 – Neg. In
ED Board 2	Output H6, H7, L6	Node 5 – Neg. Out	Node 5 – Pos. In	Node 7 – Pos. Out	Node 7 – Neg. In	Node 7 – Neg. Out	Node 7 – Pos. In
Inverted I/O Module							
Module Connector Location	Rack Label	YU-0	YU-1	YU-2	YU-3	YU-4	YU-5
EA Board 1	Input H0, H1, L1	Node 6 - Neg. Out	Node 6 - Pos. In	Node 6 - Pos. Out	Node 6 - Neg. In	Not Used	Not Used
EB Board 1	Input H2, H3, L3	Node 4 - Neg. Out	Node 4 - Pos. In	Node 4 - Pos. Out	Node 4 - Neg. In	Node 2 - Neg. Out	Node 2 - Pos. In
ED Board 1	Input H6, H7, L7	Node 2 - Pos. Out	Node 2 - Neg. In	Node 0 - Neg. Out	Node 0 - Pos. In	Node 0 - Pos. Out	Node 0 - Neg. In
EA Board 2	Output H0, H1, L0	Node 7- Pos. Out	Node 7 - Neg. In	Node 7 - Neg. Out	Node 7 - Pos. In	Not Used	Not Used
EB Board 2	Output H2, H3, L2	Node 5 - Pos. Out	Node 5 - Neg. In	Node 5 - Neg. Out	Node 5 - Pos. In	Node 3 - Pos. Out	Node 3 - Neg. In
ED Board 2	Output H6, H7, L6	Node 3 - Neg. Out	Node 3 - Pos. In	Node 1 - Pos. Out	Node 1 - Neg. In	Node 1 - Neg. Out	Node 1 - Pos. In

NOTE: The YT connectors of the I/O harness assemblies attach to the YT connectors on Board 1 and Board 2 of the IO module at locations EA, EB, and ED in the CRAY T916, CRAY T932, and CRAY T94 systems. The connectors at module location EC attach to the maintenance channel (MC) harness assemblies. The MC harness assemblies connect the IO module to the mainframe modules. Refer to the “IO Module Connections” subsection on page 21 for detailed information about the MC harness connections.

For detailed information about the YT – YU wiring in the I/O harness assembly, refer to the table “I/O Harness Assembly Wire List” in the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

Figure 7. I/O Harness Assembly

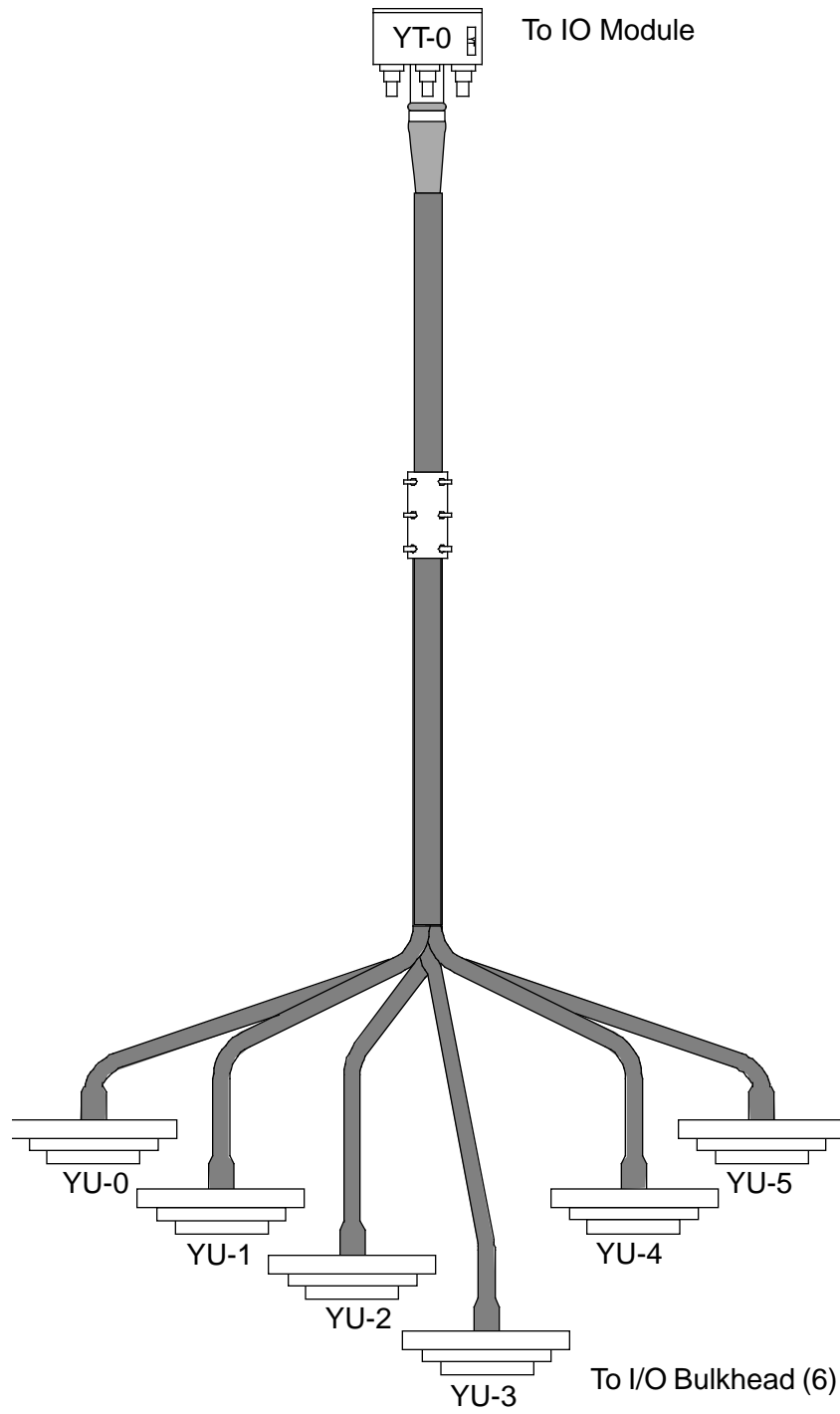
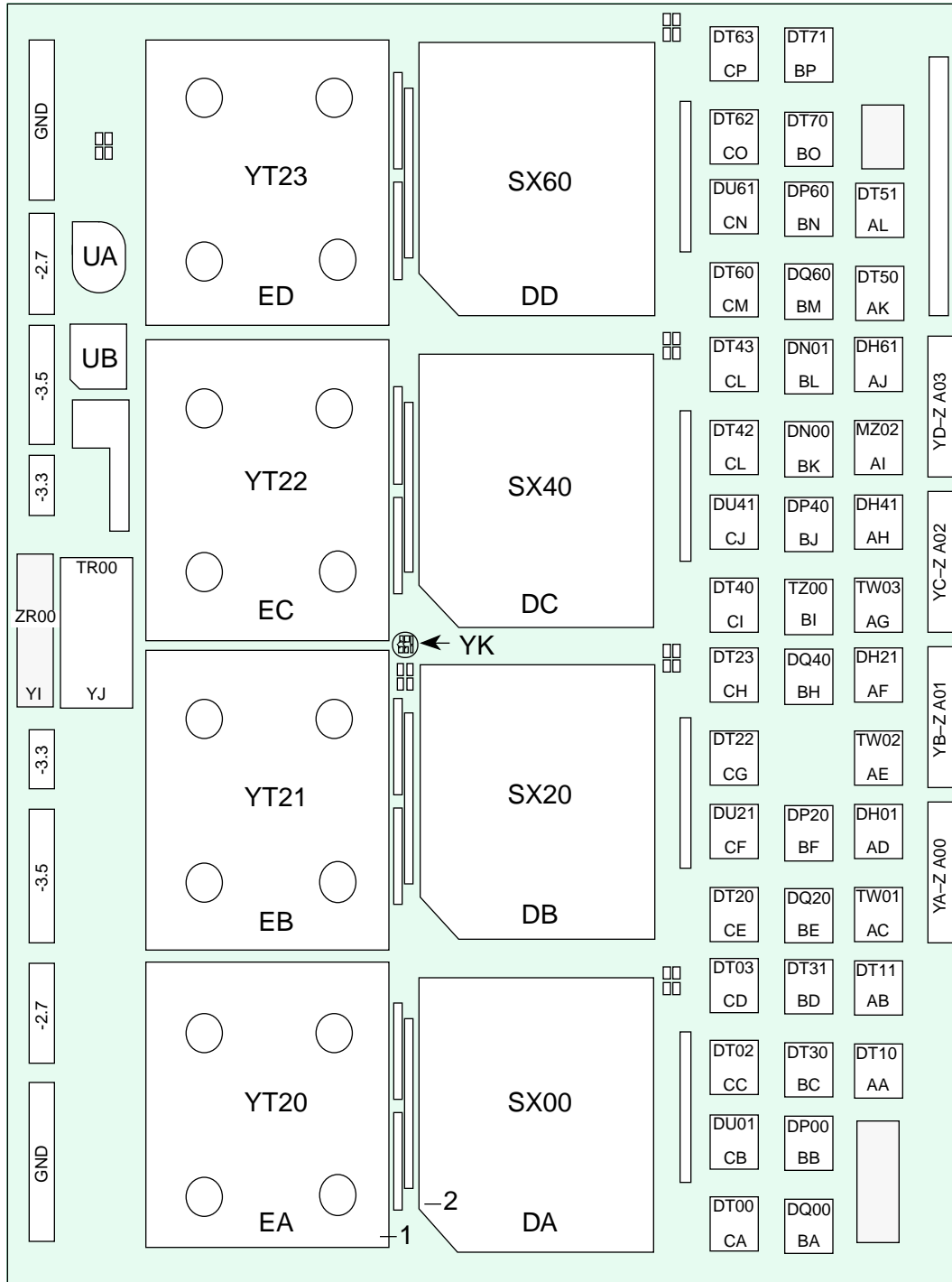


Figure 8 illustrates Board 1 of the IO module assembly. Board 2 contains the same number of GigaRing (SX) components and I/O (YT) connectors as Board 1.

Figure 8. IO02 Module Board 1 as Viewed from Layer 1



The location of each YU cable connection at the bulkhead depends on the location of the corresponding YT cable connection on the IO module. Table 2 provides the bulkhead connector layout for the I/O harness assemblies.

Table 2. Bulkhead Connector Layout, I/O Harness Assemblies

Upright Module			
514-pin Connector		80-pin Connector	
Location	Logical Name	Logical Name	Bulkhead Location
EA (Board 1)	yt020	yu000	Node 0 – negative ring out
		yu001	Node 0 – positive ring in
		yu002	Node 0 – positive ring out
		yu003	Node 0 – negative ring in
		yu004	Not used
		yu005	Not used
EB (Board 1)	yt021	yu000	Node 2 – negative ring out
		yu001	Node 2 – positive ring in
		yu002	Node 2 – positive ring out
		yu003	Node 2 – negative ring in
		yu004	Node 4 – negative ring out
		yu005	Node 4 – positive ring in
ED (Board 1)	yt023	yu000	Node 4 – positive ring out
		yu001	Node 4 – negative ring in
		yu002	Node 6 – negative ring out
		yu003	Node 6 – positive ring in
		yu004	Node 6 – positive ring out
		yu005	Node 6 – negative ring in
EA (Board 2)	yt024	yu000	Node 1 – positive ring out
		yu001	Node 1 – negative ring in
		yu002	Node 1 – negative ring out
		yu003	Node 1 – positive ring in
		yu004	Not used
		yu005	Not used
EB (Board 2)	yt025	yu000	Node 3 – negative ring out
		yu001	Node 3 – positive ring in
		yu002	Node 3 – positive ring out
		yu003	Node 3 – negative ring in
		yu004	Node 5 – negative ring out
		yu005	Node 5 – positive ring in

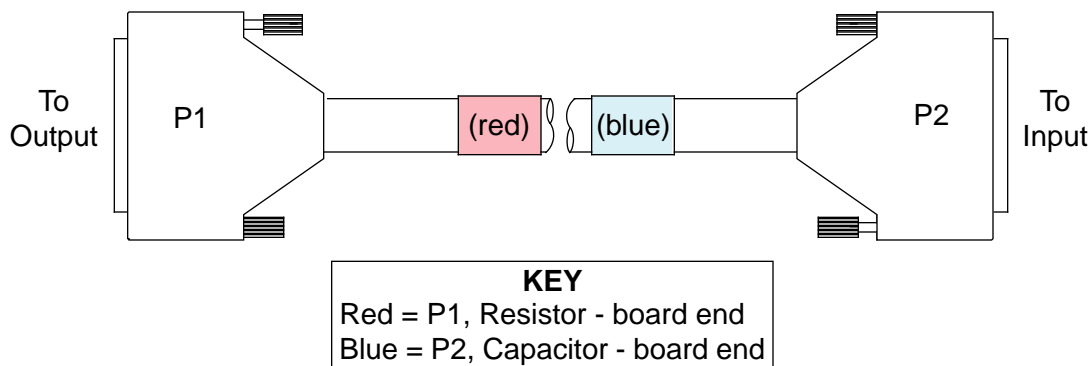
Upright Module			
514-pin Connector		80-pin Connector	
Location	Logical Name	Logical Name	Bulkhead Location
ED (Board 2)	yt027	yu000	Node 5 – negative ring out
		yu001	Node 5 – positive ring in
		yu002	Node 7 – positive ring out
		yu003	Node 7 – negative ring in
		yu004	Node 7 – negative ring out
		yu005	Node 7 – positive ring in
Inverted Module			
514-pin Connector		80-pin Connector	
Location	Logical Name	Logical Name	Bulkhead Location
EA (Board 1)	yt020	yu000	Node 6 – negative ring out
		yu001	Node 6 – positive ring in
		yu002	Node 6 – positive ring out
		yu003	Node 6 – negative ring in
		yu004	Not used
		yu005	Not used
EB (Board 1)	yt021	yu000	Node 4 – negative ring out
		yu001	Node 4 – positive ring in
		yu002	Node 4 – positive ring out
		yu003	Node 4 – negative ring in
		yu004	Node 2 – negative ring out
		yu005	Node 2 – positive ring in
ED (Board 1)	yt023	yu000	Node 2 – positive ring out
		yu001	Node 2 – negative ring in
		yu002	Node 0 – negative ring out
		yu003	Node 0 – positive ring in
		yu004	Node 0 – positive ring out
		yu005	Node 0 – negative ring in
EA (Board 2)	yt024	yu000	Node 7 – positive ring out
		yu001	Node 7 – negative ring in
		yu002	Node 7 – negative ring out
		yu003	Node 7 – positive ring in
		yu004	Not used
		yu005	Not used

Upright Module			
514-pin Connector		80-pin Connector	
Location	Logical Name	Logical Name	Bulkhead Location
EB (Board 2)	yt025	yu000	Node 5 – negative ring out
		yu001	Node 5 – positive ring in
		yu002	Node 5 – positive ring out
		yu003	Node 5 – negative ring in
		yu004	Node 3 – negative ring out
		yu005	Node 3 – positive ring in
ED (Board 2)	yt027	yu000	Node 3 – negative ring out
		yu001	Node 3 – positive ring in
		yu002	Node 1 – positive ring out
		yu003	Node 1 – negative ring in
		yu004	Node 1 – negative ring out
		yu005	Node 1 – positive ring in

GigaRing I/O Cable Assembly

The GigaRing I/O cable assemblies attach to the (YU) I/O harness connectors at the mainframe I/O bulkhead and to the GigaRing connectors in the MPN and other nodes on the ring. Each GigaRing I/O cable assembly is wired straight-through from P1 to P2, but it contains female jackscrews on the P1 connector and male jackscrews on the P2 connector. The P1 connector with female jackscrews always attaches to the output device (+ or - Out), and the P2 connector with male jackscrews always attaches to the input device (+ or - In). Figure 9 illustrates the GigaRing I/O cable assembly.

Figure 9. GigaRing I/O Cable Assembly



For further information about the input/output cable pin assignments and the GigaRing cable connectors, refer to the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

IO Module Connections

Each IO module contains eight (four on each side) GigaRing node chips that mount on *interposers*, which are sockets that connect integrated circuits to a printed circuit board. Next to the eight node chips on the IO module, there are eight 514-position YT connectors that connect the six I/O harness assemblies and the two MC harness assemblies to the IO module. Each position of the YT connector on the module attaches to a corresponding pin of the 514-pin YT harness connector. The squared-off corner of each 514-pin YT harness connector always designates the location of Pin 1. Figure 10 illustrates the IO module connector (YT) footprint. Figure 11 illustrates the 514-pin YT connector on a typical I/O harness assembly.

Figure 10. 514-position IO Module Connector (YT) Footprint

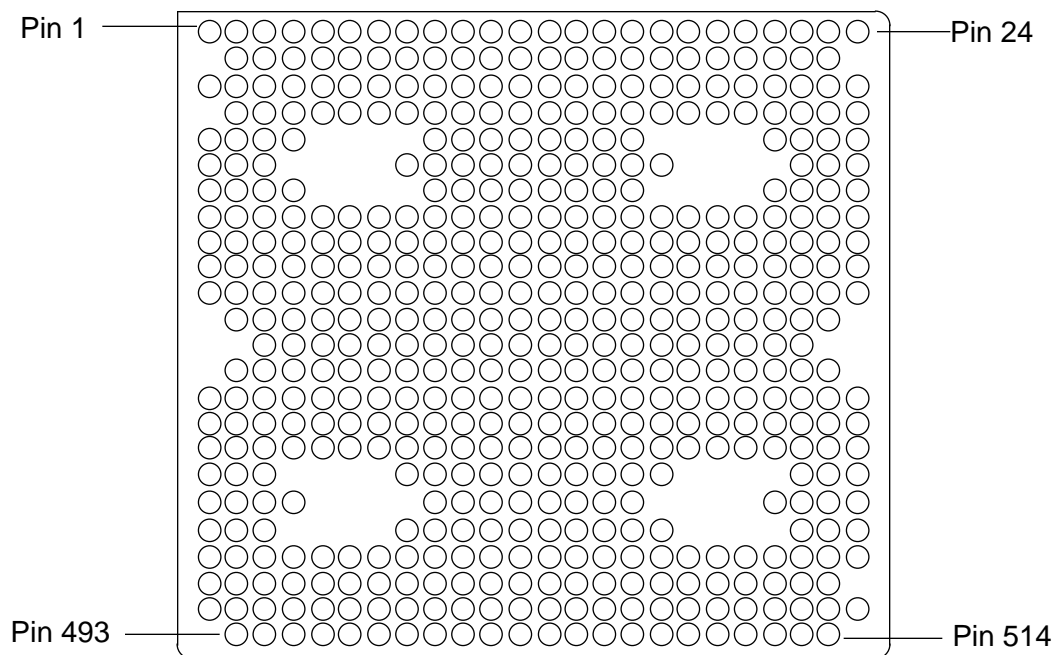
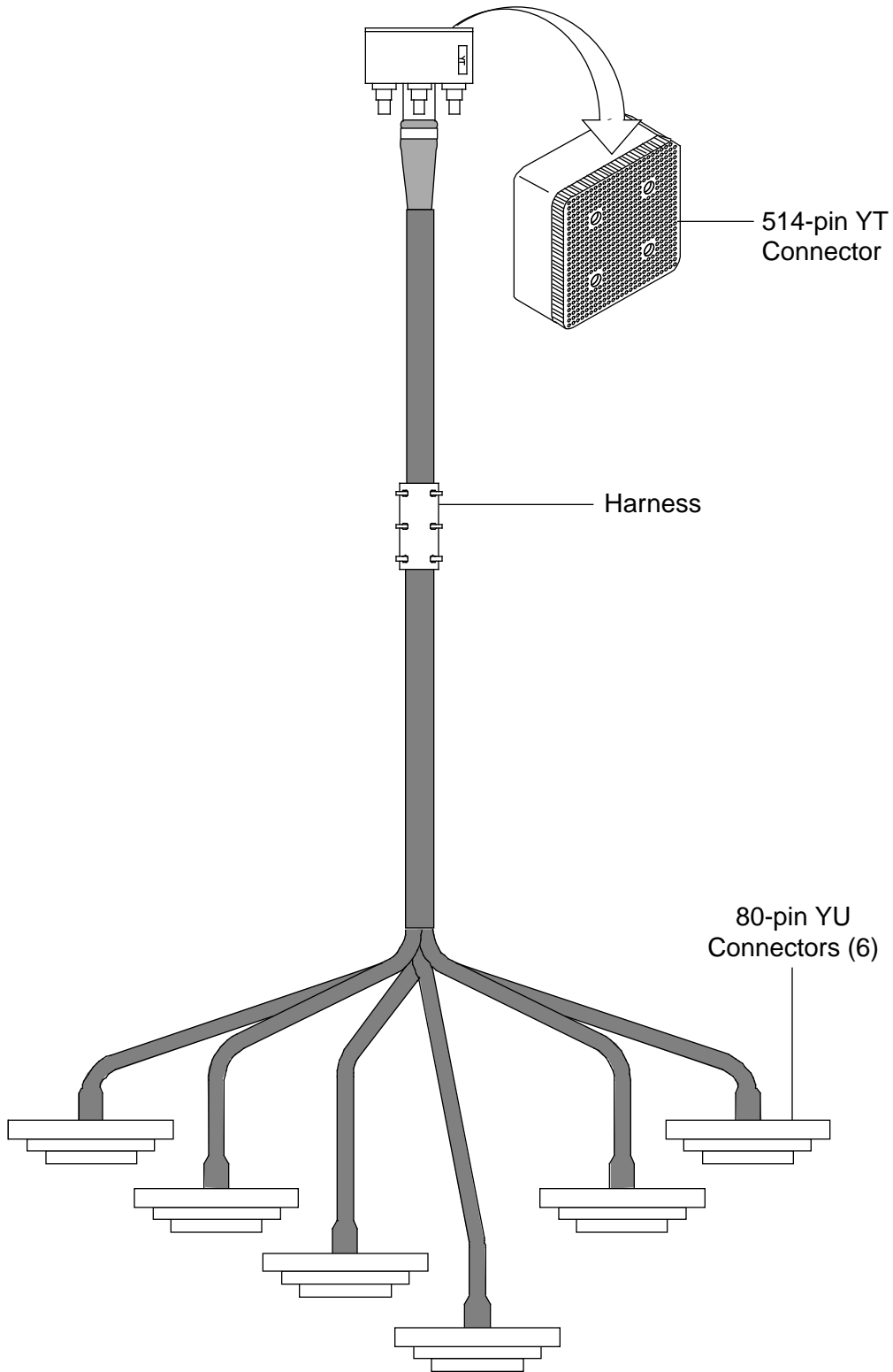


Figure 11. 514-pin YT Connector, IO Harness Assembly



Maintenance Channel (MC) Connections

Six of the eight YT connectors on each IO module attach to the YT connectors of the I/O harness assemblies (refer to the subsection *I/O Harness Assemblies* on page 14). Two of the eight YT connectors (at location EC on Board 1 and location EC on Board 2) on each IO module attach to the YT connectors of maintenance channel (MC) harnesses. Two types of MC harnesses (MC01 and MC02) contain (YL) maintenance connectors that attach to the (YL) maintenance connectors on the mainframe modules. The maintenance connectors are the boundary scan connections to the mainframe modules.

In addition to the YL connectors that attach to the maintenance connectors on the IO module, the MC01 and MC02 harnesses also contain several connections labeled volt sense, supervisory, continuity, and MC03. The tables and illustrations on the following pages describe the MC harnesses in detail. Figure 12 illustrates the typical MC01 harness assembly that all CRAY T90 series mainframes use. Table 3 provides information about the MC01 harness assembly connections. Figure 13 illustrates the MC02 harness assembly that CRAY T916 and CRAY T932 systems use. Table 4 provides information about the MC02 harness assembly connections.

Table 3. MC01 Harness Assembly Connections

Connector	Destination – CRAY T94 System	Destination – Quads 01 and 02	Destination – Quads 03 and 00	Function
YL000	B001	H001	P001	Mem H/P001 boundary scan
YL001	B002	H002	P002	Mem H/P002 boundary scan
YL002	B003	H003	P003	Mem H/P003 boundary scan
YL003	B004	H004	P004	Mem H/P004 boundary scan
YL004	C001	H005	P005	Mem H/P005 boundary scan
YL005	C002	H006	P006	Mem H/P006 boundary scan
YL006	C003	H007	P007	Mem H/P007 boundary scan
YL007	C004	H008	P008	Mem H/P008 boundary scan
YL008	C005	F001	N001	CPU F/N001 boundary scan
YL009	A001	F002	N002	A1 or F/N002 boundary scan
YL010	Spare	F003	N003	CPU F/N003 boundary scan
YL011	None	F004	N004	CPU F/N004 boundary scan
YL012	None	F005	N005	CPU F/N005 boundary scan
YL013	None	F006	N006	CPU F/N006 boundary scan
YL014	None	F007	N007	CPU F/N007 boundary scan
YL015	None	F008	N008	CPU F/N008 boundary scan
YL016	None	G001	O001	Net G/O001 boundary scan
YL017	None	G002	O002	Net G/O002 boundary scan
YL018	None	G003	O003	Net G/O003 boundary scan
YL019	None	G004	O004	Net G/O004 boundary scan
YM000	B001 – B004	H001 - H004	P001 - P004	Voltage sense
YM001	C001 – C004	H005 - H008	P005 - P008	Voltage sense
YM002	C005	F001 - F004	N001 - N004	Voltage sense
YM003	None	F005 - F008	N005 - N008	Voltage sense
YM004	None	G001 - G004	O001 - O004	Voltage sense
YN000	Interconnect Board	MUX Board, Side A	MUX Board, Side B	“Continuity,” to MUX or Interconnect Board
YD000	Bulkhead Panel, Supervisory	Bulkhead Side A, Supervisory	Bulkhead Side B, Supervisory	Supervisory connection between IO module and I/O bulkhead
YT002	IO Location A EC Board 1	IO Location E EC Board 1	IO Location M EC Board 1	MC01 YT002 to IO module connector YT22, Board 1

For detailed wiring information for the MC01 harness assembly, refer to the table “MC01 Harness Assembly Wire List” in the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

Figure 12. MC01 Harness Assembly

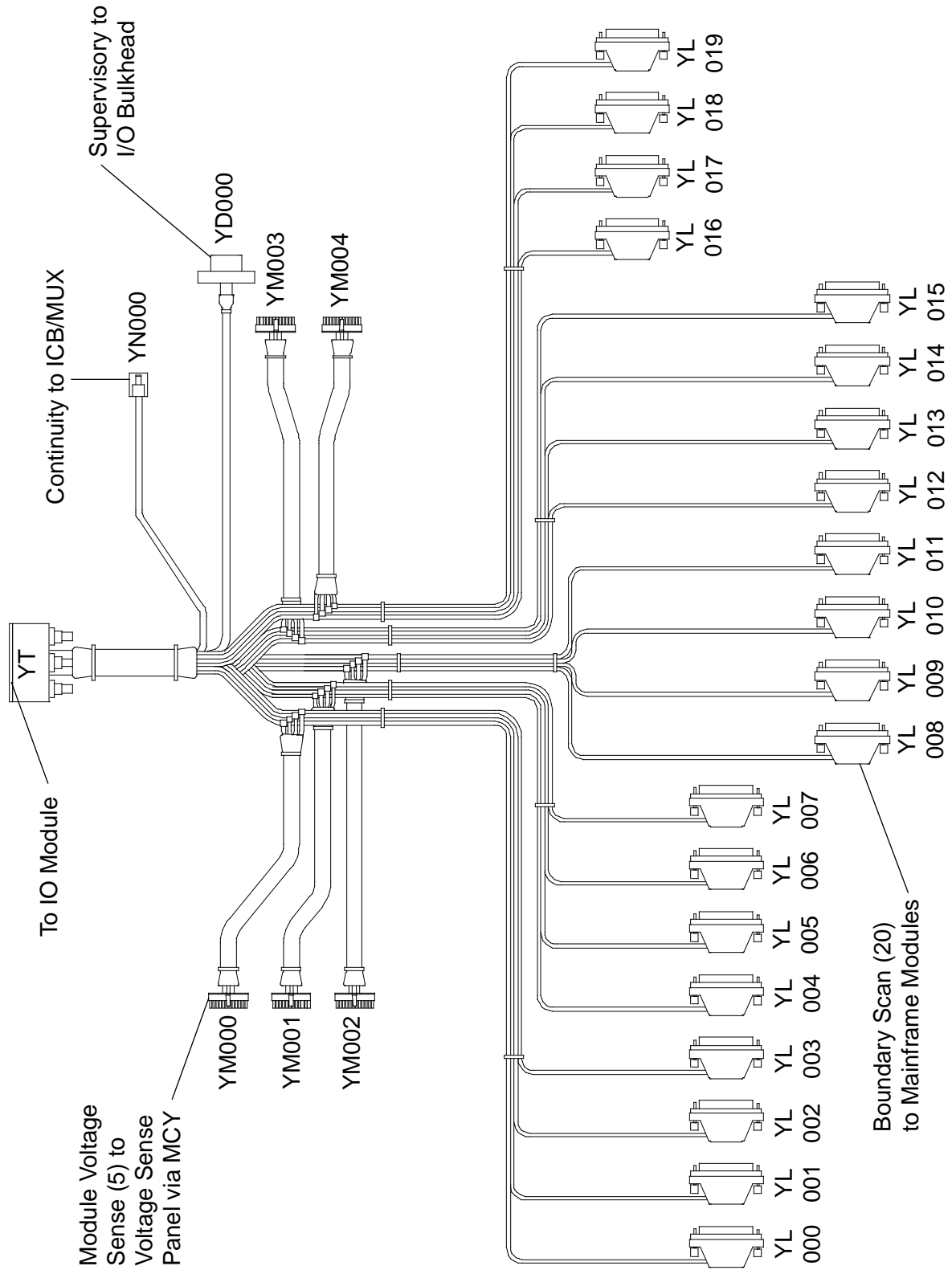
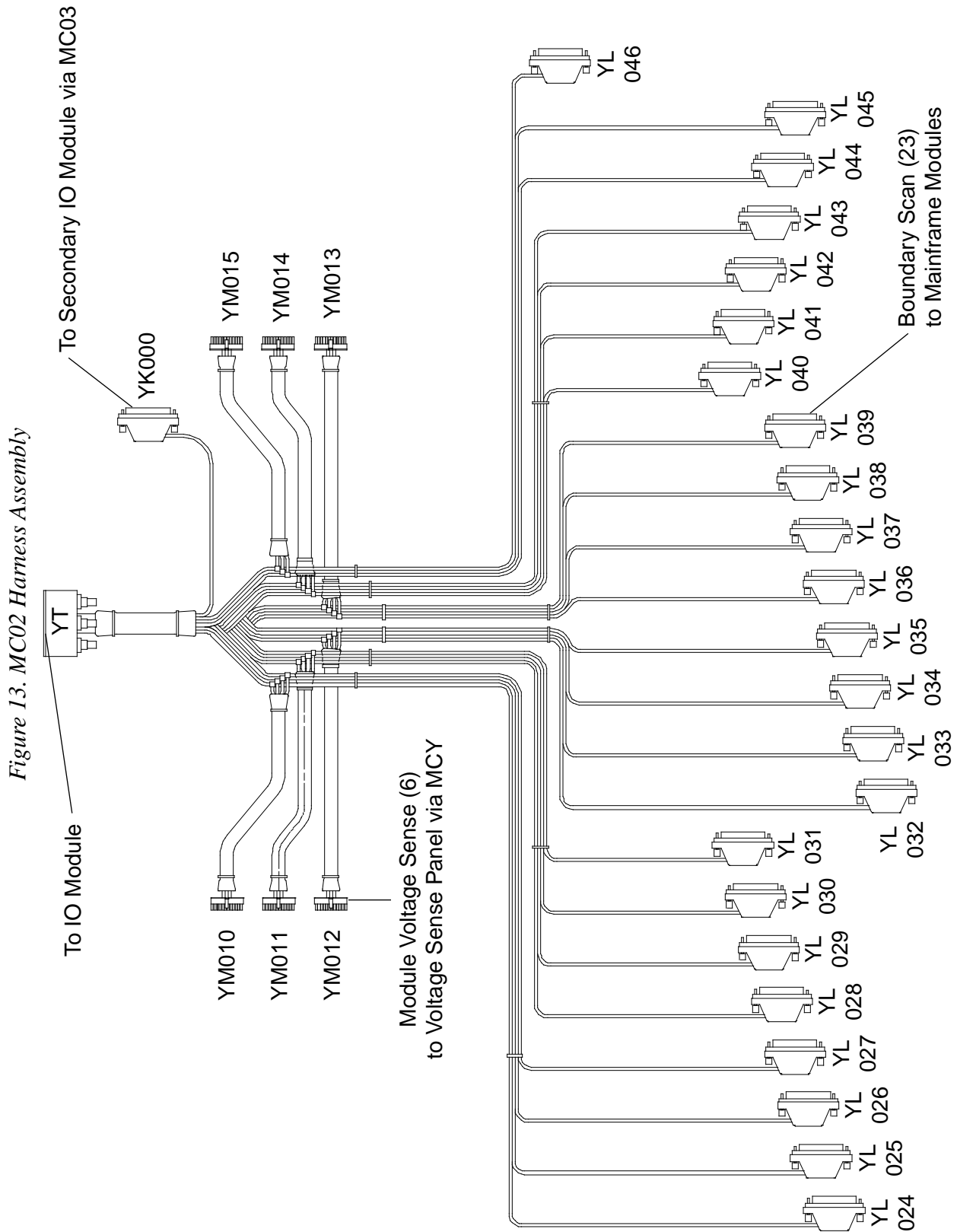


Table 4. MC02 Harness Assembly Connections

Connector	Destination – Quads 01 and 02	Destination – Quads 03 and 00	Function
YL024	J001	B001	CPU J/B001 boundary scan
YL025	J002	B002	CPU J/B002 boundary scan
YL026	J003	B003	CPU J/B003 boundary scan
YL027	J004	B004	CPU J/B004 boundary scan
YL028	J005	B005	CPU J/B005 boundary scan
YL029	J006	B006	CPU J/B006 boundary scan
YL030	J007	B007	CPU J/B007 boundary scan
YL031	J008	B008	CPU J/B008 boundary scan
YL032	L001	D001	Mem L/D001 boundary scan
YL033	L002	D002	Mem L/D002 boundary scan
YL034	L003	D003	Mem L/D003 boundary scan
YL035	L004	D004	Mem L/D004 boundary scan
YL036	L005	D005	Mem L/D005 boundary scan
YL037	L006	D006	Mem L/D006 boundary scan
YL038	L007	D007	Mem L/D007 boundary scan
YL039	L008	D008	Mem L/D008 boundary scan
YL040	K001	C001	Net K/C001 boundary scan
YL041	K002	C002	Net K/C002 boundary scan
YL042	K003	C003	Net K/C003 boundary scan
YL043	K004	C004	Net K/C 004 boundary scan
YL044	G005	C005	Net K/C005 boundary scan
YL045	I	A	Secondary IO module maintenance (location I/A)
YL046	E	M	Self-maintenance
YM010	J001 - J004	B001 - B004	Voltage sense
YM011	J005 - J008	B005 - B008	Voltage sense
YM012	L001 - L004	D001 - D004	Voltage sense
YM013	L005 - L008	D005 - D008	Voltage sense
YM014	K001 - K004	C001 - C004	Voltage sense
YM015	G005/I/E	C005/A/M	Voltage sense
YK000	MC03	MC03	MC03 data interconnect to secondary IO module
YT006	IO Location E EC Board 2	IO Location M EC Board 2	MC02 YT006 to IO module connector YT26, Board 2

For detailed MC02 wiring information, refer to the “MC02 Harness Assembly Wire List” in the *Cable Wire Lists* document, publication number HMM-368-B.

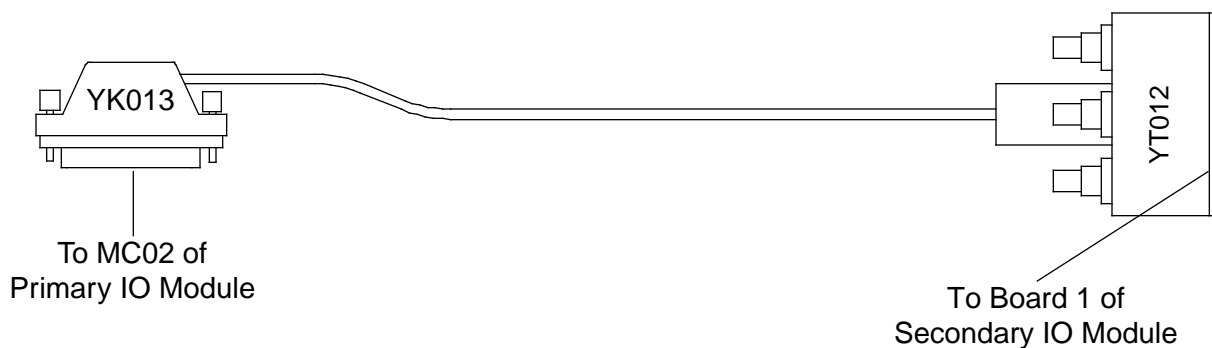


Each IO module contains logic that is capable of performing boundary scan on all mainframe modules in one side of the CRAY T916 or CRAY T932 mainframe. Only one IO module per mainframe side, however, attaches directly to the MC01 and MC02 harnesses and actually performs the boundary scan function in that particular mainframe side.

The locations of IO modules that attach directly to MC harnesses represent primary locations, and the locations of IO modules without direct MC harness connections represent secondary locations. An IO module in a secondary location communicates with the same-side IO module in the primary location through an MC03 harness assembly.

The MC03 harness assembly contains a 514-pin (YT) connector on one end and a 60-pin (YK) connector on the other end. The YT connector attaches to the module in the secondary location, and the YK connector attaches to the MC02 harness assembly in the primary location. In this way, the MC03 harness assembly interconnects the IO module in the secondary location with the IO module in the primary location. Figure 14 illustrates the MC03 harness assembly.

Figure 14. MC03 Harness Assembly

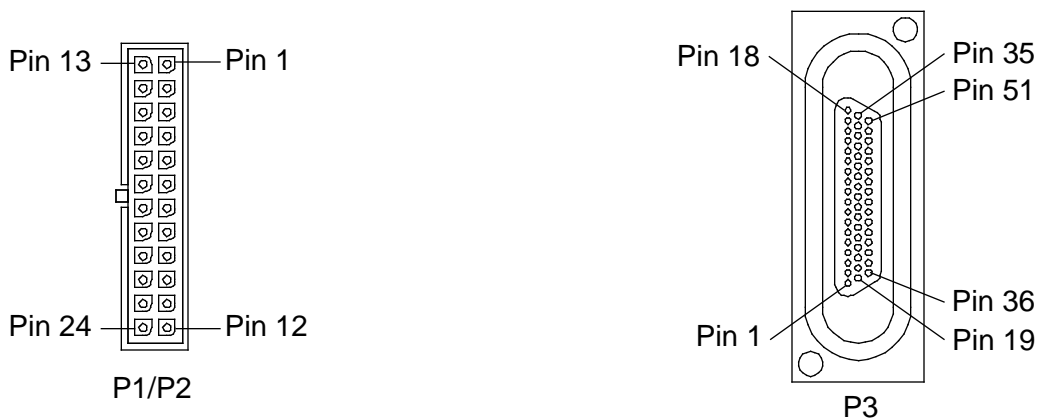
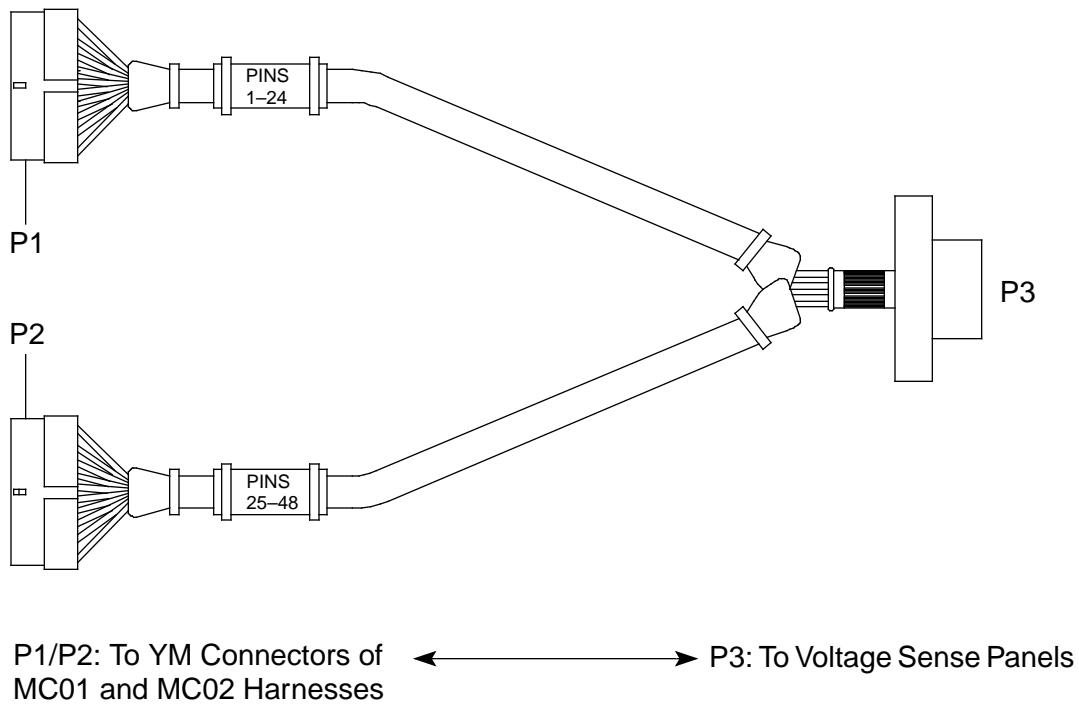


For detailed wiring information about the MC03 harness assembly, refer to the table "MC03 Harness Assembly Wire List" in the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

Voltage Sense (MCY) Harness Assembly

The YM voltage sense connectors in the MC01 and MC02 harness assemblies attach to corresponding 24-pin (P1 or P2) connectors in the MCY harness assemblies. The internal wires of each MCY harness assembly connect the P1 and P2 connectors at one end to one 51-pin (P3) connector at the other end. The P3 connectors attach to mainframe voltage sense panels to provide a remote test location for the voltage of each mainframe module. Figure 15 illustrates the MCY harness assembly.

Figure 15. MCY Harness Assembly



Voltage Sense Panels

The P3 connectors of the MCY harness assemblies attach to the inside of the I/O bulkhead panel in the CRAY T94 mainframe and to the inside of the voltage sense panels in the CRAY T916 and CRAY T932 mainframes. Figure 16 illustrates the voltage sense locations in the CRAY T94 I/O bulkhead. Figure 17 illustrates the voltage sense panels in the CRAY T916 and CRAY T932 mainframes.

Figure 16. Voltage Sense Locations, CRAY T94 I/O Bulkhead Panel

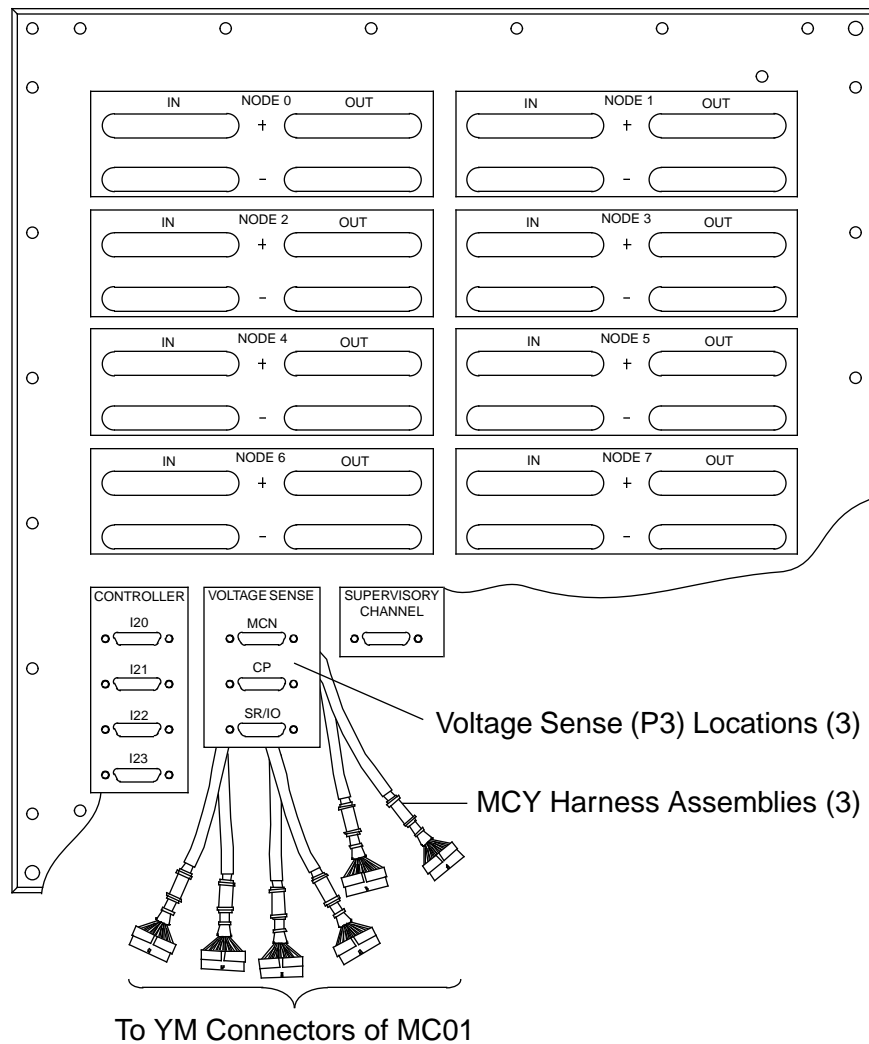
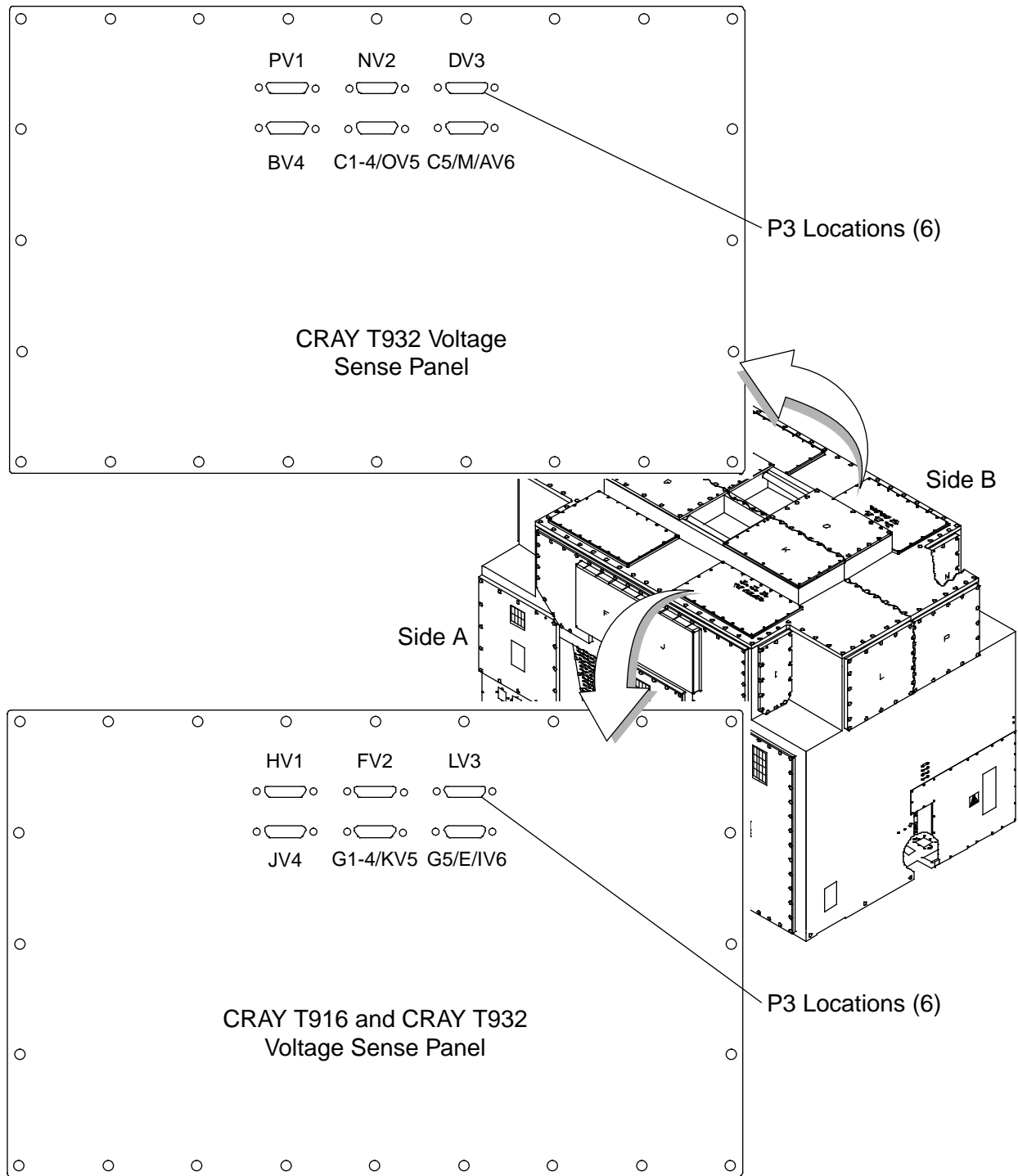


Figure 17. Voltage Sense Panels, CRAY T916 and CRAY T932 Mainframes



For detailed information about the MCY harness assembly and the voltage sense panel wiring, refer to the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

Supervisory Channel Cabling

The supervisory channel supports the maintenance, support, error logger, and boundary scan functions and connects the SWS with the mainframe IO module. The supervisory channel connection in the primary I/O bulkhead provides the interconnection between the MC01 harness (Cray Research part number 35727800) that attaches to the mainframe IO module and the supervisory cable (Cray Research part number 12159600) that attaches to the multipurpose node (MPN) in the PC-10 cabinet. Figure 18 provides a block diagram of the CRAY T90 series supervisory channel cabling.

Figure 18. CRAY T90 Series Supervisory Channel Cabling, Block Diagram

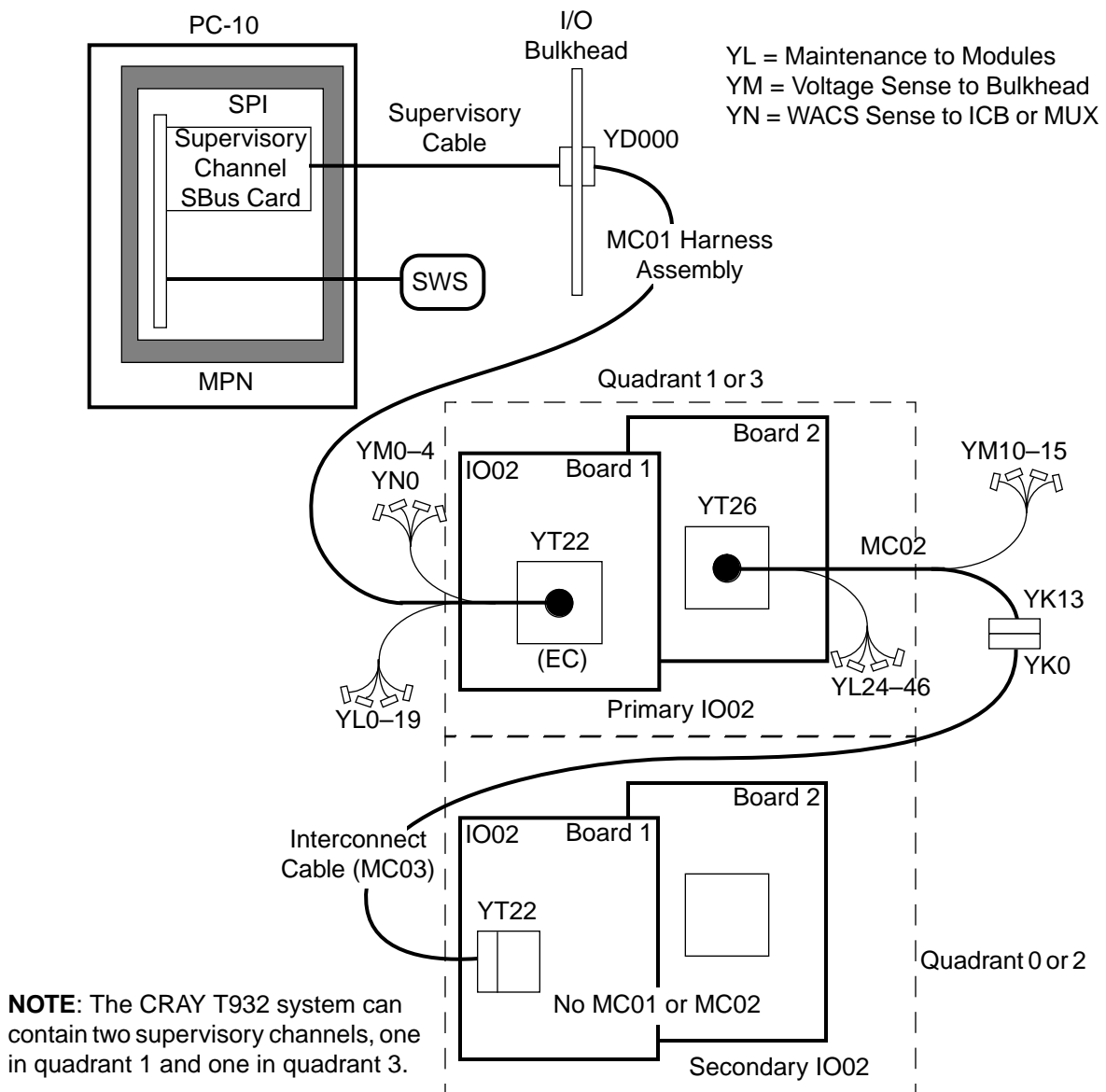
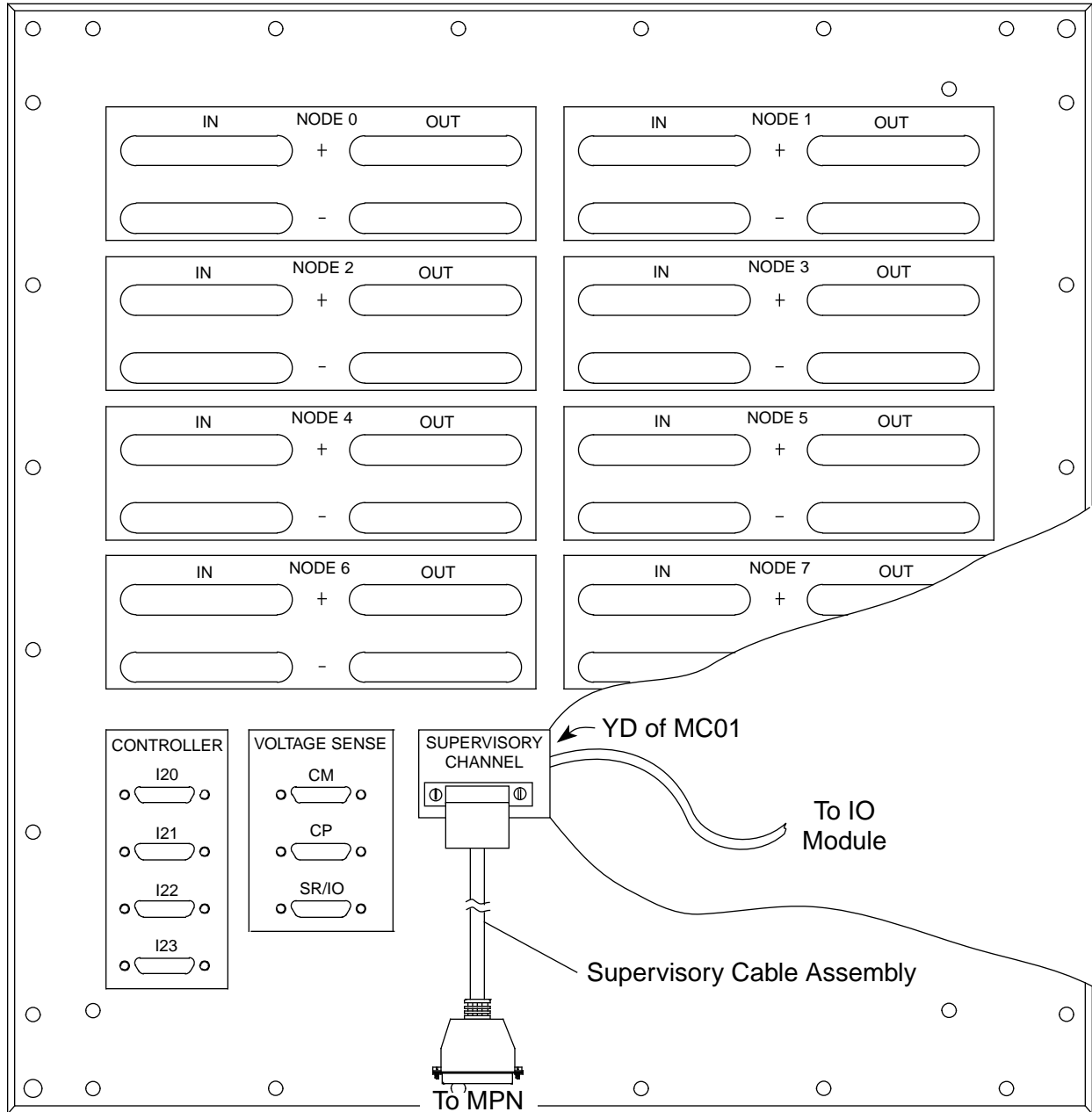


Figure 19 illustrates the supervisory channel connection in the CRAY T94 I/O bulkhead.

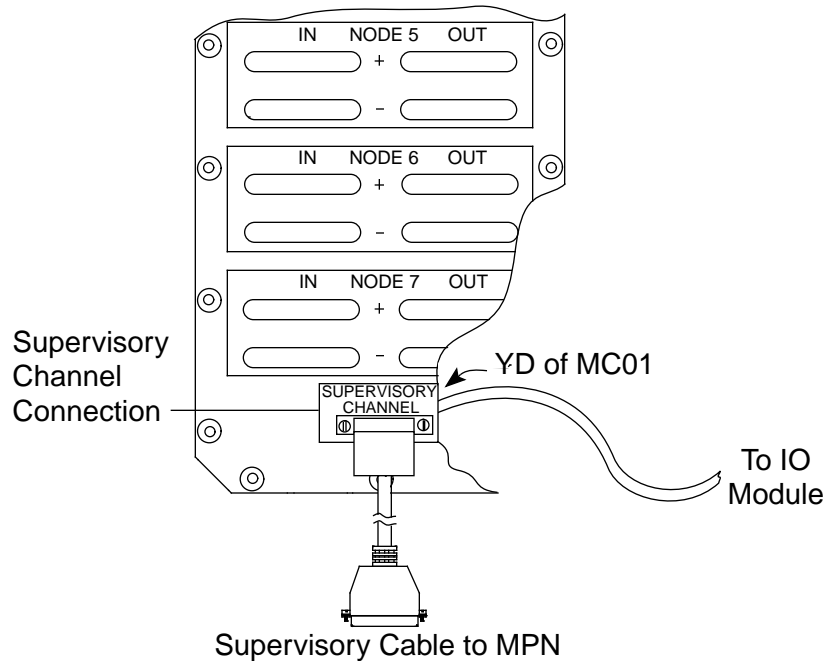
Figure 19. Supervisory Channel Connection, CRAY T94 I/O Bulkhead



For detailed information about the supervisory cable wiring, refer to the table "Supervisory Cable Assembly Wire List" in the *Cable Wire Lists* document, Cray Research publication number HMM-368-B.

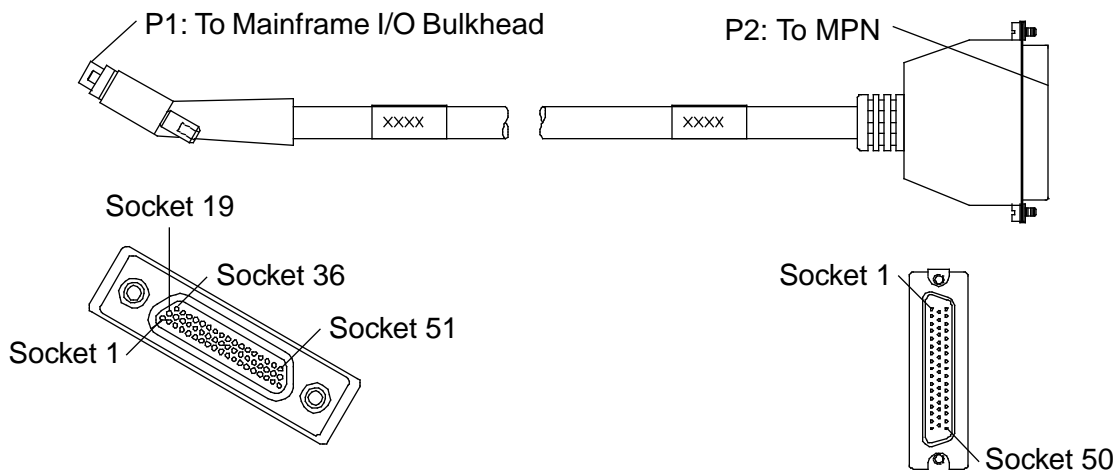
Figure 20 illustrates the supervisory channel connection in the CRAY T916 and CRAY T932 I/O bulkheads.

Figure 20. Supervisory Channel Connection, CRAY T916 and CRAY T932 I/O Bulkheads



The supervisory cable connects the primary I/O bulkhead in a CRAY T90 series mainframe to the MPN (SBus) connection in the PC-10 cabinet. The supervisory cable contains a 51-socket connector on the (P1) mainframe end and a 50-socket connector on the (P2) MPN end. Figure 21 illustrates the supervisory cable in a CRAY T90 series system. The following subsection describes the supervisory channel connections in the PC-10 cabinet and the system workstation (SWS).

Figure 21. Supervisory Cable Assembly, CRAY T90 Series Systems



PC-10 and SWS Cabling

Supervisory and GigaRing Connections in the PC-10 Cabinet

The supervisory cable assembly connects the 51-pin (MC01) supervisory channel connection in a CRAY T90 series I/O bulkhead to an SBus connection in the PC-10 cabinet. Similarly, the GigaRing I/O cable assemblies connect the 80-pin I/O harness connectors in a CRAY T90 series mainframe bulkhead to the multipurpose node (MPN) connections in the PC-10 cabinet. Figure 22 illustrates the MPN-1 subrack in a PC-10 cabinet (cabinet configurations may vary considerably).

All CRAY T90 series systems use SBus slot 5 in the MPN rear panel for the supervisory cable connection. Because a CRAY T932 system can contain two supervisory channels, it uses SBus slot 7 for the second supervisory cable connection. Figure 23 illustrates the supervisory SBus slots and GigaRing cable connections in the rear panel of the MPN-1 subrack.

Figure 22. MPN-1 Subrack, PC-10 Cabinet

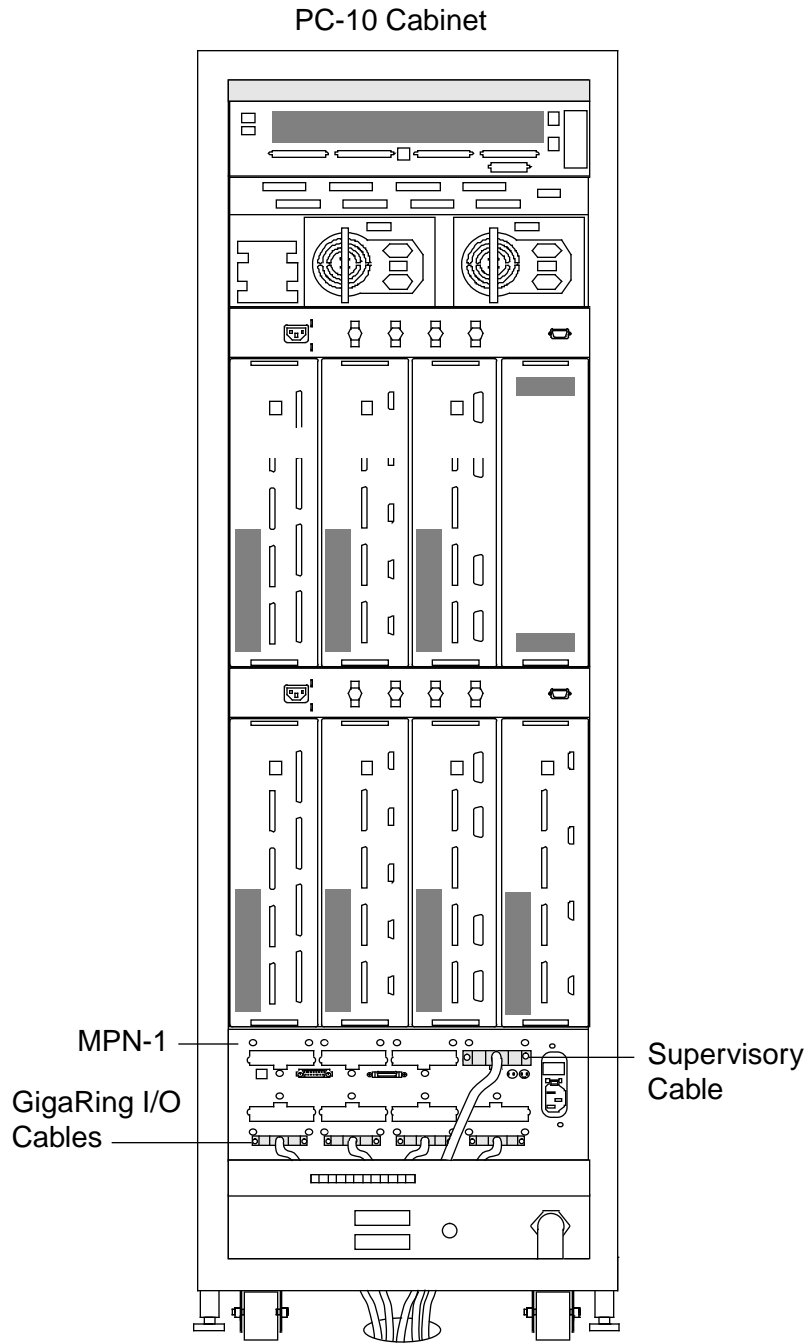
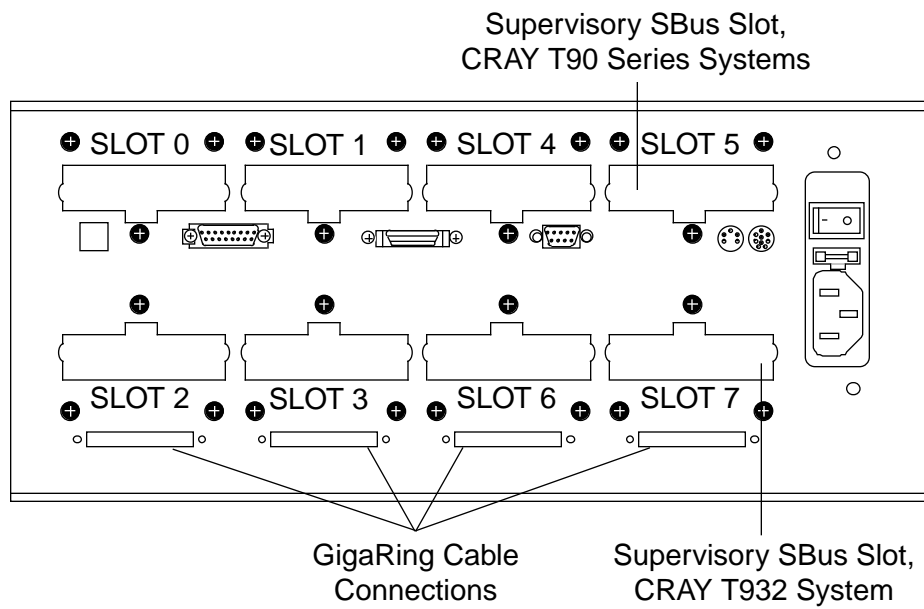
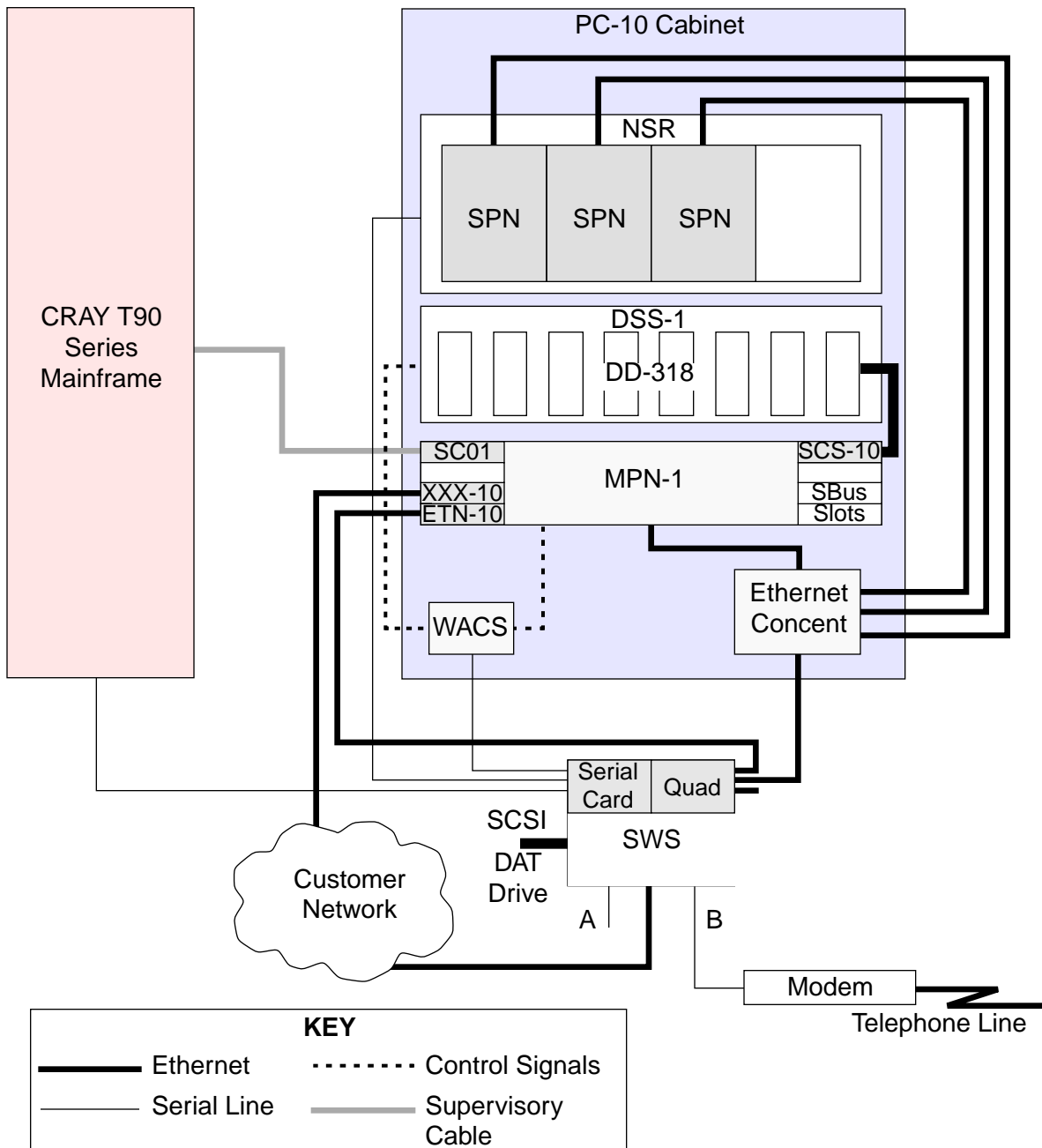


Figure 23. GigaRing Cable Connections and Supervisory SBus Slots, MPN-1 Rear Panel



The supervisory channel also connects to the Ethernet concentrator in the MPN and to the quad Ethernet connector in the SWS. The SWS provides user access to all system operations and management through the supervisory channel, including the maintenance, support, error logger, and boundary scan functions. Figure 24 provides a block diagram of the supervisory and Ethernet channels in CRAY T90 series systems.

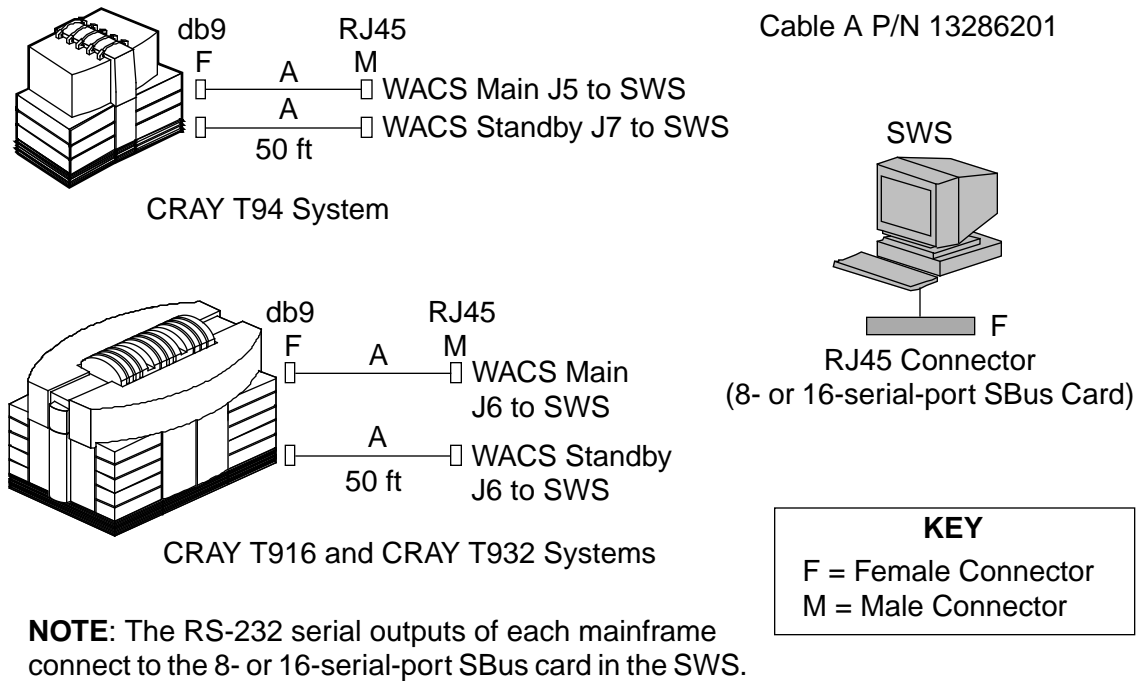
Figure 24. Supervisory and Ethernet Channels, CRAY T90 Series Systems



Serial Cables and WACS Configurations

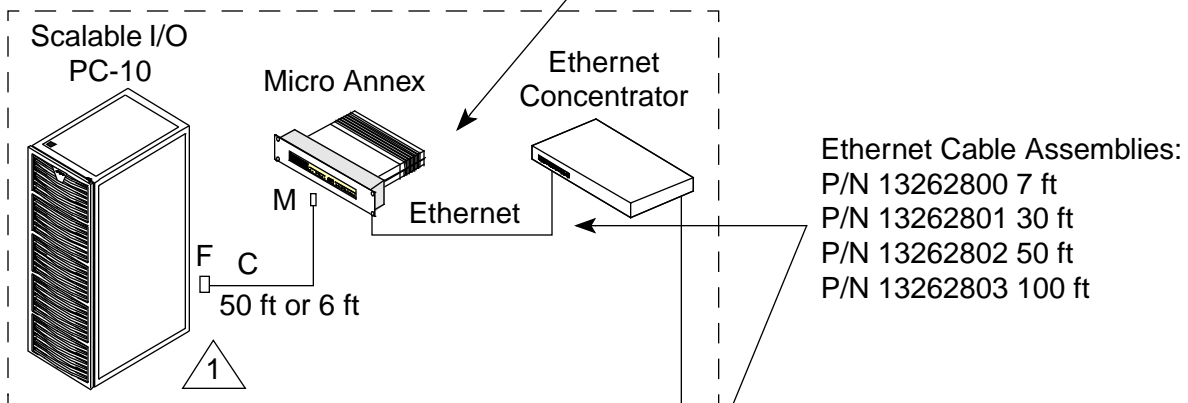
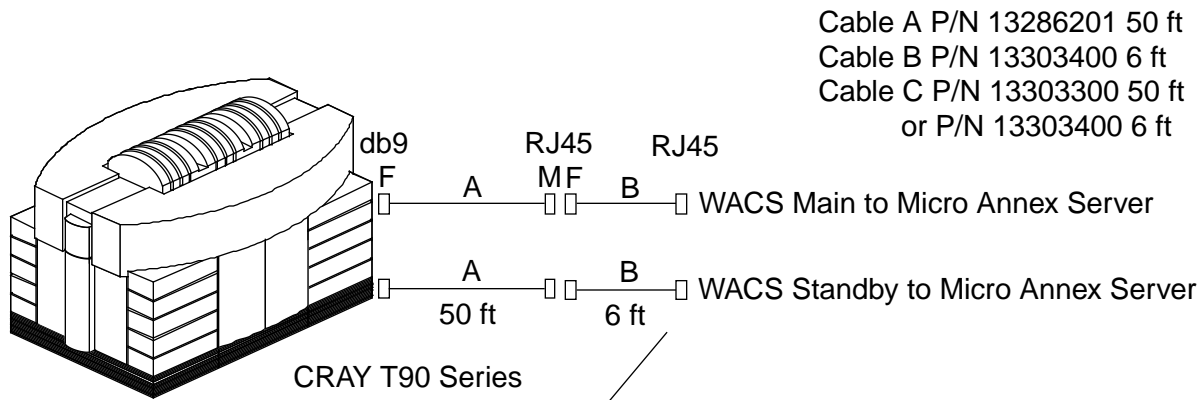
The CRAY T90 series mainframes contain serial cables that connect the control system bulkhead in the mainframe to the user interface or support system. One end of the mainframe serial cable always connects to the control system bulkhead (J5, J6, or J7), but the other end can connect to either the SWS or to the Micro Annex™ server, depending on the WACS configuration. Figure 25 illustrates the standard WACS configuration, and Figure 26 illustrates the extended-distance WACS configuration. The “Control System Cabling” section of this document, which begins on page 41, uses the extended-distance application only. For detailed information about SWS cabling and WACS configurations, refer to the *System Workstation* document, Cray Research publication number HTM-222-B.

Figure 25. Standard WACS Configuration



NOTE: The RS-232 serial outputs of each mainframe connect to the 8- or 16-serial-port SBus card in the SWS.

Figure 26. Extended-distance WACS Configurations



NOTES:

1. All WACS RS-232 serial outputs connect to the Micro Annex server.
2. The Ethernet output of the Micro Annex server connects to the Ethernet concentrator.
3. The Ethernet output of the concentrator connects to the Ethernet SBus card in the SWS.

- 1 Both the Micro Annex server and Ethernet concentrator are contained within the PC-10 cabinet.
- 2 The SWS can be located up to 328 ft (100 m) from the PC-10 cabinet.

KEY
F = Female Connector
M = Male Connector

Control System Cabling

Each CRAY T90 series computer system contains a control system that monitors and controls conditions in the mainframe power and cooling subsystems and in other system devices, such as the HEU. The control system contains a control system bulkhead, which contains the cable interconnections between the controllers (main and standby), the monitoring sensors, the support system, and other parts of the computer system. The following subsections describe the control system cable connections in CRAY T90 series computer systems.

CRAY T94 Control System Cable Connections

The control system bulkhead in a CRAY T94 mainframe contains nine cable connections: J1 through J8 and a local area network (LAN) connection. The control bulkhead connections attach to cables that connect the programmable logic controllers (PLCs) with other mainframe and system devices. This subsection describes the CRAY T94 control system cable connections in detail.

Control system connectors J1 through J3 connect to I/O bulkhead connectors 120 through 122. These three sets of cabled connections provide the interconnections between the dielectric coolant and voltage sensors inside the mainframe and the main and standby controllers. The LAN connector, located below connector J1, connects the control system to the HEU.

Control system connectors J4 through J7 provide the mainframe serial-port connections. Use J4 to download controller code to the main state logic processor, and use J6 to download controller code to the standby state logic processor. Connectors J5 and J7 attach to serial cables that route control system information through an Annex™ server to the SWS. Connector J8 is unused; it enables future enhancements to the cabling system. Figure 27 illustrates the control system cable connections in a CRAY T94 mainframe. Refer to Table 5 for a detailed summary of the CRAY T94 control system cable connections.

Figure 27. CRAY T94 Control System Cable Connections

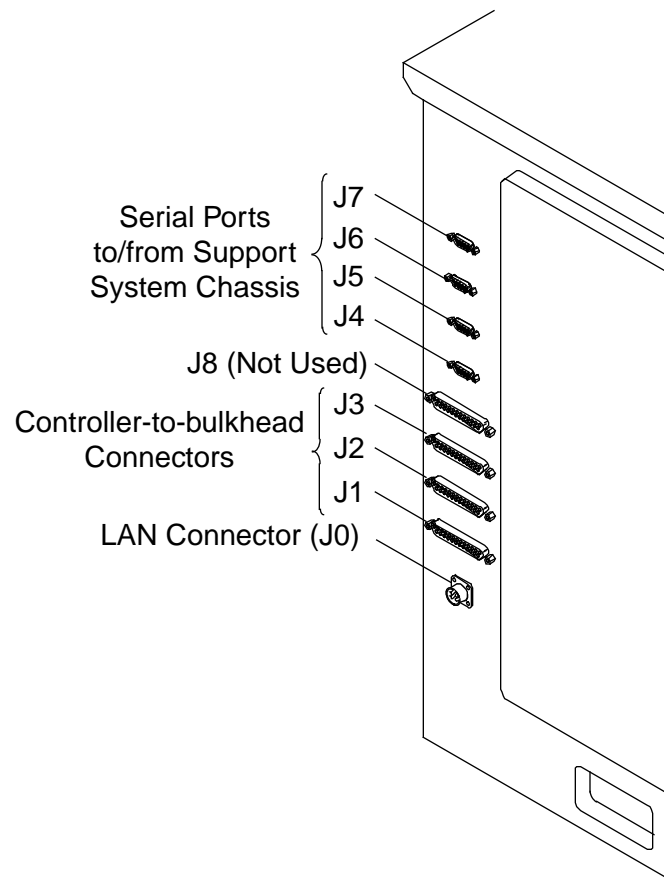


Table 5. CRAY T94 Control System Cable Connections

Connector	Connects with:	Description
J1	120	Control bulkhead connectors J1 through J3 connect to I/O bulkhead connectors 120 through 122. These cabled connections relay information about monitored conditions between the mainframe and the controllers.
J2	121	
J3	122	
J4	PC or Workstation	Use J4 to download code to the main controller.
J5	Annex Server or RS-232	J5 routes main controller output through the Annex server to the SWS.
J6	PC or Workstation	Use J6 to download code to the standby controller.
J7	Annex Server or RS-232	J7 routes standby controller output through the Annex server to the SWS
J8	N/A	Not used.
LAN	HEU	Network connection between the controller and the HEU.

CRAY T916 Control System Cable Connections

Each controller assembly (main and standby) in a CRAY T916 mainframe contains a control system bulkhead. Each of the two control system bulkheads (the main bulkhead in side A and the standby bulkhead in side B) contains nine cable connections (J1 through J9). The control system bulkhead connections attach to cables that connect the control system with other mainframe and system devices. This subsection describes the CRAY T916 control system cable connections in detail.

Figure 28 illustrates the location of the main control system bulkhead and the control system cable connections in side A of the mainframe. Side B contains the standby controller and the same number of control system bulkhead connections as side A. However, because side B does not contain mainframe tank sensors, it does not contain any corresponding penetrator receptacles.

Figure 28. CRAY T916 Control System Cable Connections, Side A

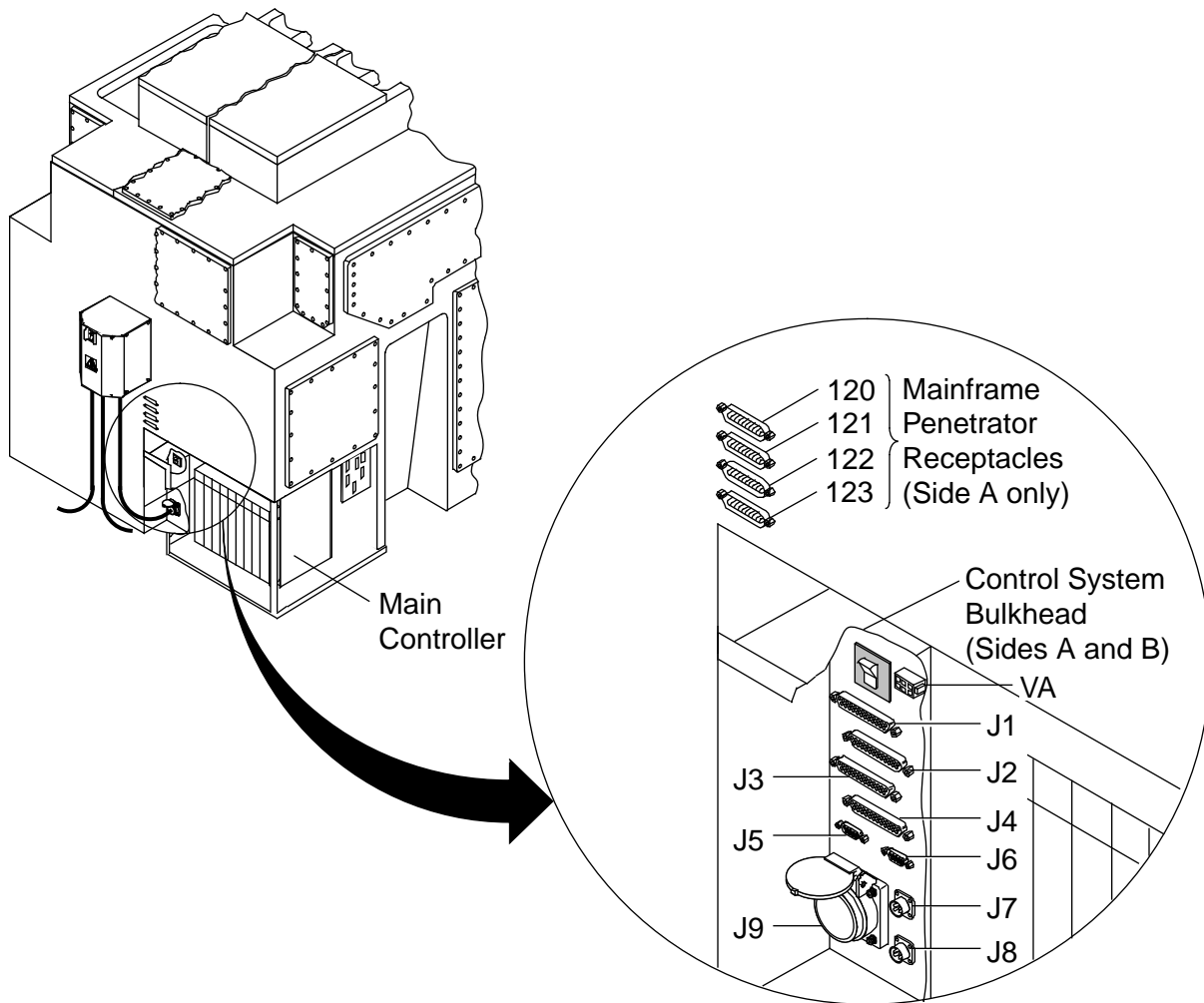
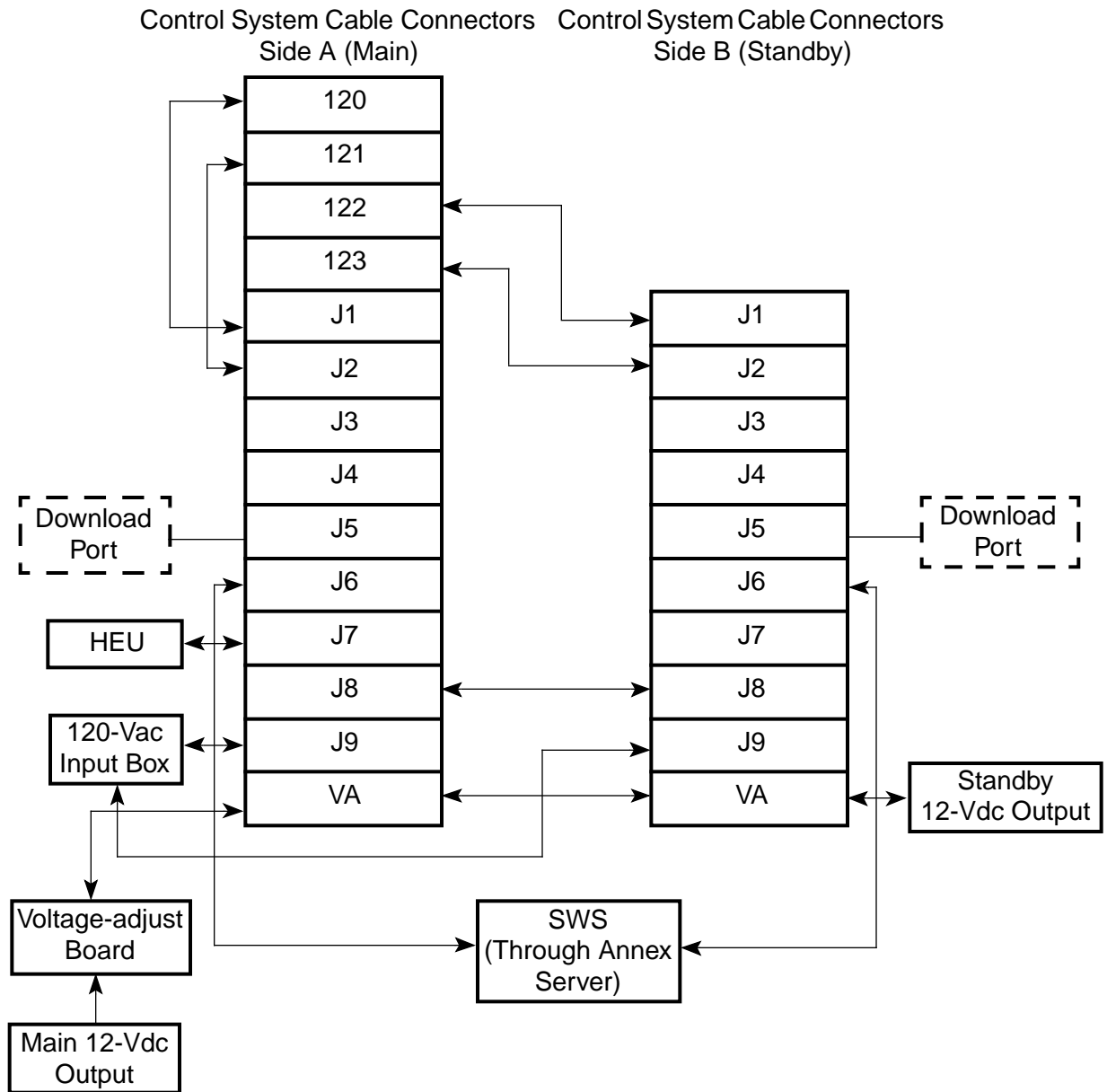


Table 6 contains detailed information about the CRAY T916 control system cable connections in both sides of the mainframe. Figure 29 on page 45 provides a block diagram of the control system cable connections.

Table 6. CRAY T916 Control System Cable Connections

Connector	Controller	Connects with:		Description
		Connector	Side	
J1	Main	120	A	J1 in the main PLC receives sensor information from penetrator receptacle 120 in side A.
J2	Main	121	A	J2 in the main PLC receives sensor information from penetrator receptacle 121 in side A.
J3	Main	N/A	N/A	Not used.
J4	Main	N/A	N/A	Not used.
J5	Main	PC or Workstation	N/A	Use J5 to download code to the main controller.
J6	Main	Annex Server	N/A	J6 routes the main controller output through the Annex server to the SWS.
J7	Main	HEU	N/A	J7 connects the Genius® I/O bus controller to the HEU on the LAN.
J8	Main (Side A)	J8	Standby (Side B)	A cable connects main J8 to standby J8.
J9	Main	Drop Cord	120-Vac Input Box	J9 receives 120-Vac power from the input box through a drop cord and provides 120-Vac power to the main controller.
J1	Standby	122	N/A	J1 in the standby PLC receives sensor information from receptacle 122 in side A.
J2	Standby	123	N/A	J2 in the standby PLC receives sensor information from receptacle 123 in side A.
J3	Standby	N/A	A	Not used.
J4	Standby	N/A	A	Not used.
J5	Standby	PC or Workstation	N/A	Use J5 to download code to the standby controller.
J6	Standby	Annex Server	N/A	J6 routes standby controller output through the Annex server to the SWS.
J7	Standby	N/A	N/A	Terminated.
J8	Standby (Side B)	J8	Main (Side A)	A cable connects main J8 to standby J8.
J9	Standby	Drop Cord	120-Vac Input Box	J9 receives 120-Vac power from the input box through a drop cord and provides 120-Vac power to the standby controller.
VA	Main	VA	Standby	A cable connects the main VA to the standby VA for a secondary power source for the VA board.

Figure 29. CRAY T916 Control System Block Diagram



CRAY T932 Control System Cable Connections

Each controller assembly (main and standby) in a CRAY T932 mainframe contains a control system bulkhead. Each of the two control system bulkheads (the main bulkhead in side A and the standby bulkhead in side B) contains nine cable connections (J1 through J9). The control system bulkhead connections attach to cables that connect the control system with other mainframe and system devices. This subsection describes the CRAY T932 control system cable connections in detail.

Figure 30 illustrates the location of the main control system bulkhead and the control system cable connections in side A of the CRAY T932 mainframe. Side B contains the standby controller and the same number of control system connections and penetrator receptacles as side A. Table 7 contains detailed information about the CRAY T932 control system cable connections.

Figure 30. CRAY T932 Control System Cable Connections, Side A

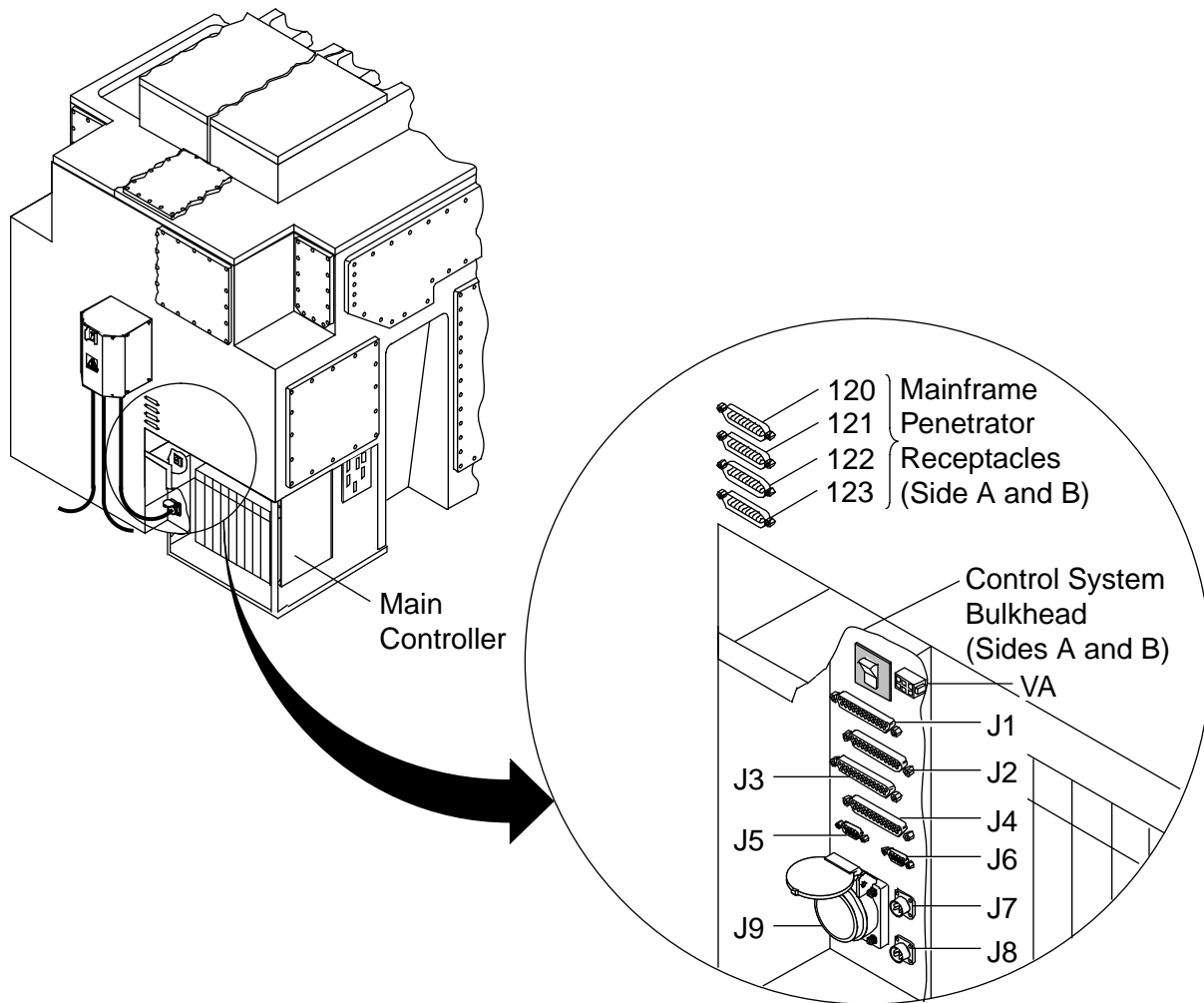
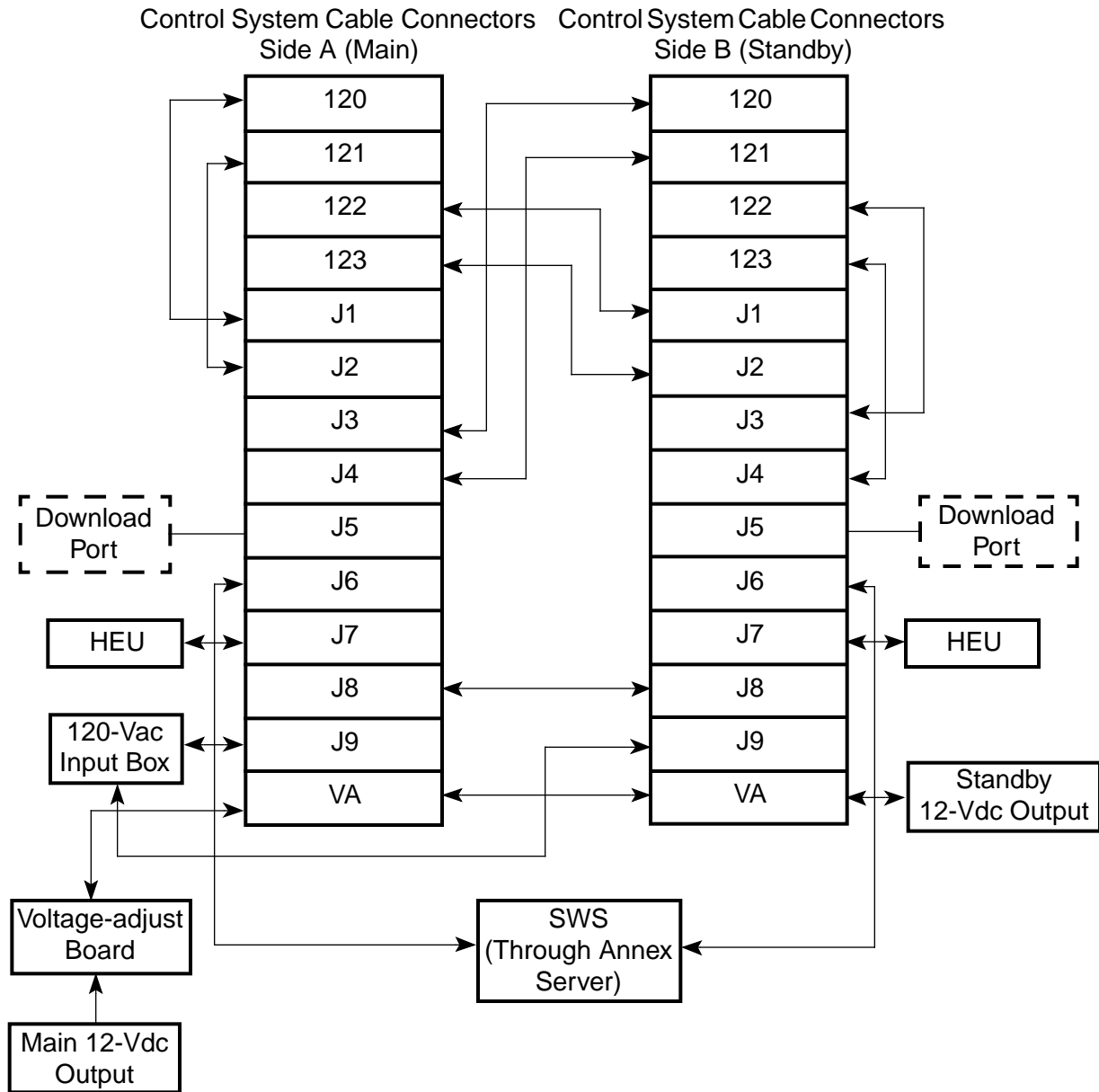


Table 7. CRAY T932 Control System Cable Connections

Connector	Side	Connects with:		Description
		Connector	Side	
J1	Main	120	A	J1 in the main PLC receives sensor information from penetrator receptacle 120 in side A.
J2	Main	121	A	J2 in the main PLC receives sensor information from penetrator receptacle 121 in side A.
J3	Main	120	B	J3 in the main PLC receives sensor information from penetrator receptacle 120 in side B.
J4	Main	121	B	J4 in the main PLC receives sensor information from penetrator receptacle 121 in side B.
J5	Main	PC or Workstation	N/A	Use J5 to download code to the main controller.
J6	Main	Annex Server	N/A	J6 routes the main controller output through the Annex server to the SWS.
J7	Main	HEU	N/A	J7 connects the Genius I/O bus controller to the HEU for side A.
J8	Main (Side A)	J8	Standby (Side B)	A cable connects main J8 to standby J8.
J9	Main	Drop Cord	120-Vac Input Box	J9 receives 120-Vac power from the input box through a drop cord and provides 120-Vac power to the main controller.
J1	Standby	122	A	J1 in the standby PLC receives sensor information from receptacle 122 in side A.
J2	Standby	123	A	J2 in the standby PLC receives sensor information from receptacle 123 in side A.
J3	Standby	122	B	J3 in the standby PLC receives sensor information from receptacle 122 in side B.
J4	Standby	123	B	J4 in the standby PLC receives sensor information from receptacle 123 in side B.
J5	Standby	PC or Workstation	N/A	Use J5 to download code to the standby controller.
J6	Standby	Annex Server	N/A	J6 routes standby controller output through the Annex server to the SWS.
J7	Standby	N/A	N/A	J7 connects the Genius I/O bus controller to the HEU for side B.
J8	Standby (Side B)	J8	Main (Side A)	A cable connects main J8 to standby J8.
J9	Standby	Drop Cord	120-Vac Input Box	J9 receives 120-Vac power from the input box through a drop cord and provides 120-Vac power to the standby controller.
VA	Main	VA	Standby	A cable connects the main VA to the standby VA for a secondary power source for the VA board.

Figure 31 provides a block diagram of the CRAY T932 control system cable connections.

Figure 31. CRAY T932 Control System Block Diagram



NOTE: The previous section explains only the external connections of the CRAY T90 series control system. Inside the mainframe tank, however, internal wire harnesses connect the penetrator receptacles (120 through 123) to the interconnect board in the CRAY T94 system and to the MUX boards in the CRAY T916 and CRAY T932 systems. Separate sense cables connect the interconnect board and MUX boards to the mainframe sensors and complete the sense circuits that relay information about monitored conditions such as temperature, flow rate, and voltage. For further information about the specific interconnect board and MUX board cable connections, refer to the appropriate *Power, Cooling, and Control System* document for each CRAY T90 series system.

