LC System Cabling

HMM-173-B
CRAY T3E Series Systems
Last Modified: December 1997

Figures

Tables

Record of Revision

January 1997

Original printing

March 1997

Revision 0.1. Corrects Table 70 for cable assembly 15249400 per ECO 26868. Corrections made to HTML and PDF files only.

April 1997

Revision A. This version incorporates information about the new WACS HEU interface cable assembly (P/N 13331000). This version also introduces the new WACS L/C fuse board (P/N 13330700). This versions incorporates, per ECO 27574, new information and illustrations regarding TCK fanout via clock wire (P/N 15224001). All other versions of this document are obsolete.

October 1997

Revision A.1. Corrects GigaRing cable connections in Figure 24.

December 1997

Revision B. This version adds a new Table 10, which lists the new round GigaRing cable part numbers. This revision makes all previous versions obsolete.

This page intentionally left blank.

LC System Cabling Overview

Document Purpose

The purpose of this document is to assist service personnel in the maintenance of the CRAY T3E liquid-cooled (LC) cabinet. This document describes internal and external cabling for the CRAY T3E LC cabinet and system.

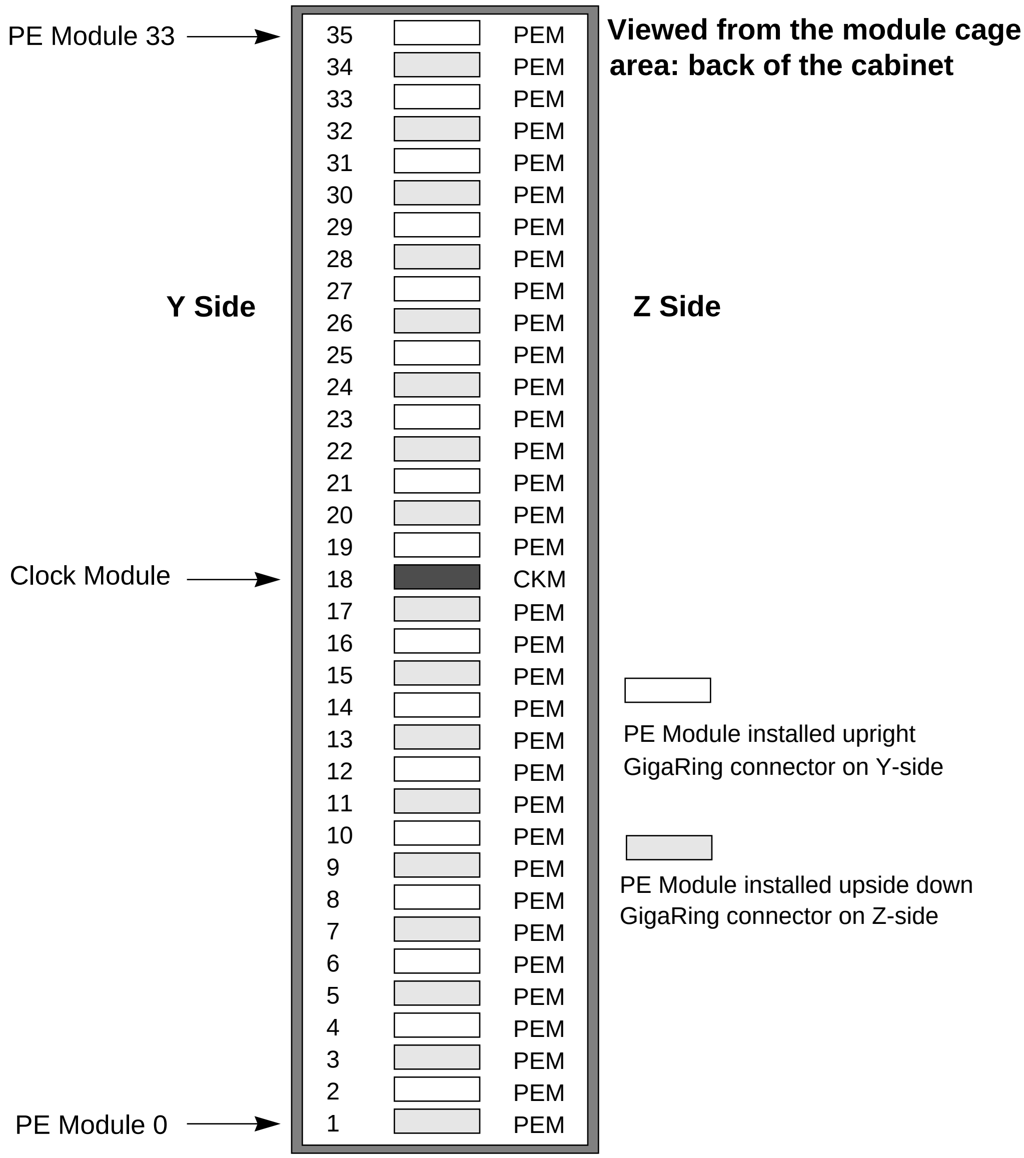
Definitions

The LC cabinet contains a maximum of 34 PE modules (PEMs). Each PEM is identified by a 3-number label that consists of the cabinet number and the module number within the cabinet. For example, PEM 104 identifies PEM #4 in cabinet 1. PEM numbering starts at 00 for the module in slot 1 and goes to 33 for the module in slot 35 (the clock module is not counted). Because PEMs are numbered differently from slot locations, PEM 104 resides in slot 5 of cabinet 1. Figure 1 shows the module identifiers and module locations.

Several tables within this document show source and destination connector locations. A source or destination connector location of 018-zah03, for example, represents:

- 018 - cabinet 0, module slot 18
- zah - rail connector zah
- 03 - pin 03 of the connector (true and complement pins included)

Figure 1. PE Module Numbering



Generic System

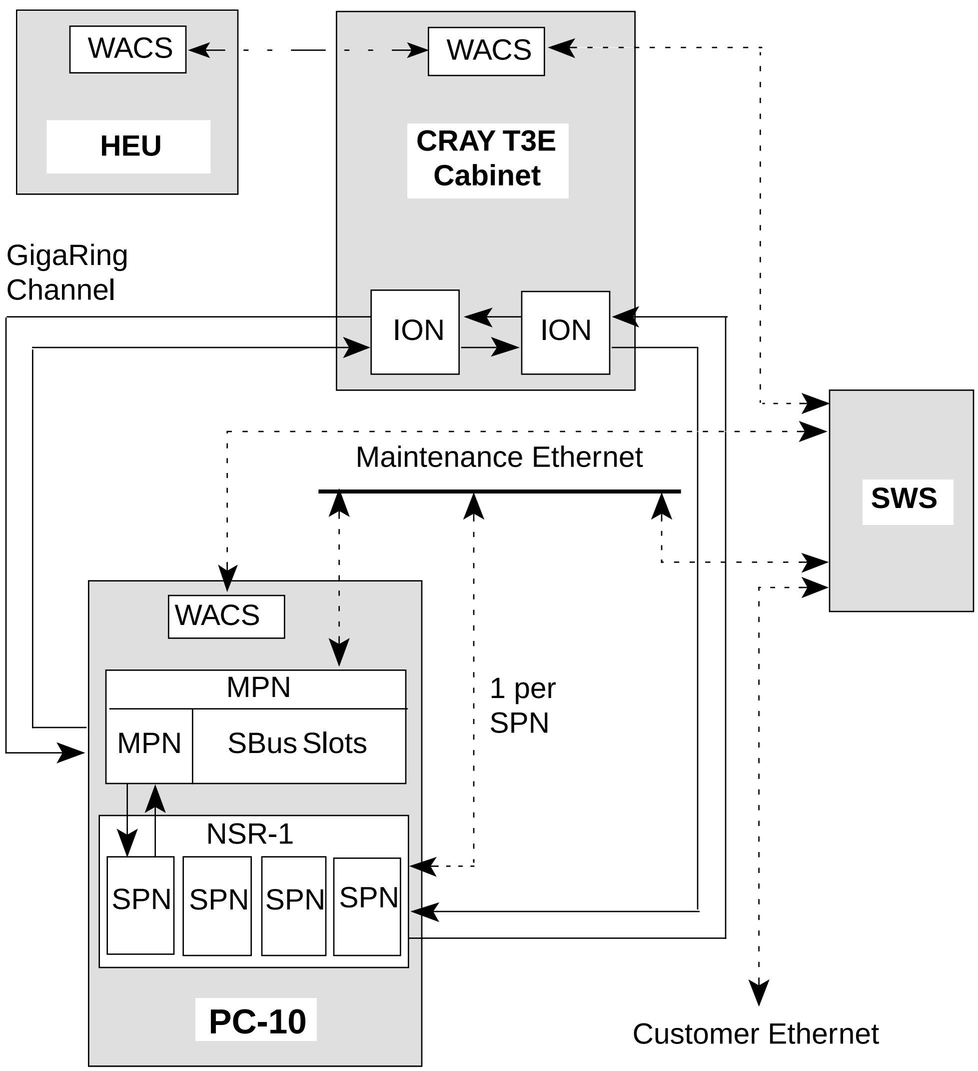
The typical CRAY T3E liquid-cooled (LC) system consists of three major types of equipment:

- One or more CRAY T3E LC cabinets
- One or more scalable I/O cabinets (PC-10)
- The system workstation (SWS)

The CRAY T3E LC cabinet(s) and the PC-10 cabinet are nodes on a GigaRing channel. The PC-10 cabinet communicates with the system workstation over the Cray Research maintenance Ethernet channel. The CRAY T3E system and the PC-10 cabinet communicate via the GigaRing channel.

Figure 2 shows a simplified diagram of the cabling between these three types of equipment.

Figure 2. CRAY T3E Block Diagram



Each LC cabinet communicates WACS information to the SWS independently from other cabinets in a multiple-cabinet system. Because the LC cabinet requires an HEU WC-1 for cooling, WACS information from the HEU is communicated to the LC cabinet, which in turn sends all WACS information to the system workstation. The HEU does not cable directly to the SWS.

Figure 3 shows the cabling from the LC cabinet to the SWS and from the LC cabinet to the HEU.

Figure 3. LC Cabinet Connections to SWS and HEU

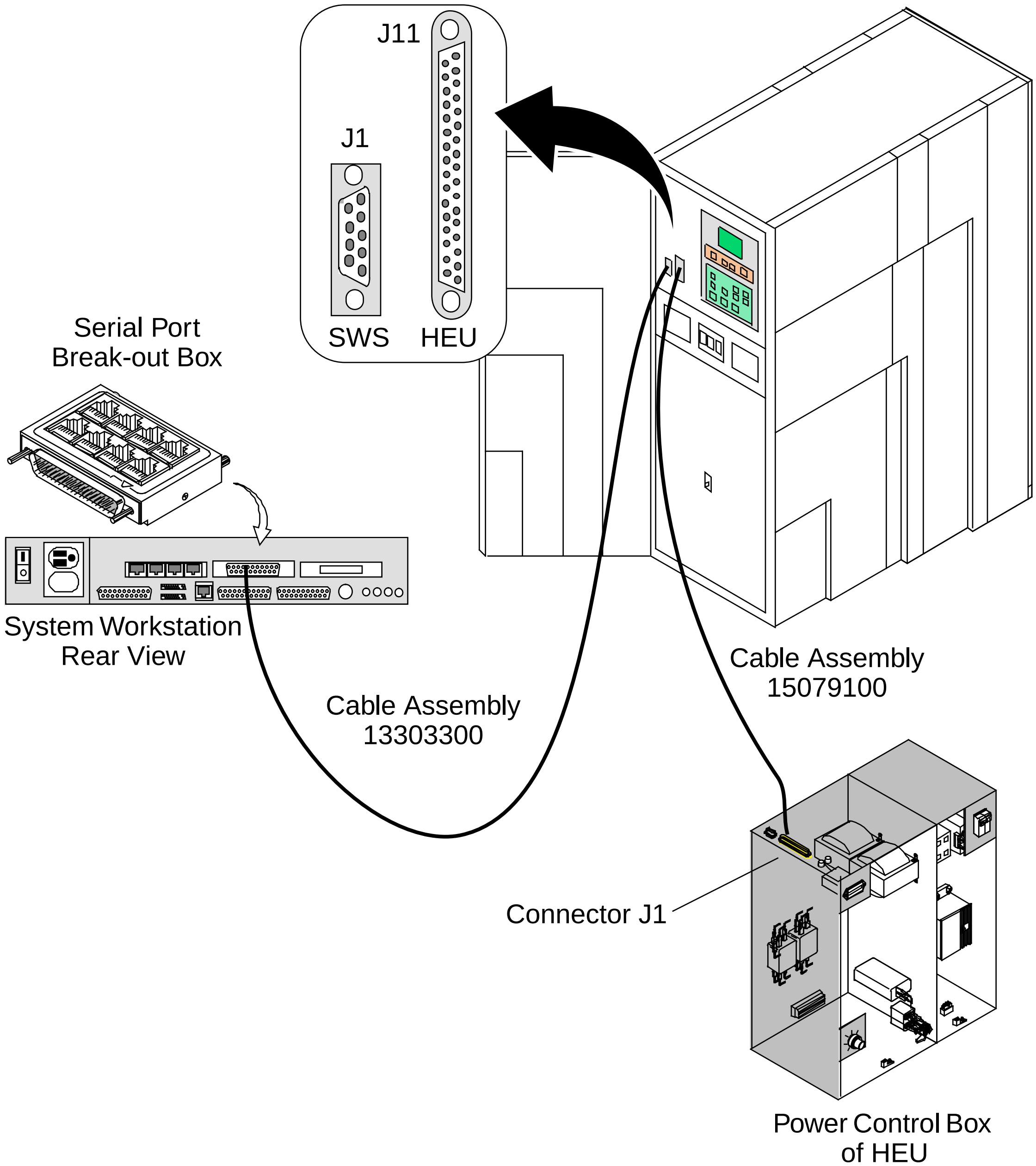
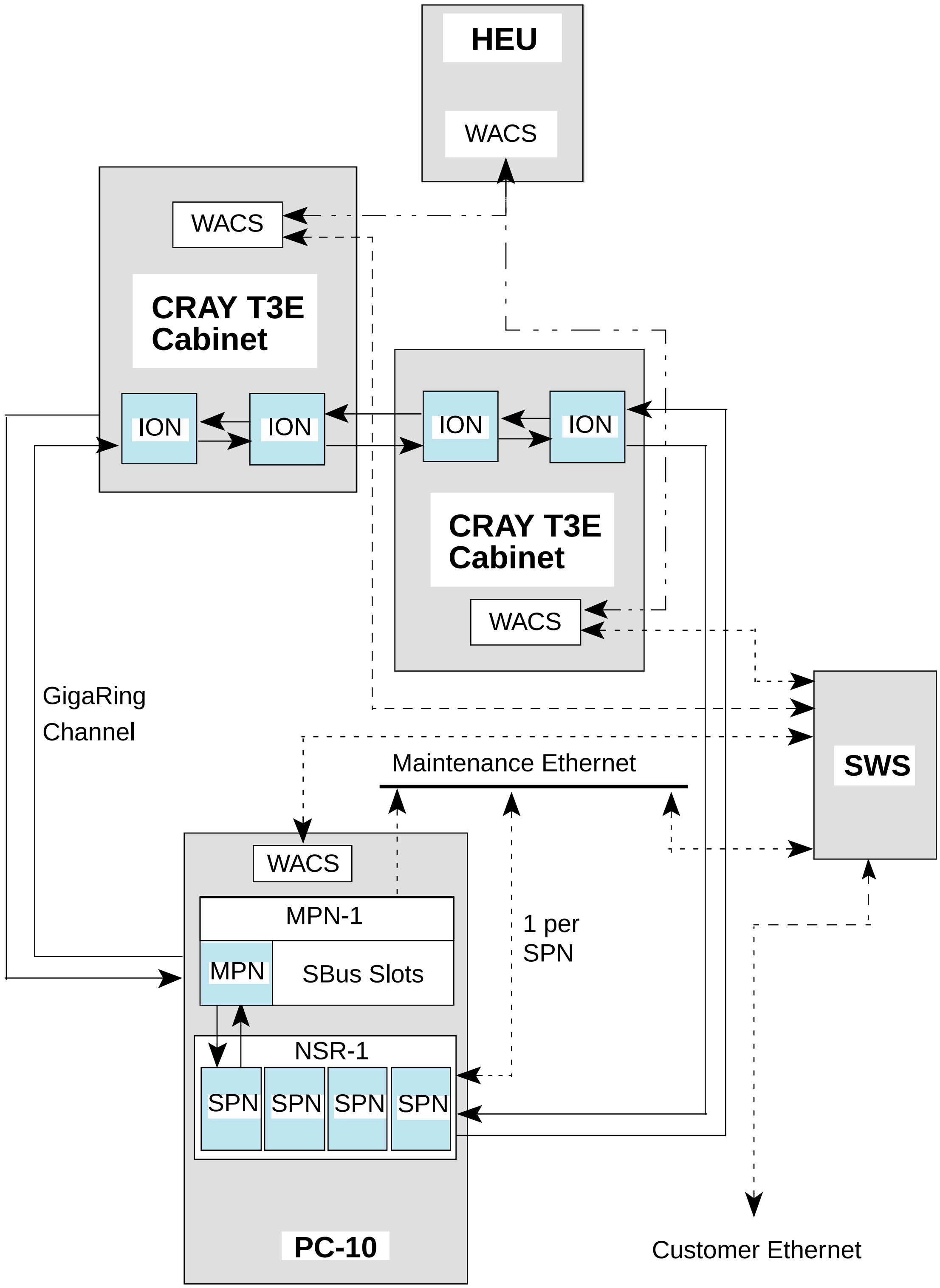


Figure 4 shows a two-cabinet system. Both LC cabinets are on the same GigaRing channel for clarity in the diagram.

Figure 4. Two-cabinet CRAY T3E LC Connections



Module Connections

In addition to power connections, each PEM contains cable connections for the following system components:

- Torus - interconnect network
- GigaRing - channel
- Clock - system and GigaRing channel
- WACS - warning and control
- Boundary scan - logic

Additionally, the LC cabinet has a direct connection to the HEU.

Torus cables connect PEMs in the same cabinet and PEMs in adjacent cabinets.

GigaRing cables connect the module rails of the PEMs and the I/O bulkhead, then connect to the GigaRing channels of other devices (other devices may be PEMs in the same cabinet).

The clock cabling connects the clock module to as many as 34 associated modules within the same cabinet. Cabinet 0's clock module is also the master clock for the other cabinets in a multiple-cabinet system. Master-clock cables connect the clock module in cabinet 0 to the clock modules of other cabinets in the system.

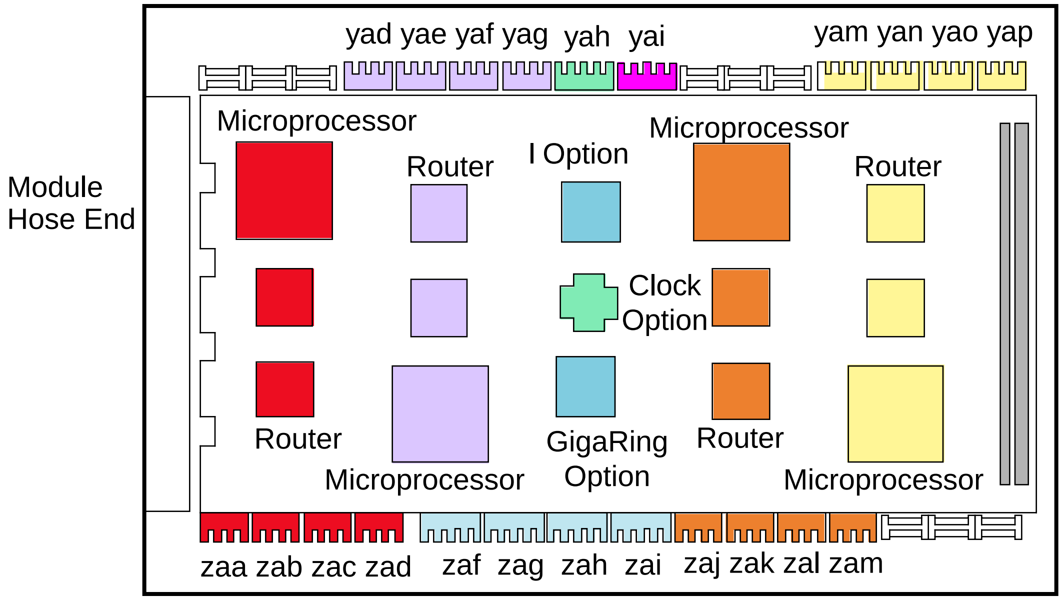
The WACS cabling connects each PEM and module power supply to the interconnect board, then to the WACS, then to the system workstation.

Boundary scan cabling connects the PEM in slot 1 (boundary scan master) of cabinet 0 to all other PE and clock modules in the system.

Printed Circuit Board

The printed circuit board (PCB) contains edge connectors that are referred to as *shuttle* connectors. Each PCB contains 22 shuttle connectors, which line the side of the PCB on the Y side and Z side; refer to Figure 5. The PCB connectors join to the connectors in the module rails.

Figure 5. PCB Shuttle Connectors



The PEM of the LC cabinet contains two PCBs, one on each side of the cold plate. To accommodate the two PCBs, the module rails contain two rows of connectors, A and B.

For the PCB on the bottom side of the cold plate, the Y-side PCB connectors join with the Y-side, B-row rail connectors. The Z-side PCB connectors join with the Z-side, B-row rail connectors. For the PCB on the top side of the cold plate, the Z-side PCB connectors join with the Y-side, A-row rail connectors. The Y-side PCB connectors join with the Z-side, A-row rail connectors.

Table 1 lists the PCB edge connectors in relationship to the module rail connectors for the PEM; Table 2 lists the connectors for the clock module.

Table 1. PCB-to-Rail Connections

Module "A" Board			Module "B" Board	
PCB Connector	Rail Connector	Usage	PCB Connector	Rail Connector
	Z Side			**Y Side**
YAD	ZAD	Node 10 - Y dimension	YAD	YBD
YAE	ZAE	Node 10 - Z dimension	YAE	YBE
YAF	ZAF	Node 10 - Z dimension	YAF	YBF
YAG	ZAG	Node 10 - X dimension	YAG	YBG

Table 1. PCB-to-Rail Connections (continued)

Module "A" Board			Module "B" Board	
YAH	ZAH	Clock, WACS, Boundary Scan	YAH	YBH
YAI	ZAI	Boundary Scan	YAI	YBI
YAM	ZAM	Node 11 - Y dimension	YAM	YBM
YAN	ZAN	Node 11 - Z dimension	YAN	YBN
YAO	ZAO	Node 11 - Z dimension	YAO	YBO
YAP	ZAP	Node 11 - X dimension	YAP	YBP
	Y Side			**Z Side**
ZAA	YAA	Node 00 - X dimension	ZAA	ZBA
ZAB	YAB	Node 00 - Z dimension	ZAB	ZBB
ZAC	YAC	Node 00 - Z dimension	ZAC	ZBC
ZAD	YAD	Node 00 - Y dimension	ZAD	ZBD
ZAF	YAF	GigaRing - Negative Ring In	ZAF	ZBF
ZAG	YAG	GigaRing - Positive Ring Out	ZAG	ZBG
ZAH	YAH	GigaRing - Positive Ring In	ZAH	ZBH
ZAI	YAI	GigaRing - Negative Ring Out	ZAI	ZBI
ZAJ	YAJ	Node 01 - X dimension	ZAJ	ZBJ
ZAK	YAK	Node 01 - Z dimension	ZAK	ZBK
ZAL	YAL	Node 01 - Z dimension	ZAL	ZBL
ZAM	YAM	Node 01 - Y dimension	ZAM	ZBM

Table 2. Clock PCB-to-rail Connections

PCB Connector	Rail Connector	Usage
YAE	ZAE	stms0 fanout/stms0, 1 i
YAF	ZAF	stclk fanout/stclk in/snclk
YAG	ZAG	snclk
YAH	ZAH	snclk/mxclk
YAI	ZAI	mnclk/clksel/mtclk in
ZAE	YAE	stm1 fanout
ZAF	YAF	snclk/stclk fanout
ZAG	YAG	snclk fanout
ZAH	YAH	oscscx/mxclk in/mxclk out
ZAI	YAI	-10 & in/sense & interlock/tclk select

The cabinet(s) ships with the rails and modules installed and with almost all connectors and wires installed in the rails. At installation, however, personnel need to connect any cabinet-to-cabinet connections (cabinet-to-cabinet connections must be disconnected for shipping).

Shuttle Connector

The *shuttle connector* is the primary connector used in the CRAY T3E system. It comprises two main parts: the rail connector and the PCB connector. The rail portion of the connector assembly contains the pins and has no moveable parts. The PCB portion of the connector assembly contains sliding shuttles, which contain the sockets. Three styles of shuttle connectors are used:

- A 3-shuttle connector with 36 pins (torus connections)
- A 4-shuttle connector with 48 pins (GigaRing connections)
- A 4-shuttle connector with 64 pins (clock and scan connections)

After you install a module, you must connect the PCB connectors (shuttles) to the rail connectors by a process called *camming*. Camming is the mechanical process that pushes the shuttles horizontally away from the PCB. As a result of this movement, the shuttle sockets slide over the pins in the rail connectors.

The PCB connector consists of either 3 or 4 shuttles housed in a shuttle block (refer to Figure 6). The shuttle block attaches to the sides of the PCB. The ribbon portion of the shuttle attaches directly to the PCB.

Figure 6. Shuttle Connector

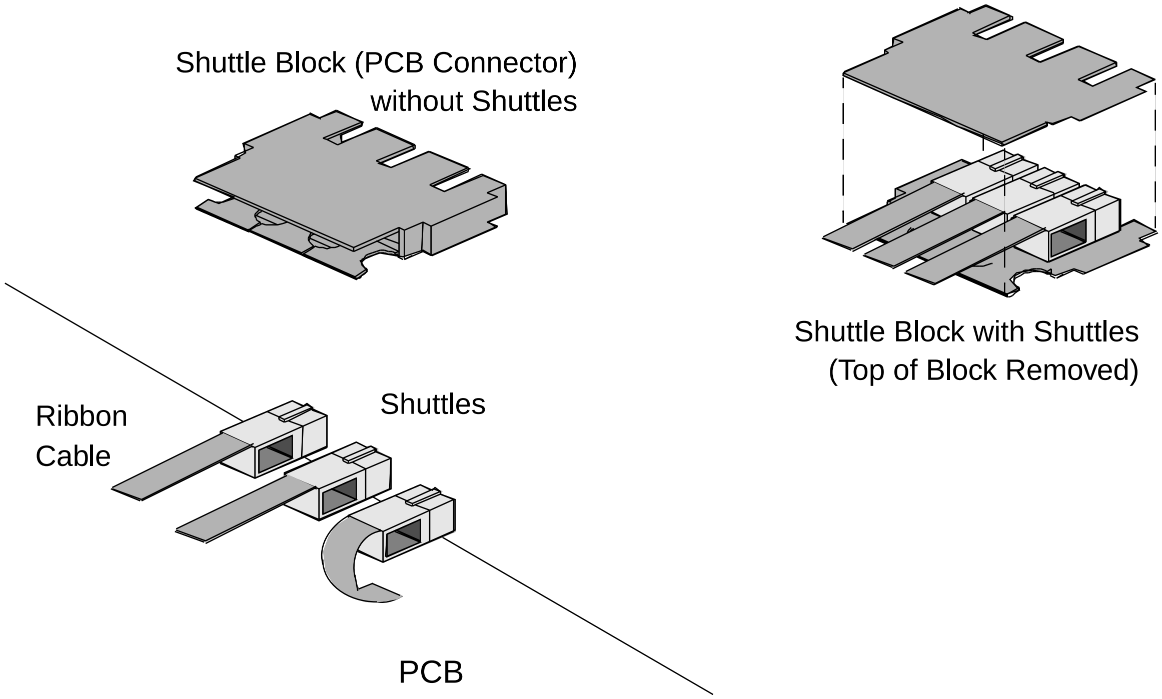
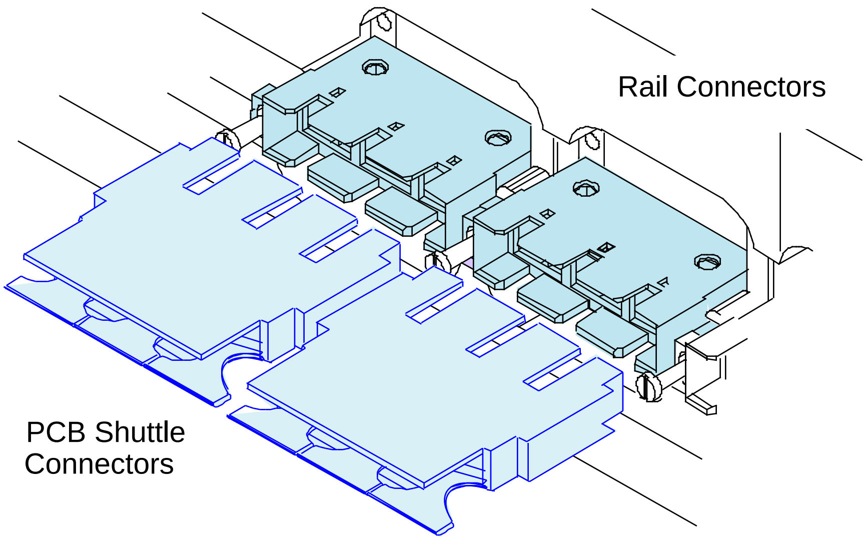


Figure 7 shows the relation of the rail connector to the PCB connector from both a side-view and a top-down view.

Figure 7. Connector Placement



For simplicity, this figure does not show the shuttles or pins, and it shows the PCB connectors further from the rail connectors than in a real system. In fact, the connector blocks almost touch.

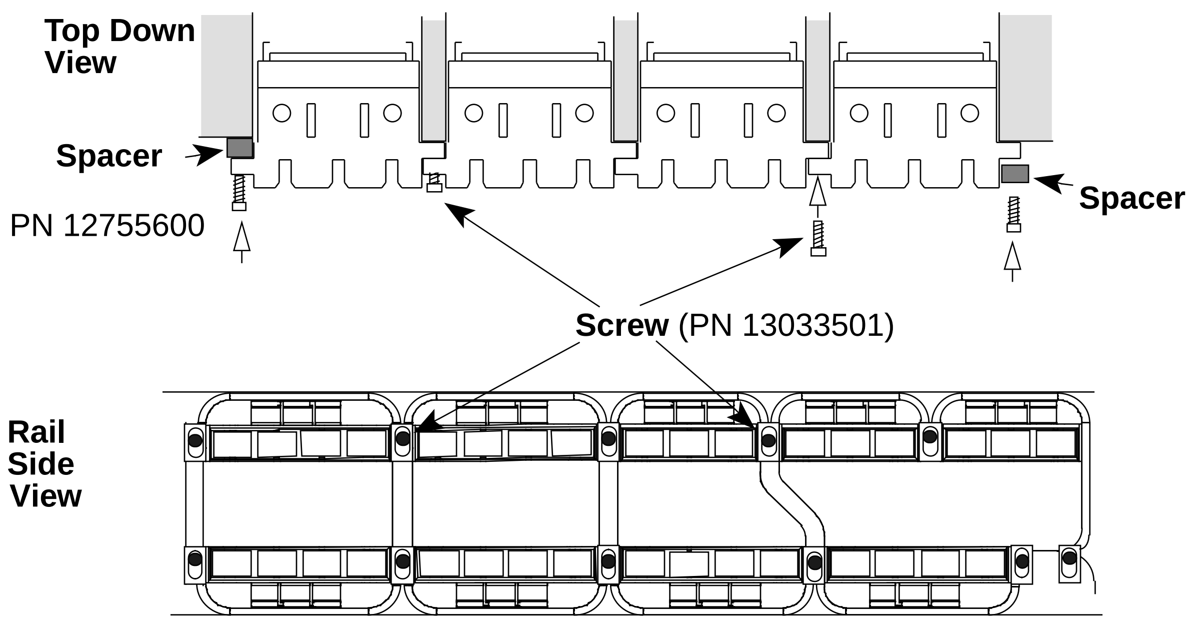
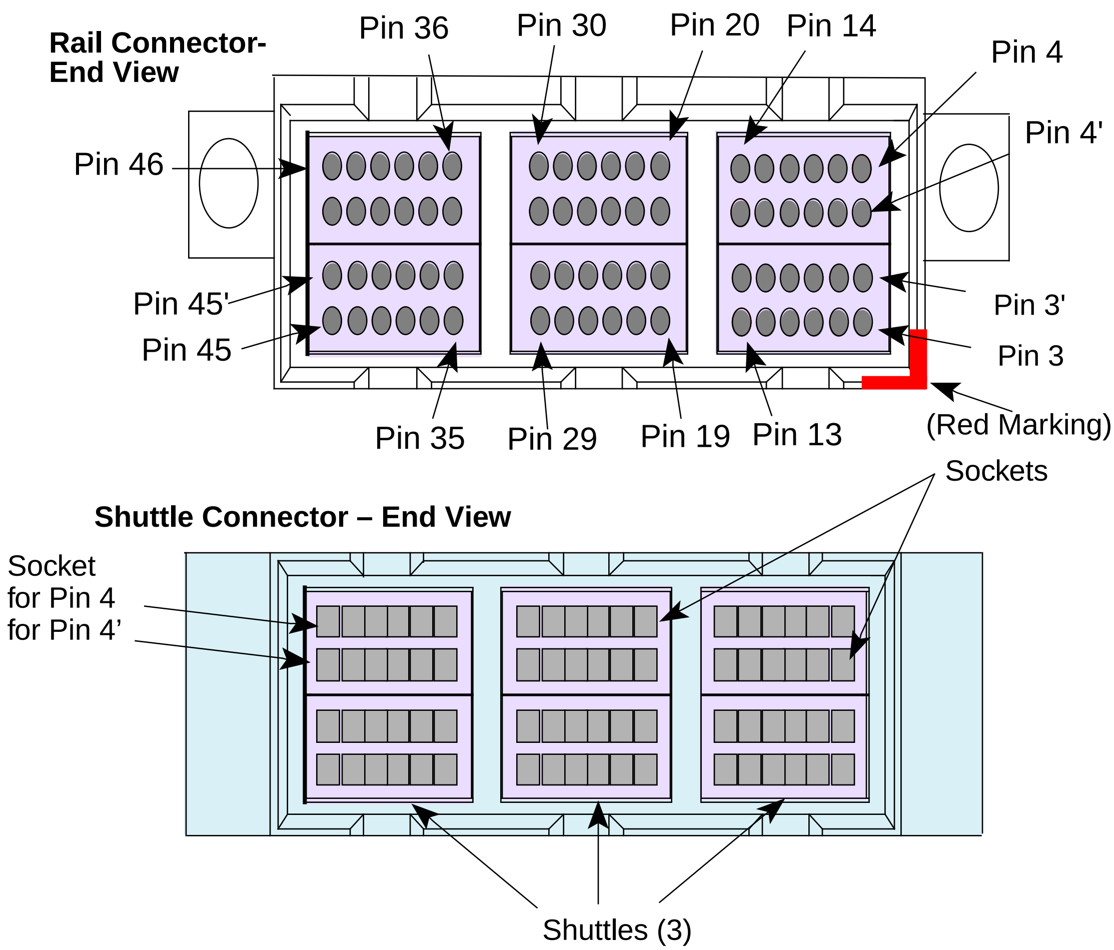


Figure 8 shows the pin numbering for the 3-shuttle molded connector. When you view the pins, you are looking at the connector portion, which is mounted on the rail. When you view the sockets, you are looking at the connector and shuttles on the PCB. Figure 9 shows the pin numbering for the 4-shuttle GigaRing connector. Figure 10 shows the pin numbering for the clock or scan connector.

Figure 8. 3-shuttle Torus Connector



Each pin pair consists of a true and complement (') pin

NOTE: Notice that each shuttle contains 12 pin pairs and the numbering starts at pin 3 rather than pin 1. Pins 1 and 2, 15 and 16, 17 and 18, 31 and 32, 33 and 34, and 47 and 48 are not present or numbered.

Figure 9. GigaRing Connector

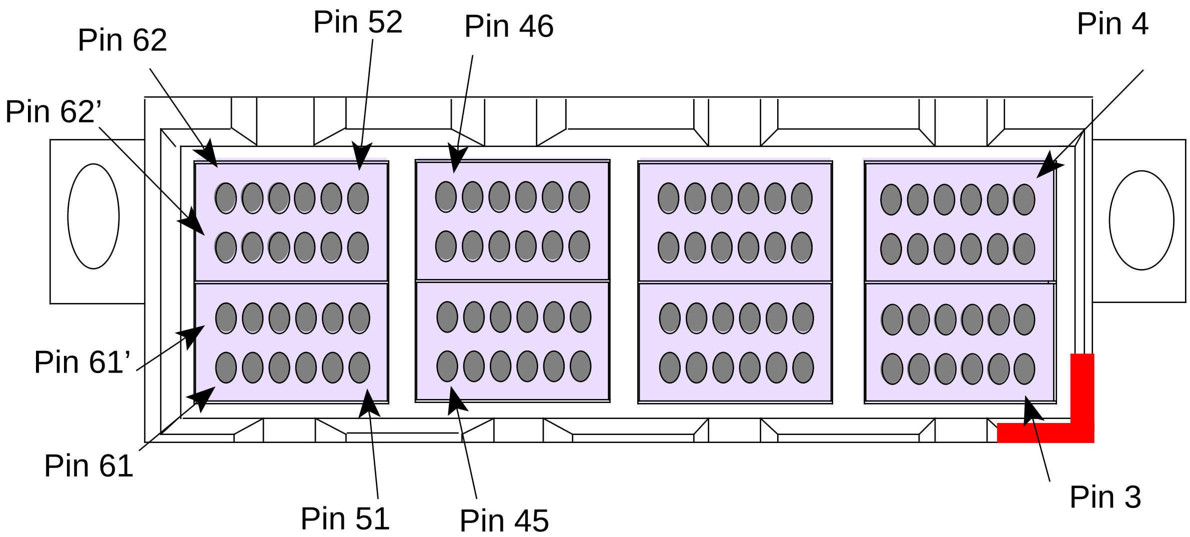


Figure 10. Clock or Scan Connector

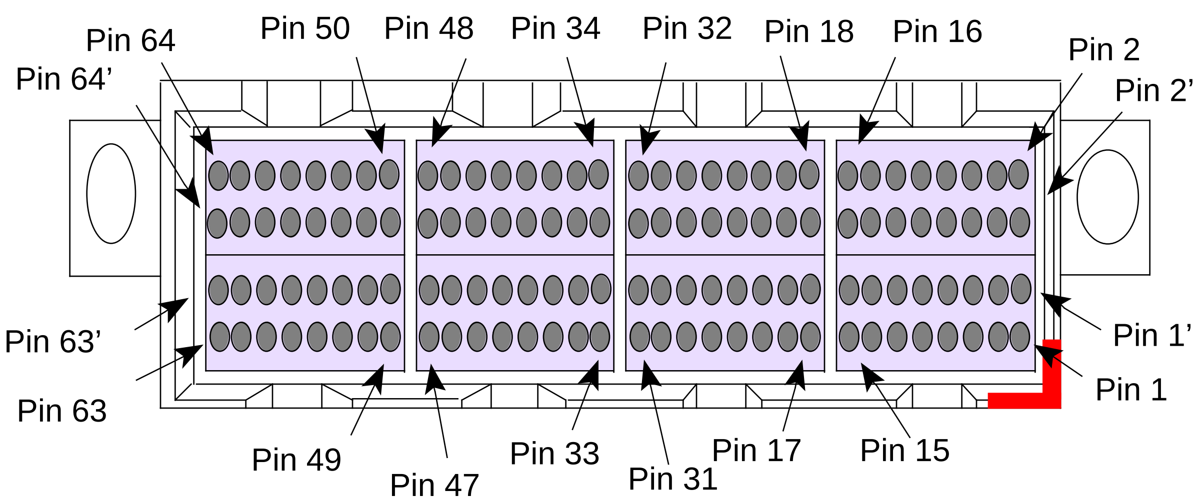


Figure 11 shows the module rails with all connectors installed for both the Y side and Z side of the PEM.

Figure 11. PE Module Rails

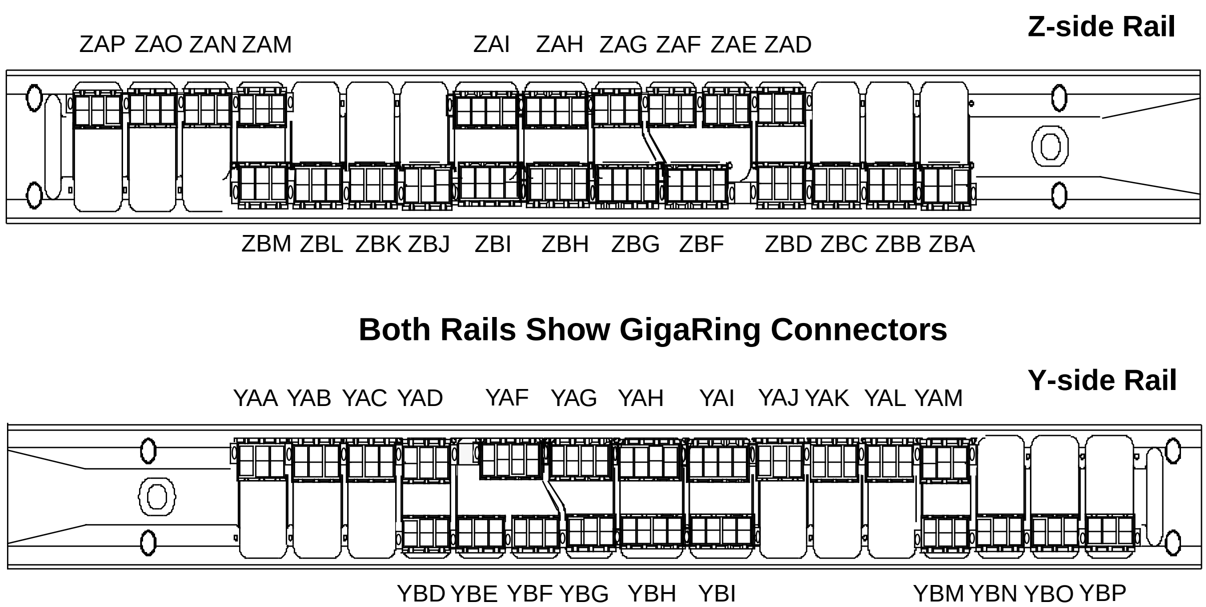
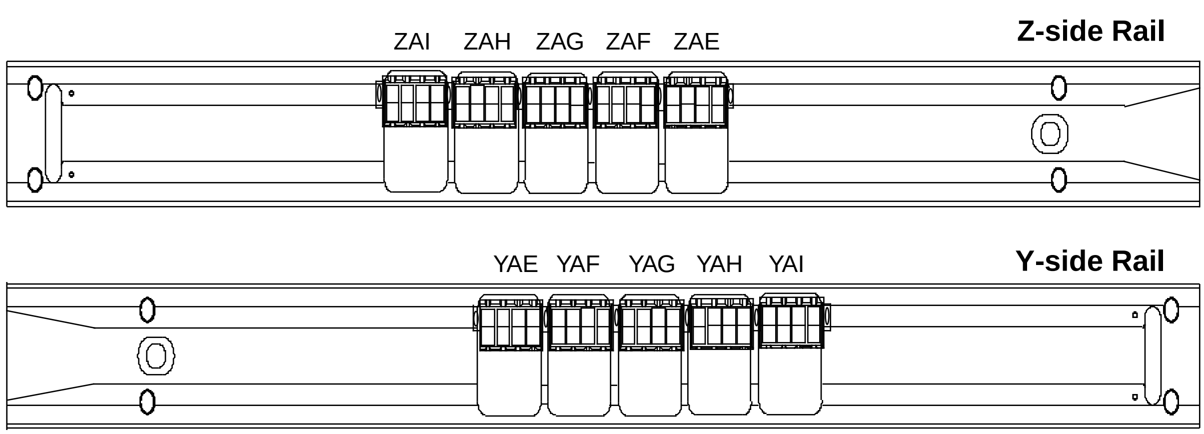


Figure 12 shows the clock rails with all connectors installed.

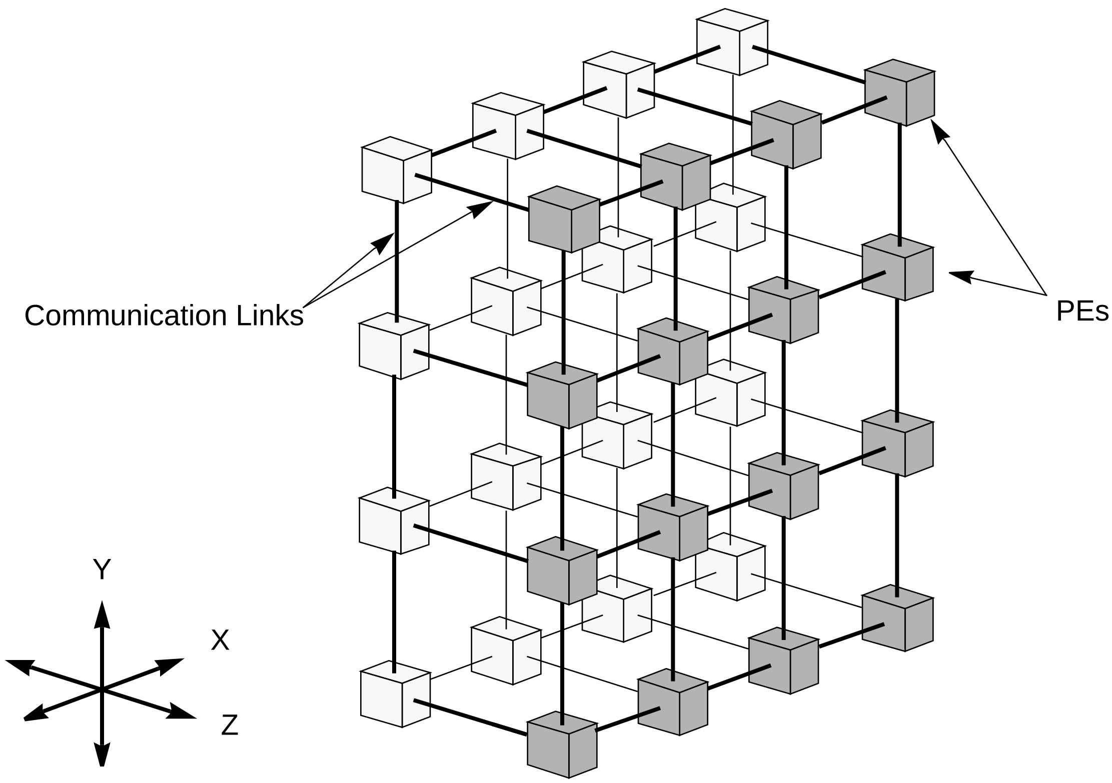
Figure 12. Clock Rails



Torus Cabling

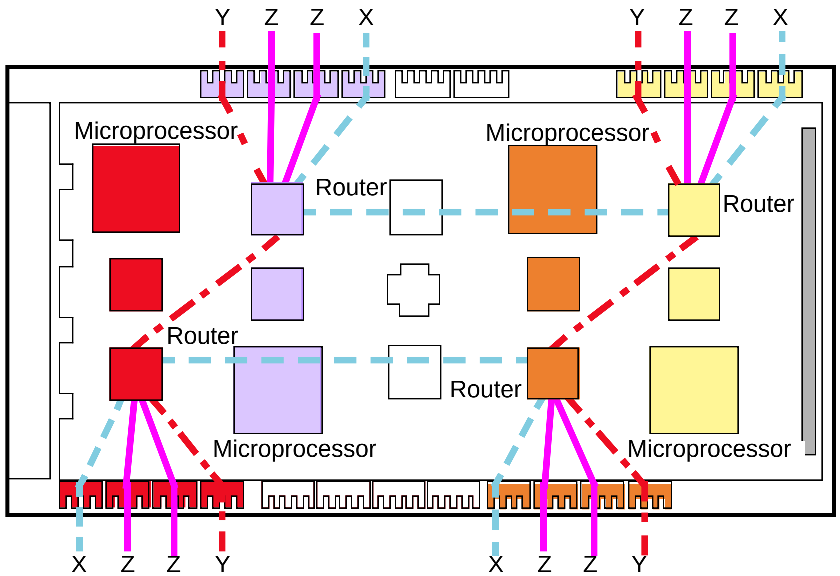
The PEs communicate via a three-dimensional torus interconnect network. Figure 13 shows a simplified, logical representation of a network. For clarity, the figure does not show some communication links.

Figure 13. Simplified Interconnect Network



Each PE has six communication links: +X, –X, +Y, –Y, +Z, and –Z. On each PE, one X link and one Y link are hardwired on the PCB. The other four links are external, pluggable connections. Figure 14 shows the PCB with its communication links identified.

Figure 14. Torus Dimensions



The torus cables connect PEMs in the same cabinet and PEMs in adjacent cabinets. Eight cable troughs on each side of the LC cabinet support cabinet-to-cabinet connections.

Torus Cables

Each torus cable consists of a 3-shuttle molded connector (P1) and a pair of ribbon cables. One ribbon cable ends at a 40-socket connector (P2) and the other at a 40-pin connector (P3). Figure 15 and Figure 16 show the 3-shuttle torus cable.

Figure 15. Torus Cables

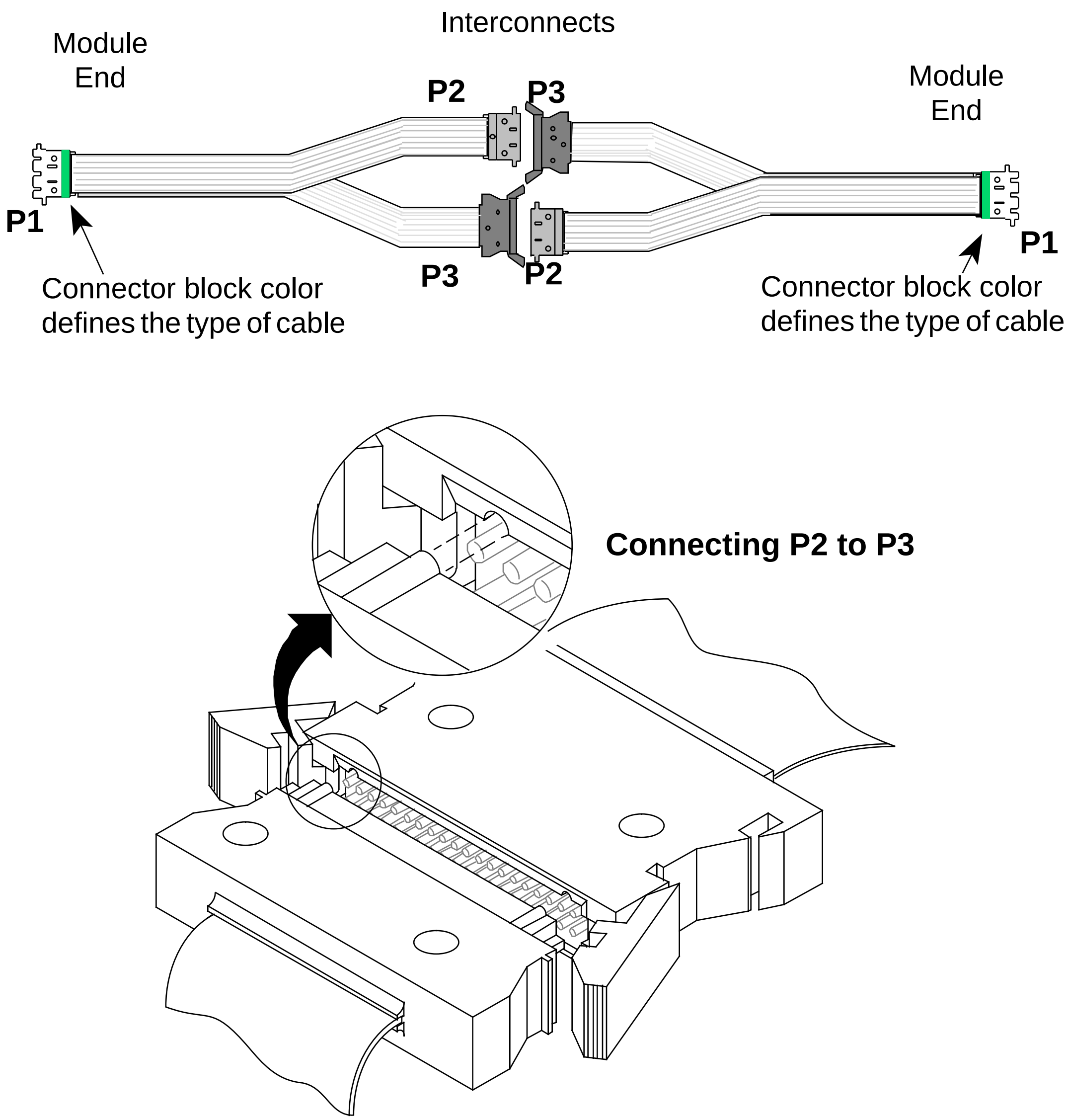
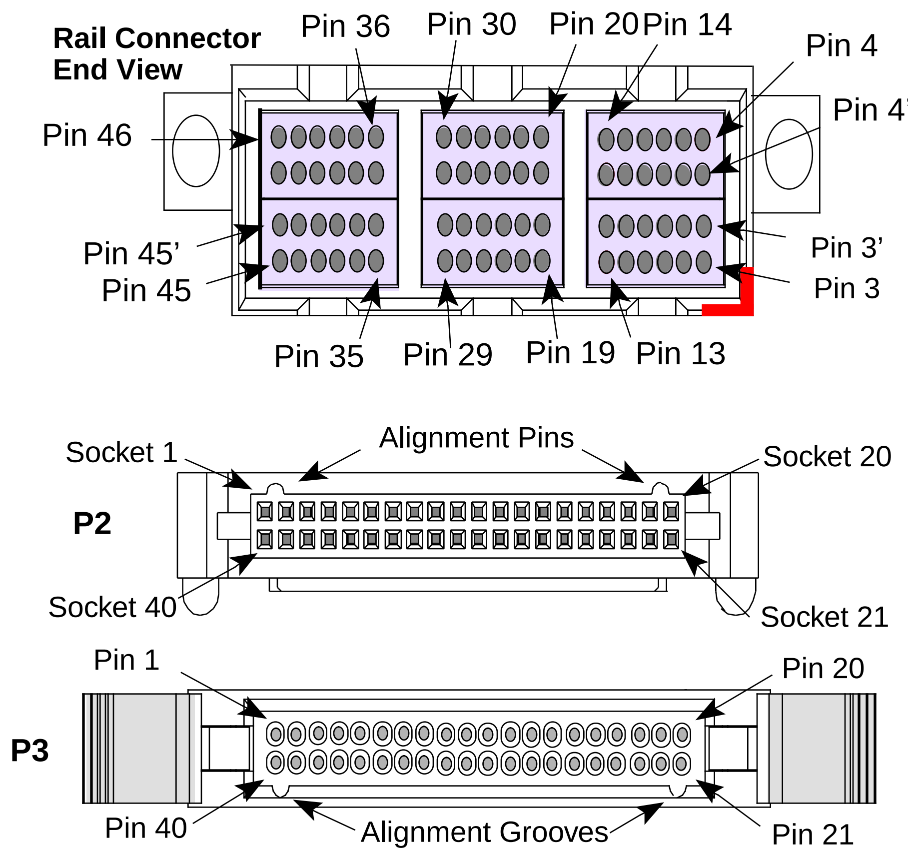


Figure 16. Torus Connectors



An LC cabinet contains three torus cable types: X dimension, Y dimension, and Z dimension. These cables are basically the same except in length. Additionally, an inverted Y cable is used instead of twisting a Y cable. The four torus cables and their lengths, part numbers, and connector colors are listed in Table 3.

Table 3. Torus Cable Descriptions

Cable	Length	Part Number	Connector Block Color
X dimension	13 in. (33 cm)	15112904	Gray
Y dimension	23 in. (58 cm)	15112906	Green
Z dimension	24 in. (61 cm)	15112905	Blue
Inverted Y	23 in. (58 cm)	15128901	Red

Table 4 lists the pin assignments for the torus cable connectors. Refer to Figure 16 for pin locations.

Table 4. Torus Cable 3-shuttle Connector (Standard)

Input			Output		
Pin	Signal	Connects to Pin___ on Connector P3	Pin	Signal	Connects to Pin___ on Connector P2
3/3’	Clock	39/2	4/4’	Clock	2/39
5/5’	Vdd Ground	38/3	6/6’	Vdd Ground	3/38
7/7’	Bit 00	37/4	8/8’	Bit 00	4/37
9/9’	Bit 01	36/5	10/10’	Bit 01	5/36
11/11’	Bit 02	35/6	12/12’	Bit 02	6/35
13/13’	Bit 03	34/7	14/14’	Bit 03	7/34
19/19’	Bit 04	33/8	20/20’	Bit 04	8/33
21/21’	Bit 05	32/9	22/22’	Bit 05	9/32
23/23’	Bit 06	31/10	24/24’	Bit 06	10/31
25/25’	Bit 07	30/11	26/26’	Bit 07	11/30
27/27’	Bit 08	29/12	28/28’	Bit 08	12/29
29/29’	Bit 09	28/13	30/30’	Bit 09	13/28
35/35’	Bit 10	27/14	36/36’	Bit 10	14/27
37/37’	Bit 11	26/15	38/38’	Bit 11	15/26
39/39’	Bit 12	25/16	40/40’	Bit 12	16/25
41/41’	Bit 13	24/17	42/42’	Bit 13	17/24
43/43’	Vdd Ground	23/18	44/44’	Vdd Ground	18/23
45/45’	Spare	22/19	46/46’	Spare	19/22

NOTE: In columns that contain pin numbers, the first number is the true pin and the second is the false/complement pin.

Two cable connections require the inverted Y cable: PCB connectors YAD and YAM. Table 5 lists the pin assignments for the inverted Y cable.

Table 5. Torus Cable 3-shuttle Connector (Inverted)

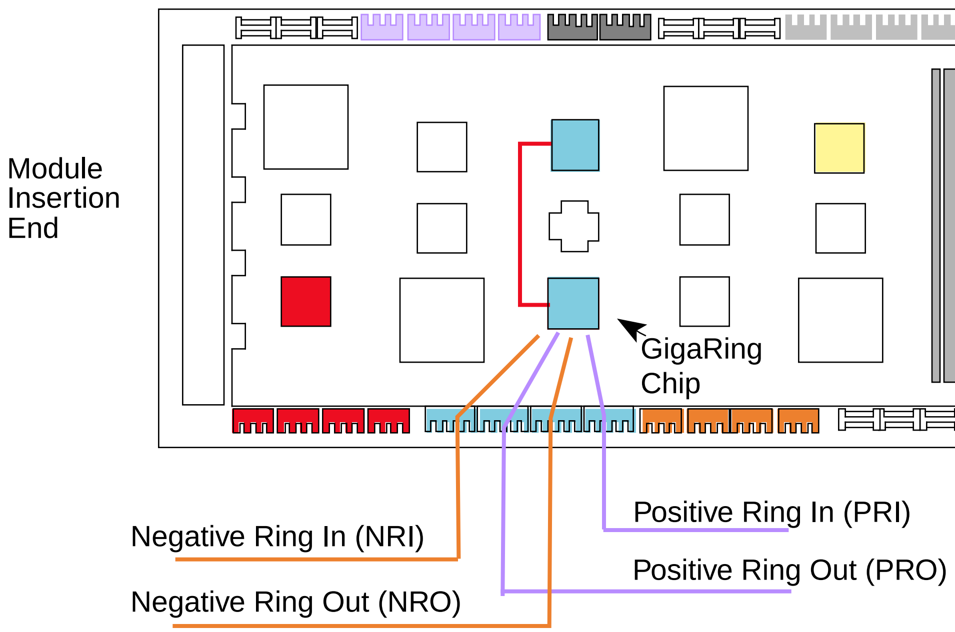
Pin	Signal Name	Pin	Signal Name
Input Channel		Output Channel	
3	Spare	4	Spare
5	Vdd - Ground	6	Vdd - Ground
7	Bit 13	8	Bit 13
9	Bit 12	10	Bit 12
11	Bit 11	12	Bit 11
13	Bit 10	14	Bit 10
19	Bit 09	20	Bit 09
21	Bit 08	22	Bit 08
23	Bit 07	24	Bit 07
25	Bit 06	26	Bit 06
27	Bit 05	28	Bit 05
29	Bit 04	30	Bit 04
35	Bit 03	36	Bit 03
37	Bit 02	38	Bit 02
39	Bit 01	40	Bit 01
41	Bit 00	42	Bit 00
43	Vdd - Ground	44	Vdd - Ground
45	Clock	46	Clock

GigaRing Cabling

An 80-wire cable provides I/O connections between the LC cabinet and a GigaRing channel. The PC board with the GigaRing option contains four 4-shuttle molded connectors: 2 for the negative ring and 2 for the positive ring. Figure 17 shows the PCB with the GigaRing connectors labeled.

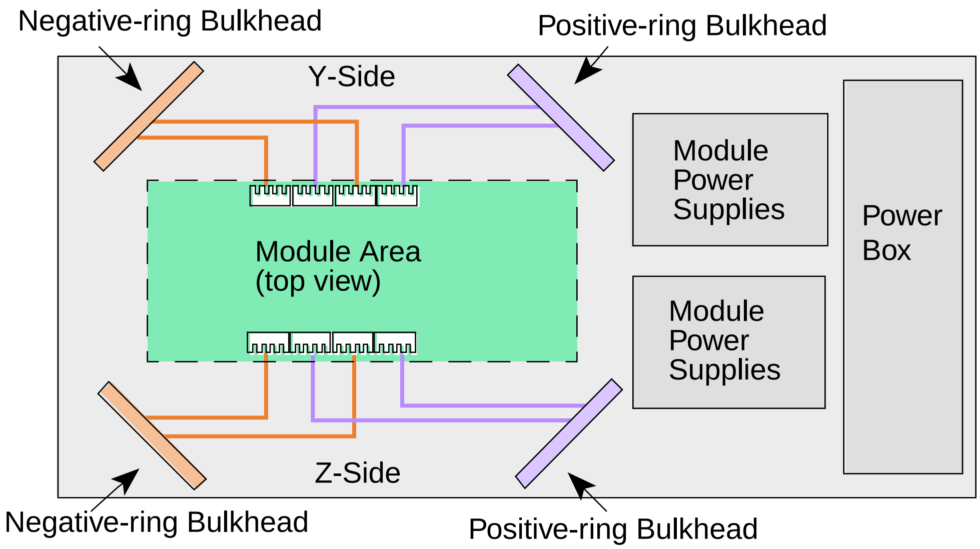
Not all PCBs contain the GigaRing chip. In PCBs without the GigaRing chip, the connectors are replaced by camming-tool guide blocks.

Figure 17. PCB with GigaRing Connectors



The GigaRing cable is a 4-shuttle molded connector cable. There is one cable for each of the four PCB connectors. The cables connect the module rail to the bulkheads on the sides of the cabinet in the module area. Figure 18 shows the layout of the cabinet and the negative- and positive-ring connector bulkheads.

Figure 18. GigaRing Bulkheads



Each bulkhead consists of two section plates; each contains 18 cable connector openings, 1 through 18. These section plates are identified as GRB01 through GRB07 and two are stacked to form a bulkhead. Depending upon their location in the cabinet, connector openings 1 and 2 of the section plate can be located at the top of each section or the bottom of each section.

Figure 19 and Figure 20 show both the Y-side and Z-side bulkheads. Module slot locations and rail connections are identified in Table 6 for a standard full-cabinet configuration.

Each of the four bulkheads contains connector openings for a maximum of 18 GigaRing channel connections. The negative ring and the positive ring are paired to allow a maximum of 18 external GigaRing connections per cabinet side. However, the standard configuration for a fully populated LC cabinet contains no more than 17 GigaRing connections per cabinet side (34 PEMs with 1 GigaRing chip per module).

The support module and boundary scan module are connected by the *support channel*. This channel is used to run boundary scan and offline diagnostics and to support the operating system. The remaining 16 possible GigaRing channels are for customer use.

Figure 19. Cabinet Bulkheads (Y Side)

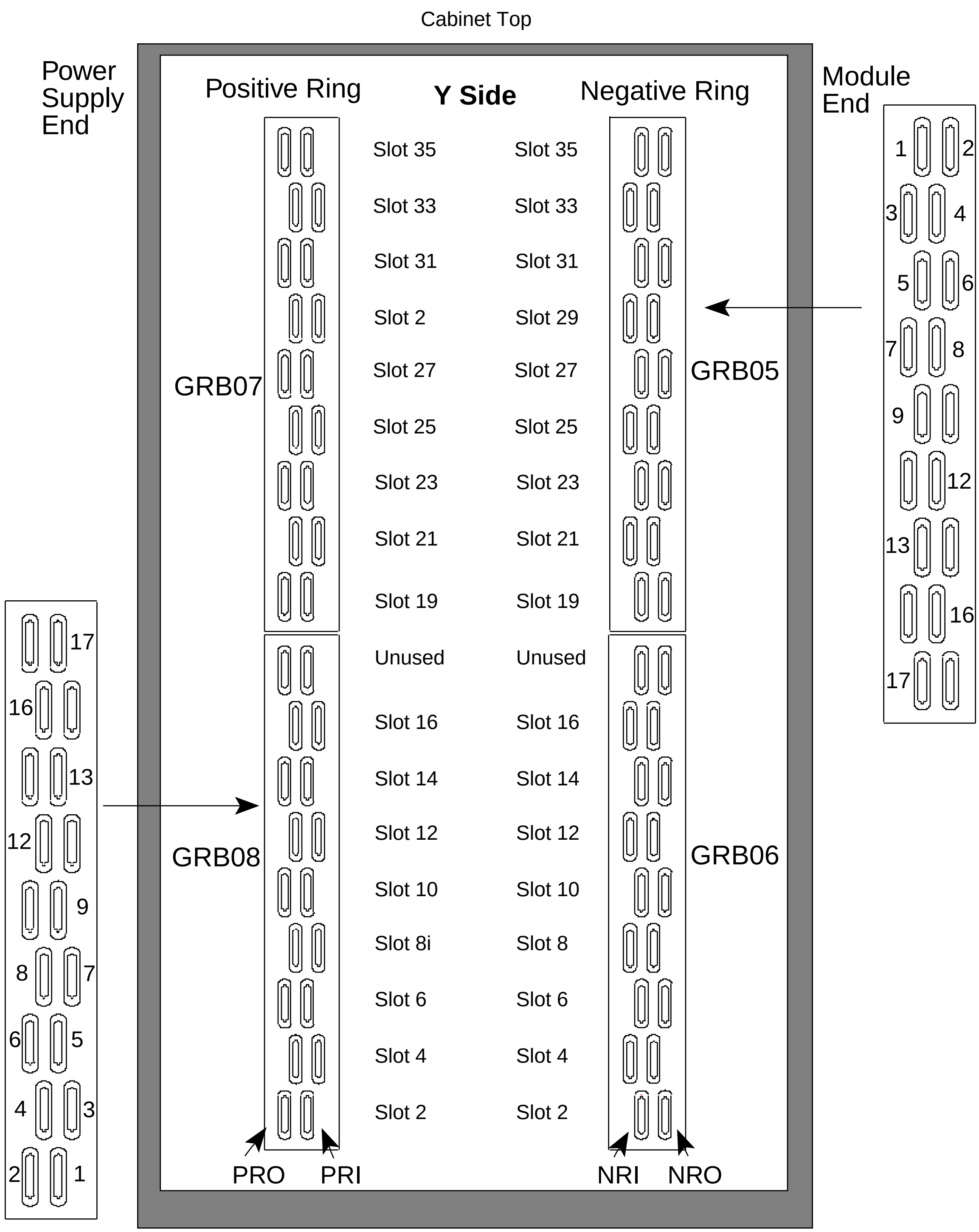


Figure 20. Cabinet Bulkheads (Z Side)

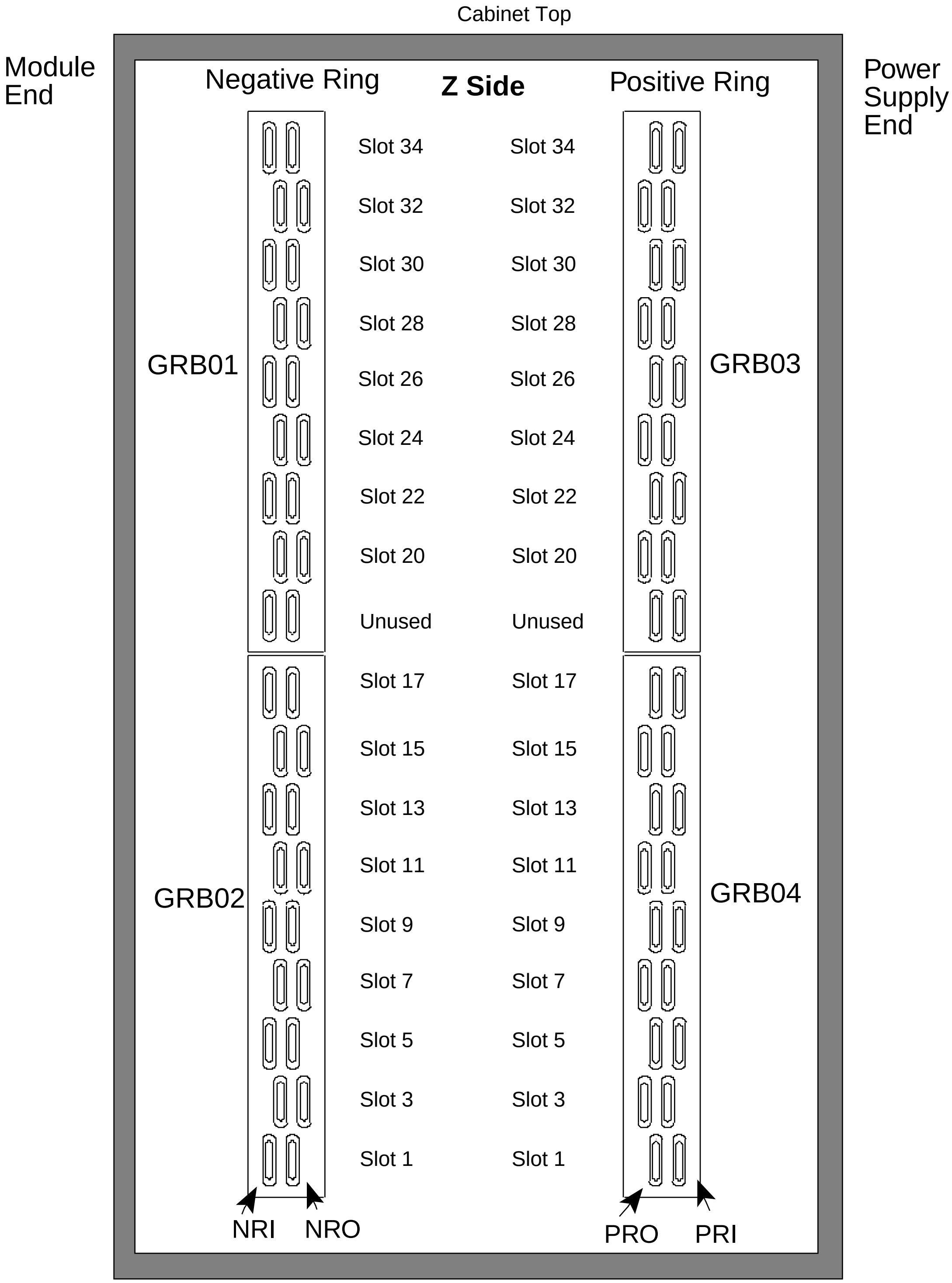


Table 6. GigaRing Bulkhead Connections

Bulkhead Number	Bulkhead Section Connector Opening	Module Slot	Rail Connector	Bulkhead Number	Bulkhead Section Connector Opening	Module Slot	Rail Connector
Z Side							
	Neg In, Out				Pos Out, In		
GRB01	18, 17	34	zbf, zbh	GRB03	1, 2	34	zbg, zbi
GRB01	16, 15	32	zbf, zbh	GRB03	3, 4	32	zbg, zbi
GRB01	14, 13	30	zbf, zbh	GRB03	5, 6	30	zbg, zbi
GRB01	12, 11	28	zbf, zbh	GRB03	7, 8	28	zbg, zbi
GRB01	10, 9	26	zbf, zbh	GRB03	9, 10	26	zbg, zbi
GRB01	8, 7	24	zbf, zbh	GRB03	11, 12	24	zbg, zbi
GRB01	6, 5	22	zbf, zbh	GRB03	13, 14	22	zbg, zbi
GRB01	4, 3	20	zbf, zbh	GRB03	15, 16	20	zbg, zbi
GRB01	2, 1	Unused	zbf, zbh	GRB03	17, 18	Unused	zbg, zbi
GRB02	18, 17	17	zbf, zbh	GRB04	1, 2	17	zbg, zbi
GRB02	16, 15	15	zbf, zbh	GRB04	3, 4	15	zbg, zbi
GRB02	14, 13	13	zbf, zbh	GRB04	5, 6	13	zbg, zbi
GRB02	12, 11	11	zbf, zbh	GRB04	7, 8	11	zbg, zbi
GRB02	10, 9	9	zbf, zbh	GRB04	9, 10	9	zbg, zbi
GRB02	8, 7	7	zbf, zbh	GRB04	11, 12	7	zbg, zbi
GRB02	6, 5	5	zbf, zbh	GRB04	13, 14	5	zbg, zbi
GRB02	4, 3	3	zbf, zbh	GRB04	15, 16	3	zbg, zbi
GRB02	2, 1	1	zbf, zbh	GRB04	17, 18	1	zbg, zbi
Y Side							
GRB05	1, 2	35	yaf, yah	GRB07	18, 17	35	yag, yai
GRB05	3, 4	33	yaf, yah	GRB07	16, 15	33	yag, yai
GRB05	5, 6	31	yaf, yah	GRB07	14, 13	31	yag, yai
GRB05	7, 8	29	yaf, yah	GRB07	12, 11	29	yag, yai
GRB05	9, 10	27	yaf, yah	GRB07	10, 9	27	yag, yai

Table 6. GigaRing Bulkhead Connections (continued)

Bulkhead Number	Bulkhead Section Connector Opening	Module Slot	Rail Connector	Bulkhead Number	Bulkhead Section Connector Opening	Module Slot	Rail Connector
GRB05	11, 12	25	yaf, yah	GRB07	8, 7	25	yag, yai
GRB05	13, 14	23	yaf, yah	GRB07	6, 5	23	yag, yai
GRB05	15, 16	21	yaf, yah	GRB07	4, 3	21	yag, yai
GRB05	17, 18	19	yaf, yah	GRB07	2, 1	19	yag, yai
GRB06	1, 2	Unused		GRB08	18, 17	Unused	
GRB06	3, 4	16	yaf, yah	GRB08	16, 15	16	yag, yai
GRB06	5, 6	14	yaf, yah	GRB08	14, 13	14	yag, yai
GRB06	7, 8	12	yaf, yah	GRB08	12, 11	12	yag, yai
GRB06	9, 10	10	yaf, yah	GRB08	10, 9	10	yag, yai
GRB06	11, 12	8	yaf, yah	GRB08	8, 7	8	yag, yai
GRB06	13, 14	6	yaf, yah	GRB08	6, 5	6	yag, yai
GRB06	15, 16	4	yaf, yah	GRB08	4, 3	4	yag, yai
GRB06	17, 18	2	yaf, yah	GRB08	2, 1	2	yag, yai

GigaRing Cable

Each GigaRing rail-to-bulkhead cable is 18 in. (46 cm) long and consists of a 4-shuttle connector block, ribbon cables, and a bulkhead connector. Refer to Figure 21.

Figure 21. GigaRing Cable

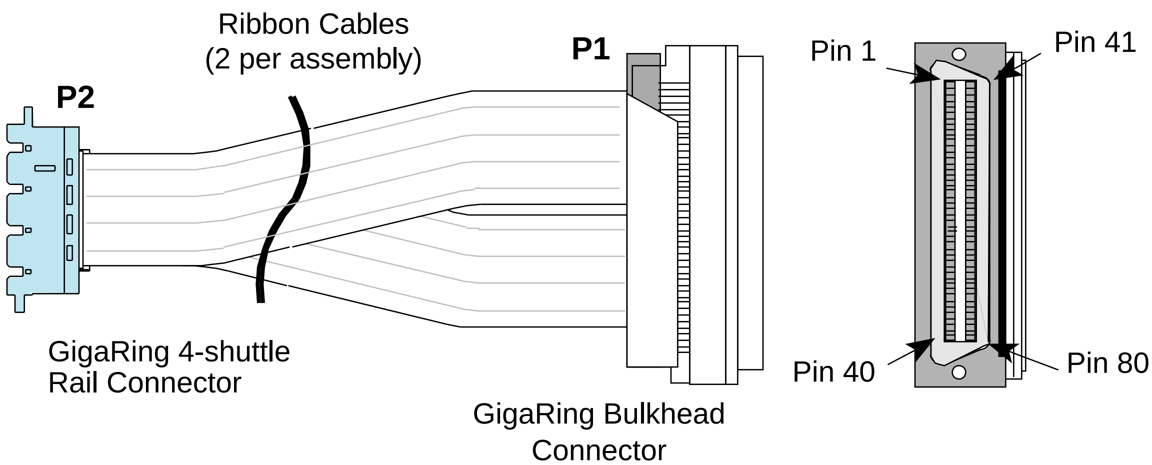


Figure 22 shows the pin numbering scheme for both the rail connector P2 and the bulkhead connector P1.

Figure 22. GigaRing Connectors

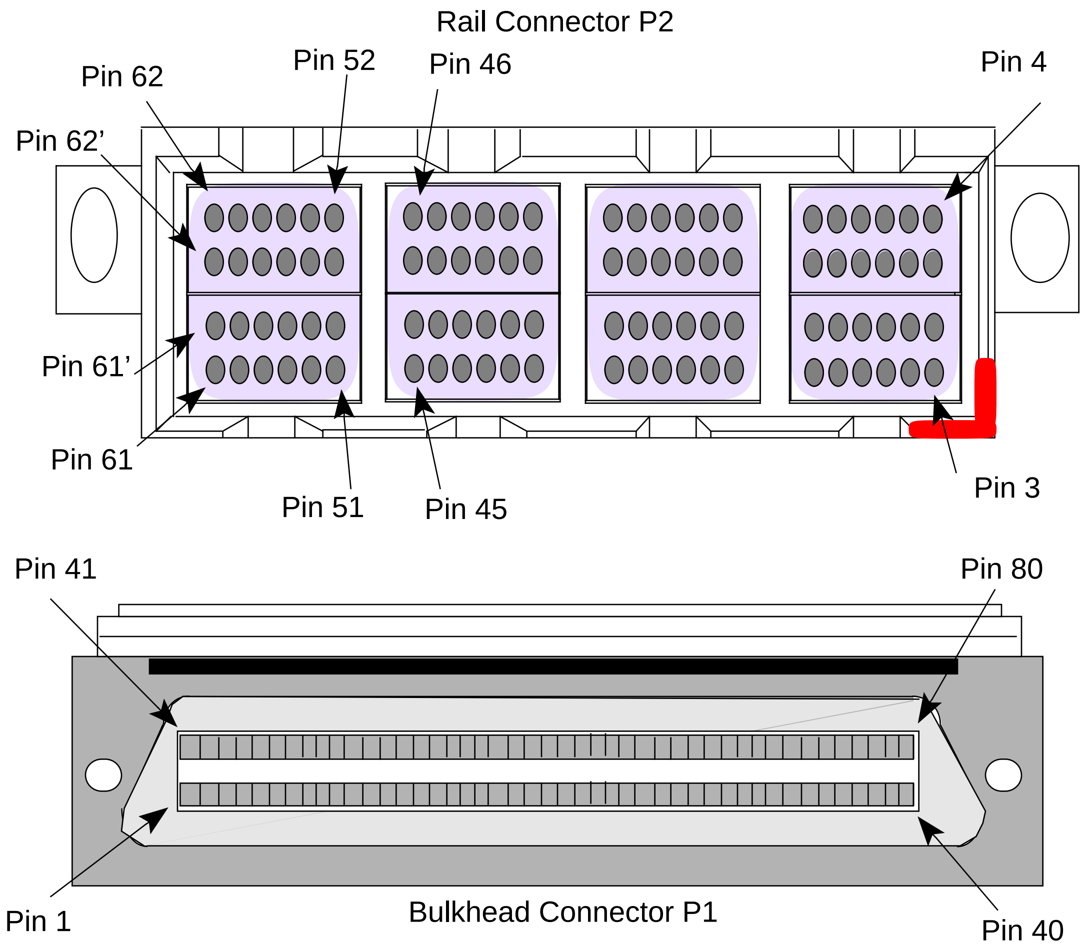


Table 7 lists the pin assignments and signal names for the GigaRing cable. Each GigaRing cable is numbered the same whether the PCB with the GigaRing chip is installed as the top PCB or the bottom PCB of the PEM. This same numbering scheme is used for the negative ring and the positive ring (in and out). Table 8 is the cross-reference table for the GigaRing cable.

Table 7. Shuttle Connector to Bulkhead Connector

P2 Pin	Signal	P1 Pin	P2 Pin	Signal	P1 Pin	P2 Pin	Signal	P1 Pin
3	Vdd		23	Bit 04	35	43	Bit 12	26
3’			23’		36	43’		27
4	Vdd		24	Bit 19	54	44	Bit 27	5
4’			24’		55	44’		6
5	Vdd		25	Bit 06	33	45	Bit 15	63
5’			25’		34	45’		64
6	Vdd		26	Bit 20	12	46	Bit 28	44
6’			26’		13	46’		45
7	Vdd		27	Bit 07	72	51	Bit 14	24
7’			27’		73	51’		25
8	Clock	20	28	Bit 21	52	52	Bit 29	3
8’		21	28’		53	52’		4
9	Bit 01	78	29	Bit 09	70	53	Flag	61
9’		79	29’		71	53’		62
10	Vdd		30	Bit 22	10	54	Bit 30	42
10’			30’		11	54’		43
11	Bit 00	39	35	Bit 08	30	55	Parity	22
11’		40	35’		31	55’		23
12	Frame Bit	18	36	Bit 23	50	56	Bit 31	1
12’		19	36’		51	56’		2
13	Bit 03	76	37	Bit 11	68	57	Clock	59
13’		77	37’		69	57’		60
14	Bit 16	57	38	Bit 24	48	58	Vdd	
14’		58	38’		49	58’		
19	Bit 02	37	39	Bit 10	28	59	Vdd	
19’		38	39’		29	59’		
20	Bit 17	16	40	Bit 25	7	60	Vdd	
20’		17	40’		8	60’		
21	Bit 05	74	41	Bit 13	66	61	Vdd	
21’		75	41’		67	61’		
22	Bit 18	14	42	Bit 26	46	62	Vdd	
22’		15	42’		47	62’		

Table 8. Bulkhead Connector to Rail Connector – Pin Cross-reference

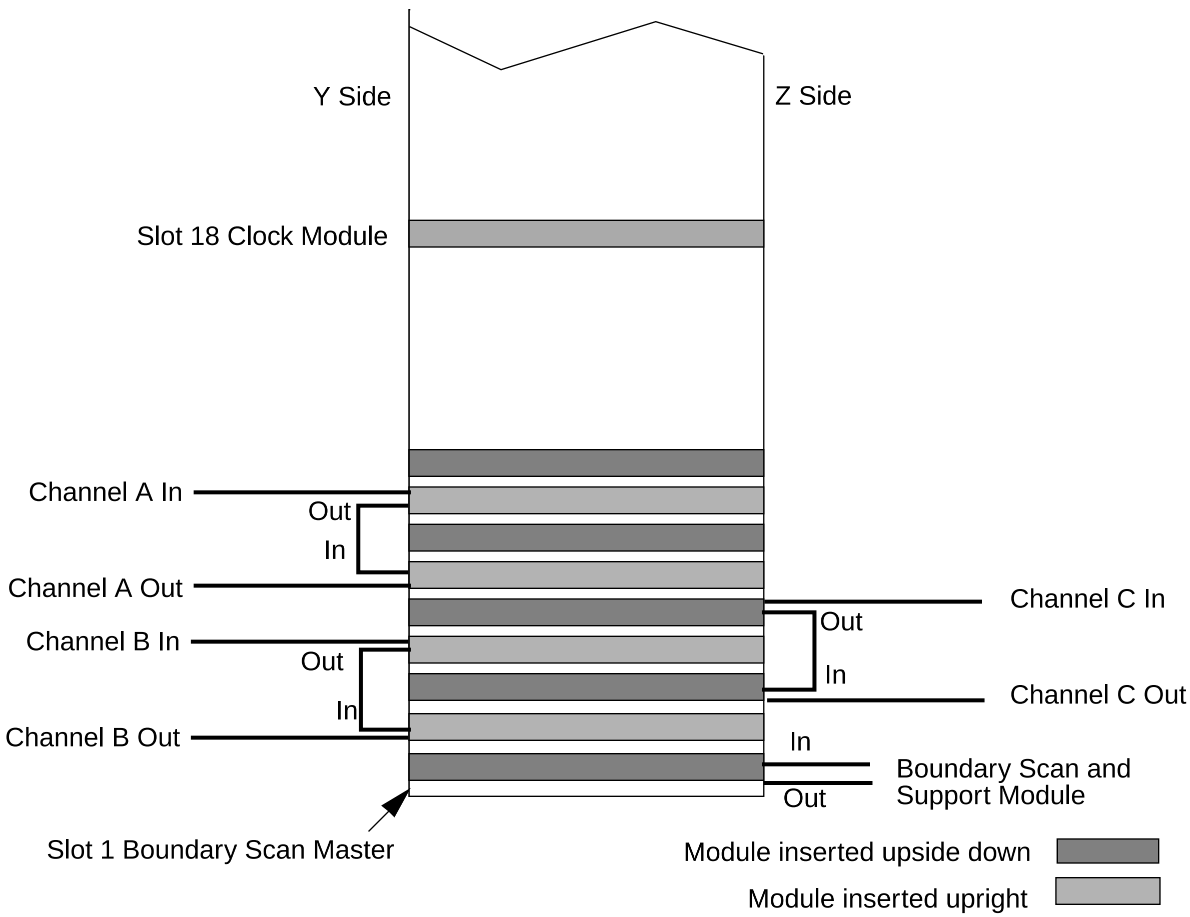
P1 Pin	P2 Pin	P1 Pin	P2 Pin	P1 Pin	P2	P1 Pin	P2 Pin
1	56	21	8’	41	Ground	61	53
2	56’	22	55	42	54	62	53’
3	52	23	55’	43	54’	63	45
4	52’	24	51	44	46	64	45’
5	44	25	51’	45	46’	65	Ground
6	44’	26	43	46	42	66	41
7	40	27	43’	47	42’	67	41’
8	40’	28	39	48	38	68	37
9	Ground	29	39’	49	38’	69	37’
10	30	30	35	50	36	70	29
11	30’	31	35’	51	36’	71	29’
12	26	32	Ground	52	28	72	27
13	26’	33	25	53	28’	73	27’
14	22	34	25’	54	24	74	21
15	22’	35	23	55	24’	75	21’
16	20	36	23’	56	Ground	76	13
17	20’	37	19	57	14	77	13’
18	12	38	19’	58	14’	78	9
19	12’	39	11	59	57	79	9’
20	8	40	11’	60	57’	80	Ground

Cabling Connections

The LC cabinet can have many variations of GigaRing connections; it is not possible to show all variations. Therefore, Figure 23 shows one possible GigaRing configuration for a 64-PE node system. In this example, the boundary scan master connects on a separate ring with a multipurpose node (MPN).

The example also shows that channels are configured between modules in slots 2 and 4 (channel B), 6 and 8 (channel A), and 3 and 5 (channel C). Modules in slots 7 and 9 do not have an external GigaRing connection.

Figure 23. GigaRing Channel Connections



The cable connections for the Z-side channels are shown in Figure 24. For clarity, only the bottom portion of the bulkheads is shown.

Figure 24. GigaRing Cabling

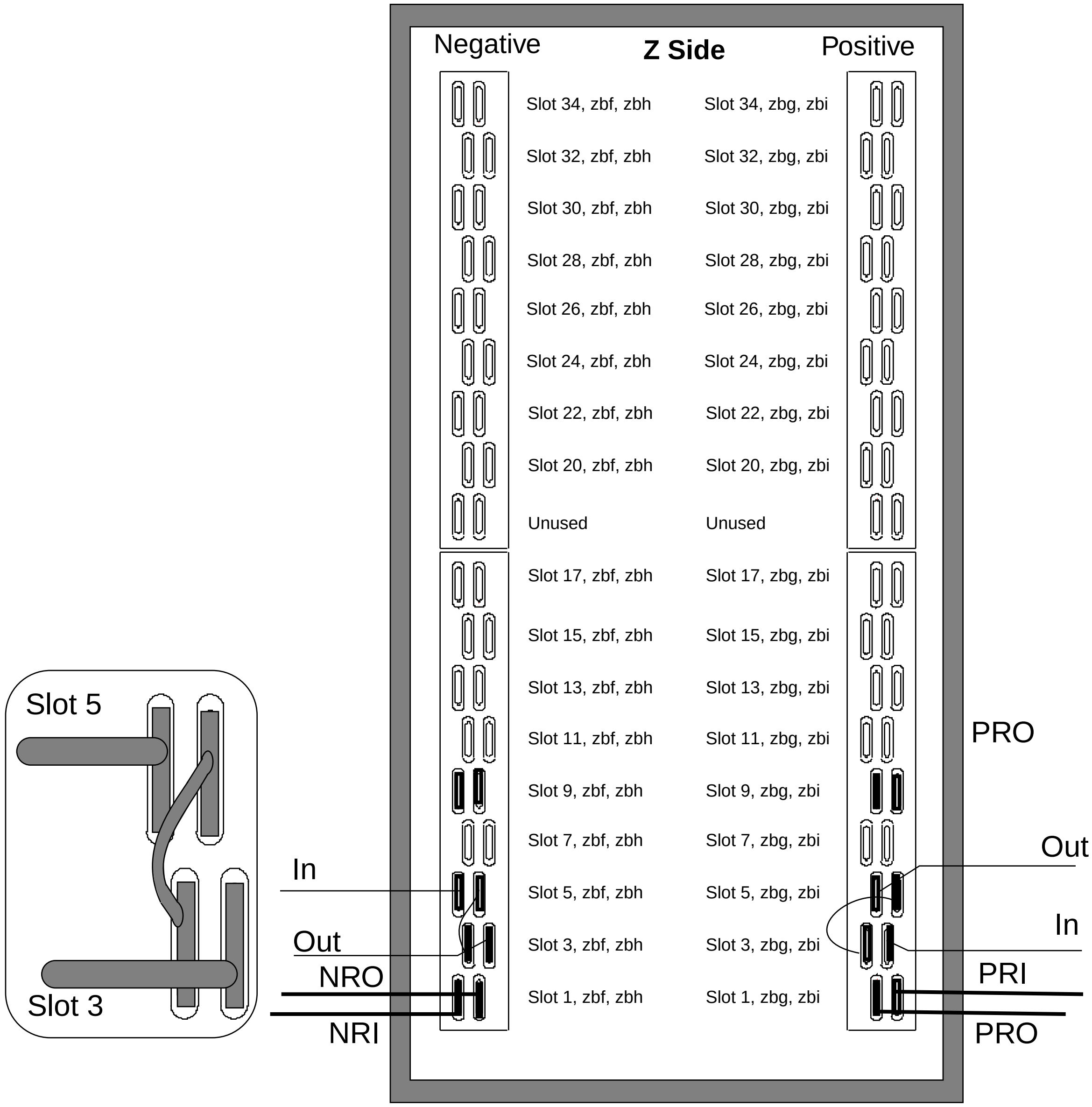


Table 9 and Table 10 list the GigaRing cables, part numbers, and lengths.

Table 9. Flat GigaRing Cables

Flat Cable	Part Number	Length
Rail-to-bulkhead	15200501	18 in. (46 cm)
Bulkhead-to-bulkhead	13296700	0.5 meter
Bulkhead-to-bulkhead	13296701	0.8 meter
Bulkhead-to-bulkhead	13296801	4 meter
Bulkhead-to-external	13296800	11 meter
Loopback adapter board	15255500	

Table 10. Round GigaRing Cables

Round Cable	Part Number	Length
Rail-to-bulkhead	15200501	18 in. (46 cm)
Bulkhead-to-bulkhead	13334600	0.5 meter
Bulkhead-to-bulkhead	13334601	1 meter
Bulkhead-to-bulkhead	13334602	2 meter
Bulkhead-to-bulkhead	35746901	4 meter
Bulkhead-to-external	35746900	11 meter
Loopback adapter board	15255500	

Early systems and optional configurations with more than 32 customer GigaRing channels use the loopback adapter board. The GigaRing rail-to-bulkhead cables loop back-to-back in the wiremat area, instead of at the bulkhead.

Clock Cabling

The clock module, located in slot 18, fans out three clock signals:

- Master clock or system clock
- GigaRing node clock
- Boundary scan and test clock

System Clock Signal

Master clock or system clock signals originate on the clock module and are controlled by the margin switches (located on the WACS access panel door in the power distribution box of chassis 0). The normal clock speed is 13.3 nsec. Clock margins are selectable by margin switches; clock margin speeds are listed in Table 11 with their switch settings.

Table 11. Clock Margin Switches

Switch S1	Switch S0	Speed
0	0	Slow
0	1	Normal
1	0	Fast
1	1	Coax (external)

The clock module in cabinet 0 is referred to as the *master clock* and it fans out a copy of the master clock signal to all other cabinet clock modules. The master clock module creates eight copies of the signal, one for each cabinet. From the clock module in cabinet 0, a 14-ft (4.26 meter) wire connects to each additional LC cabinet. To maintain synchronization with the other cabinets, cabinet 0 also uses the same 14-ft wire. Figure 25 shows the fanout of the master clock signal for an 8-cabinet system; Table 12 lists the source and destination locations for Master Clock signal fanout.

NOTE: In LC system configurations of 5, 6, 7, or 8 cabinets, a 24-ft (7.3 meter) wire replaces all 14-ft. clock wires.

Figure 25. Master Clock Signal Fanout

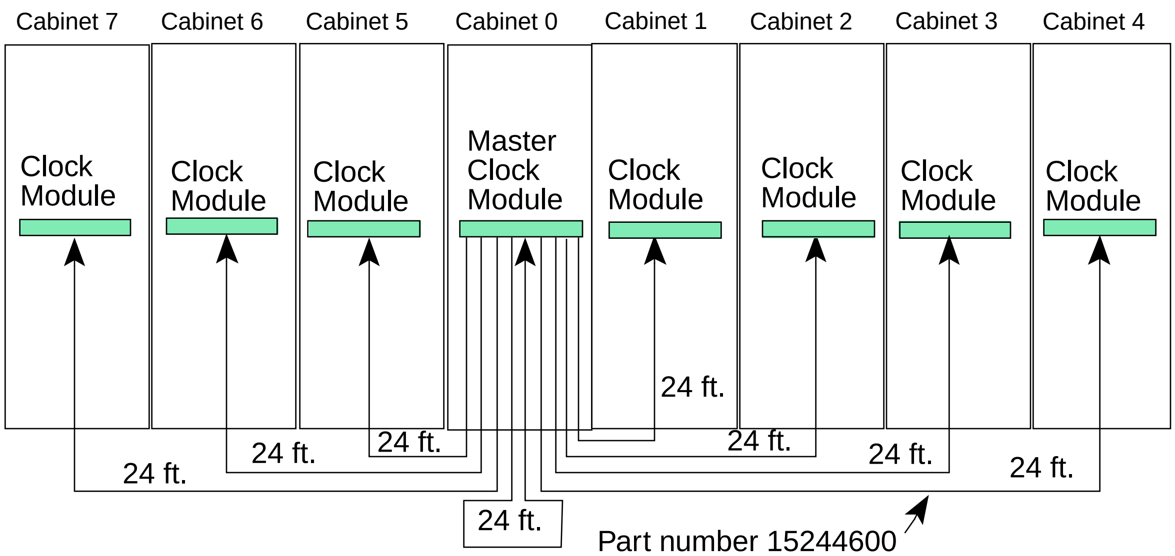


Table 12. Master Clock Signal Fanout

Source slot-conn/pin	Destination slot-conn/pin	Description
018-zai04	018-zah03	Master Clock Fanout - Cabinet 0
018-zai07	118-zah03	Master Clock Fanout - Cabinet 1
018-zai08	218-zah03	Master Clock Fanout - Cabinet 2
018-zai11	318-zah03	Master Clock Fanout - Cabinet 3
018-zai12	418-zah03	Master Clock Fanout - Cabinet 4
018-zai19	518-zah03	Master Clock Fanout - Cabinet 5
018-zai20	618-zah03	Master Clock Fanout - Cabinet 6
018-zai23	718-zah03	Master Clock Fanout - Cabinet 7

After the clock modules receive a copy of the system clock signal, the clock module performs a 1-to-68 fanout to distribute the signal to all PEMs in the LC cabinet. To balance the load, all the lower PCBs of each module slot are wired on the Y side of the cabinet; all the upper PCBs of each module slot are wired on the Z side. Table 13 and Table 14 show the source and destination of the system clock signal for each PEM.

NOTE: All clock fanouts occur via a 120-in. (305-cm) wire, part number 15223701.

Table 13. System Clock Signal - Lower PCBs

Source slot-conn/pin	Destination slot-conn/pin	Description
018-yaf04	001-ybh03	SysClock Fanout to PEM0
018-yaf06	002-ybh03	SysClock Fanout to PEM1
018-yaf08	003-ybh03	SysClock Fanout to PEM2
018-yaf10	004-ybh03	SysClock Fanout to PEM3
018-yaf12	005-ybh03	SysClock Fanout to PEM4
018-yaf14	006-ybh03	SysClock Fanout to PEM5
018-yag03	007-ybh03	SysClock Fanout to PEM6
018-yag04	008-ybh03	SysClock Fanout to PEM7
018-yag06	009-ybh03	SysClock Fanout to PEM8
018-yag08	010-ybh03	SysClock Fanout to PEM9
018-yag10	011-ybh03	SysClock Fanout to PEM10
018-yag11	012-ybh03	SysClock Fanout to PEM11
018-yag13	013-ybh03	SysClock Fanout to PEM12
018-yag14	014-ybh03	SysClock Fanout to PEM13
018-yag19	015-ybh03	SysClock Fanout to PEM14
018-yag20	016-ybh03	SysClock Fanout to PEM15
018-yag22	017-ybh03	SysClock Fanout to PEM16
018-yag23	019-ybh03	SysClock Fanout to PEM17
018-yag24	020-ybh03	SysClock Fanout to PEM18
018-yag26	021-ybh03	SysClock Fanout to PEM19
018-yag28	022-ybh03	SysClock Fanout to PEM20
018-yag29	023-ybh03	SysClock Fanout to PEM21
018-yag30	024-ybh03	SysClock Fanout to PEM22
018-yag35	025-ybh03	SysClock Fanout to PEM23
018-yag38	026-ybh03	SysClock Fanout to PEM24
018-yag39	027-ybh03	SysClock Fanout to PEM25
018-yag42	028-ybh03	SysClock Fanout to PEM26
018-yag44	029-ybh03	SysClock Fanout to PEM27
018-yag46	030-ybh03	SysClock Fanout to PEM28
018-yag52	031-ybh03	SysClock Fanout to PEM29
018-yag54	032-ybh03	SysClock Fanout to PEM30
018-yag56	033-ybh03	SysClock Fanout to PEM31
018-yag60	034-ybh03	SysClock Fanout to PEM32
018-yag62	035-ybh03	SysClock Fanout to PEM33

Table 14. System Clock Signal - Upper PCBs

Source slot-conn/pin	Destination slot-conn/pin	Description
018-zai04	018-zah03	Master System Clock to CKM0 1 - 68 Fanout
018-zai51	018-zah07	Ground Drain
018-zaf51	001-zah03	SysClock Fanout to PEM0
018-zaf54	002-zah03	SysClock Fanout to PEM1
018-zaf55	003-zah03	SysClock Fanout to PEM2
018-zaf58	004-zah03	SysClock Fanout to PEM3
018-zaf60	005-zah03	SysClock Fanout to PEM4
018-zaf61	006-zah03	SysClock Fanout to PEM5
018-zag04	007-zah03	SysClock Fanout to PEM6
018-zag06	008-zah03	SysClock Fanout to PEM7
018-zag08	009-zah03	SysClock Fanout to PEM8
018-zag10	010-zah03	SysClock Fanout to PEM9
018-zag11	011-zah03	SysClock Fanout to PEM10
018-zag13	012-zah03	SysClock Fanout to PEM11
018-zag14	013-zah03	SysClock Fanout to PEM12
018-zag19	014-zah03	SysClock Fanout to PEM13
018-zag20	015-zah03	SysClock Fanout to PEM14
018-zag22	016-zah03	SysClock Fanout to PEM15
018-zag24	017-zah03	SysClock Fanout to PEM16
018-zag26	019-zah03	SysClock Fanout to PEM17
018-zag28	020-zah03	SysClock Fanout to PEM18
018-zag29	021-zah03	SysClock Fanout to PEM19
018-zag30	022-zah03	SysClock Fanout to PEM20
018-zag35	023-zah03	SysClock Fanout to PEM21
018-zag37	024-zah03	SysClock Fanout to PEM22
018-zag38	025-zah03	SysClock Fanout to PEM23
018-zag39	026-zah03	SysClock Fanout to PEM24
018-zag41	027-zah03	SysClock Fanout to PEM25
018-zag43	028-zah03	SysClock Fanout to PEM26
018-zag45	029-zah03	SysClock Fanout to PEM27
018-zag51	030-zah03	SysClock Fanout to PEM28
018-zag53	031-zah03	SysClock Fanout to PEM29
018-zag54	032-zah03	SysClock Fanout to PEM30
018-zag55	033-zah03	SysClock Fanout to PEM31

Table 14. System Clock Signal - Upper PCBs (continued)

Source slot-conn/pin	Destination slot-conn/pin	Description
018-zag58	034-zah03	SysClock Fanout to PEM32
018-zag60	035-zah03	SysClock Fanout to PEM33

GigaRing Clock Signal

The clock module fans out the GigaRing clock signal to each PCB that contains the GigaRing chip. All the lower PCBs of each module slot are wired on the Y side of the cabinet; all upper PCBs of each module slot are wired on the Z side. To facilitate the fanout of the GigaRing clock signal, an additional power supply is installed at location 18 on the Y side of the cabinet. Output wiring from this air-cooled power supply is routed through the wiremat and enters the front of the clock module.

Table 15 and Table 16 list the source and destination connector locations for the GigaRing clock fanout for a standard configuration.

NOTE: All GigaRing clock fanouts are via a 72 in. (183 cm) wire, part number 15224006.

Table 15. GigaRing Clock Signal- Lower PCBs

Source slot-conn/pin	Destination slot-conn/pin	Description
018-zah51	018-yah52	Master GigaRing Clock to CKM0 1 - 68 Fanout
018-yah19	001-ybh07	GigaRing Clock Fanout to PEM0
018-yah20	003-ybh07	GigaRing Clock Fanout to PEM2
018-yah21	005-ybh07	GigaRing Clock Fanout to PEM4
018-yah22	007-ybh07	GigaRing Clock Fanout to PEM6
018-yah23	009-ybh07	GigaRing Clock Fanout to PEM8
018-yah24	011-ybh07	GigaRing Clock Fanout to PEM10
018-yah25	013-ybh07	GigaRing Clock Fanout to PEM12
018-yah26	015-ybh07	GigaRing Clock Fanout to PEM14
018-yah27	017-ybh07	GigaRing Clock Fanout to PEM16
018-yah28	020-ybh07	GigaRing Clock Fanout to PEM18
018-yah29	022-ybh07	GigaRing Clock Fanout to PEM20

Table 15. GigaRing Clock Signal- Lower PCBs (continued)

Source slot-conn/pin	Destination slot-conn/pin	Description
018-yah30	024-ybh07	GigaRing Clock Fanout to PEM22
018-yah35	026-ybh07	GigaRing Clock Fanout to PEM24
018-yah36	028-ybh07	GigaRing Clock Fanout to PEM26
018-yah37	030-ybh07	GigaRing Clock Fanout to PEM28
018-yah38	032-ybh07	GigaRing Clock Fanout to PEM30
018-yah39	034-ybh07	GigaRing Clock Fanout to PEM32

Table 16. GigaRing Clock Signal - Upper PCBs

Source slot-conn/pin	Destination slot-conn/pin	Description
018-zah19	002-zah07	GigaRing Clock Fanout to PEM1
018-zah20	004-zah07	GigaRing Clock Fanout to PEM3
018-zah21	006-zah07	GigaRing Clock Fanout to PEM5
018-zah22	008-zah07	GigaRing Clock Fanout to PEM7
018-zah23	010-zah07	GigaRing Clock Fanout to PEM9
018-zah24	012-zah07	GigaRing Clock Fanout to PEM11
018-zah25	014-zah07	GigaRing Clock Fanout to PEM13
018-zah26	016-zah07	GigaRing Clock Fanout to PEM15
018-zah27	019-zah07	GigaRing Clock Fanout to PEM17
018-zah28	021-zah07	GigaRing Clock Fanout to PEM19
018-zah29	023-zah07	GigaRing Clock Fanout to PEM21
018-zah30	025-zah07	GigaRing Clock Fanout to PEM23
018-zah35	027-zah07	GigaRing Clock Fanout to PEM25
018-zah36	029-zah07	GigaRing Clock Fanout to PEM27
018-zah37	031-zah07	GigaRing Clock Fanout to PEM29
018-zah38	033-zah07	GigaRing Clock Fanout to PEM31
018-zah39	035-zah07	GigaRing Clock Fanout to PEM33

Boundary Scan Clock

The clock module distributes boundary scan signals: clock (TCK) and boundary scan test mode (TMS0, TMS1) to all modules within the LC cabinet. TCK and TMS signals originate on the scan master module, then go to the clock module for distribution. The scan master module is located in slot 1 of cabinet 0.

The clock module in cabinet 0 (CKM0) generates eight copies of the TCK signal, one for each cabinet in a multiple-cabinet configuration.

TMS signals originate on the scan master module and travel via the YBI connector to the clock modules of other cabinets (in a multiple-cabinet configuration). Each clock module receives two copies of the TMS signal. The clock modules then create a 1-to-34 fanout for each signal and fan out that signal throughout the cabinet.

Clock Rails

To aid in future upgrades, all system clock, GigaRing clock, and boundary scan (TCK and TMS) wiring is installed on the clock rails. At the time of an upgrade, service personnel attach the correct wiring to the new rails.

Clock Connector on PCB

The onboard clock connector for each PCB is YAH, a 4-shuttle 64-pin connector. This clock connector receives the system clock, the GigaRing node clock, the scan clock, and the scan test mode signals. The clock connector is also used for the PEM-to-WACS cable connection, the boundary scan cable, and the auxiliary voltage input from the module power supply. Table 17 lists the pin assignments for the clock connector.

Table 17. Clock Connector

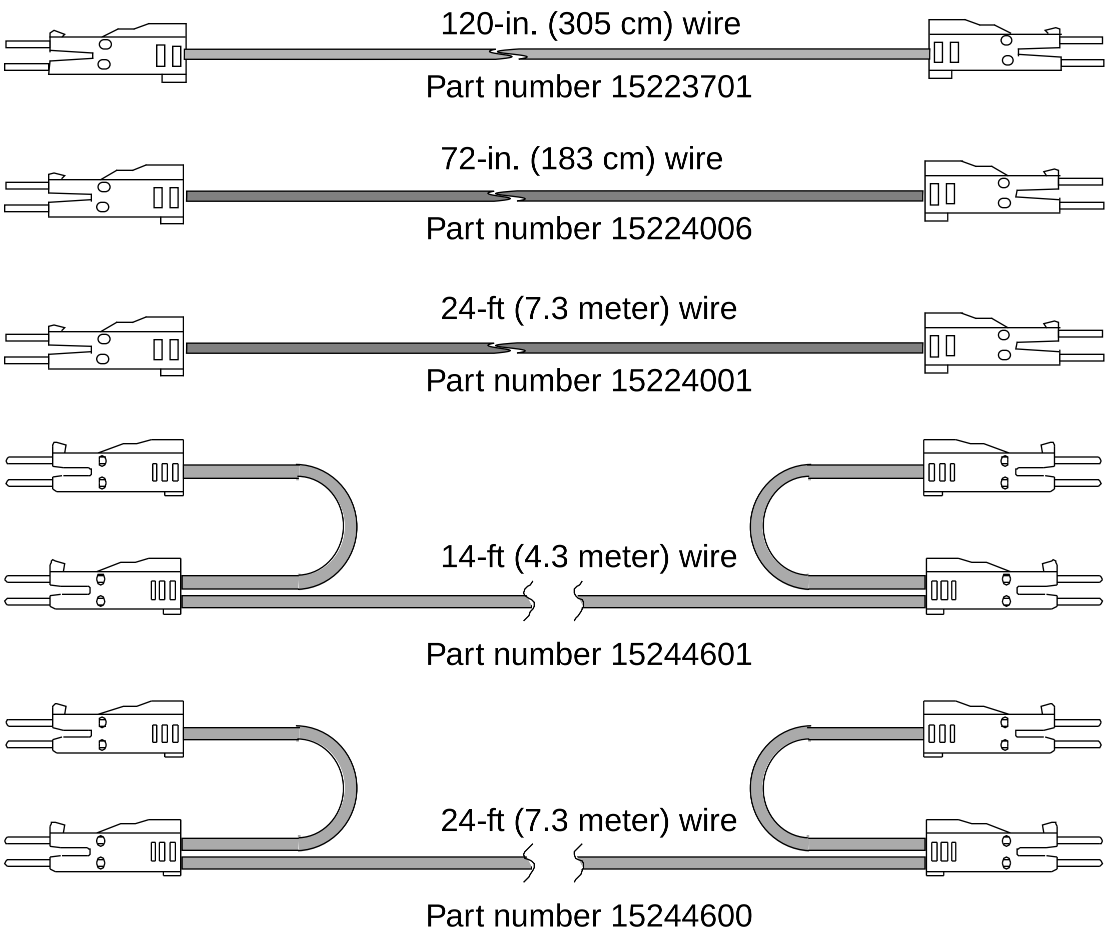
Pin	Signal	Description	Pin	Signal	Description
03	sysclkin	12ns Sysclk In (shielded)	19	sensevcss	Sense VSS
04	vdd	vdd for test vehicle	20	intlok1	Interlock 1
05			21	Therm1p1	Thermistor 1
06	vdd	Landmark Bit 0	22	therm2p1	Thermistor 2
07	scxclkin	6.67ns GigaRing clock In (shielded)	23	sensevss	Meter VSS
08	vdd	Landmark Bit 1	24	intlok2	Interlock 2
09			25	p00tdioden	Node 00 EV5 Tdiode

Table 17. Clock Connector (continued)

Pin	Signal	Description	Pin	Signal	Description
10	vdd	Landmark Bit 2	26	c00tdioden	Node 00 C Tdiode
11			27	r00tdioden	Node 00 R Tdiode
12	auxpos	Reserved for +10V	28	p01tdioden	Node 01 EV5 Tdiode
13	auxpos	Reserved for +10V	29	c01tdioden	Node 01 C Tdiode
14	auxpos	Reserved for +10V	30	r01tdioden	Node 01 R Tdiode
35	p10tdioden	Node 10 EV5 Tdiode	51	tmsmb	SCAN TMSMb
36	c10tdioden	Node 10 C Tdiode	52	tckm	SCAN TCKM
37	r10tdioden	Node 10 R Tdiode	53	tdim	SCAN TDIM
38	p11tdioden	Node 11 EV5 Tdiode	54	tdom	SCAM TDOM
39	c11tdioden	Node 11 C Tdiode	55	tcks	SCAN TCKS
40	r11tdioden	Node 11 R Tdiode	56	repeati	Repeat IN
41	itdioden	I Option Tdiode	57	repeato	Repeat OUT
42	thtdioden	TH Option Tdiode	58	vdd	SCAN Scan_master_enable Module slot 1, B Board, only
43	scxtdioden	GigaRing Option Tdiode	59		
44	vss	Reserved for VSS	60		
45	vss	Reserved for VSS	61	vdd	VDD for Test vehicle
46	vss	Reserved for VSS	62	vdd	VDD for Test vehicle

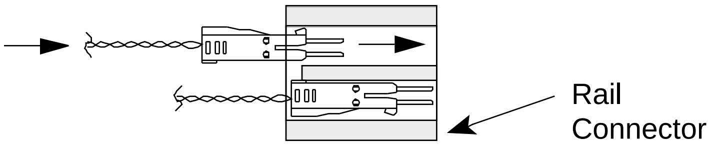
Figure 26 shows the clock wires and their part numbers.

Figure 26. Clock Wires



The connector ends of the wire assemblies plug into the PEM and clock module rail connectors as shown in Figure 27.

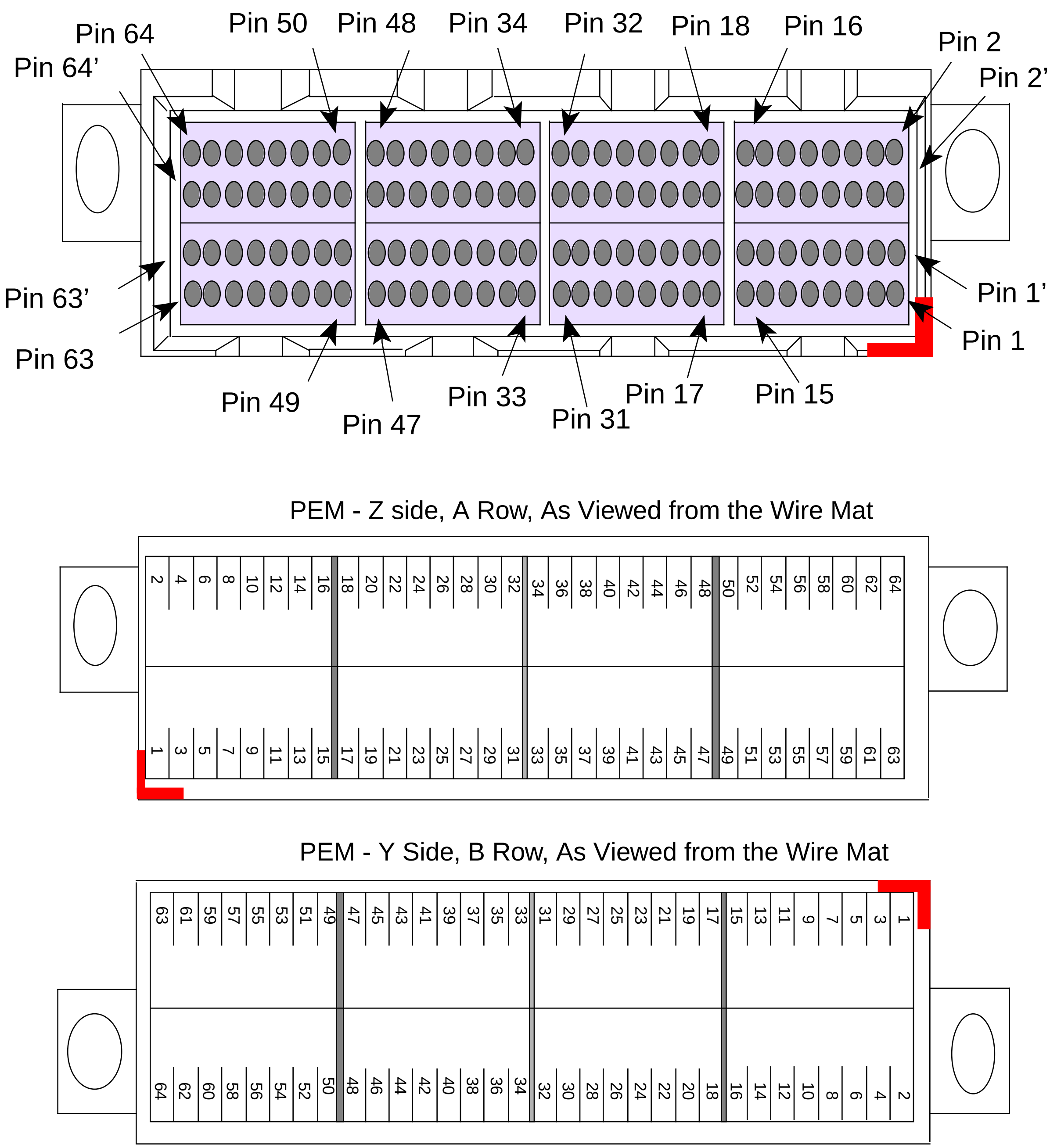
Figure 27. Wire Insertion



Pin Assignments

Figure 28 shows the pin numbering scheme for the clock connector as viewed from the module end and from the wire-insertion end. The view from the wire-insertion end is important because it shows where you must insert the clock wires during upgrades.

Figure 28. Clock Connector - Pin Assignments



Boundary Scan Cabling

The CRAY T3E system uses a boundary scan test to verify the continuity of logical interconnections. In a CRAY T3E LC system, the lower PCB of the PEM in slot 1 of cabinet 0 is designated as the scan master (SM); there is only one scan master in a single- or multiple-cabinet configuration. The Scan Master Enable (SME) signal is created by inserting a jumper across pin 58 of rail connector 001-YBH.

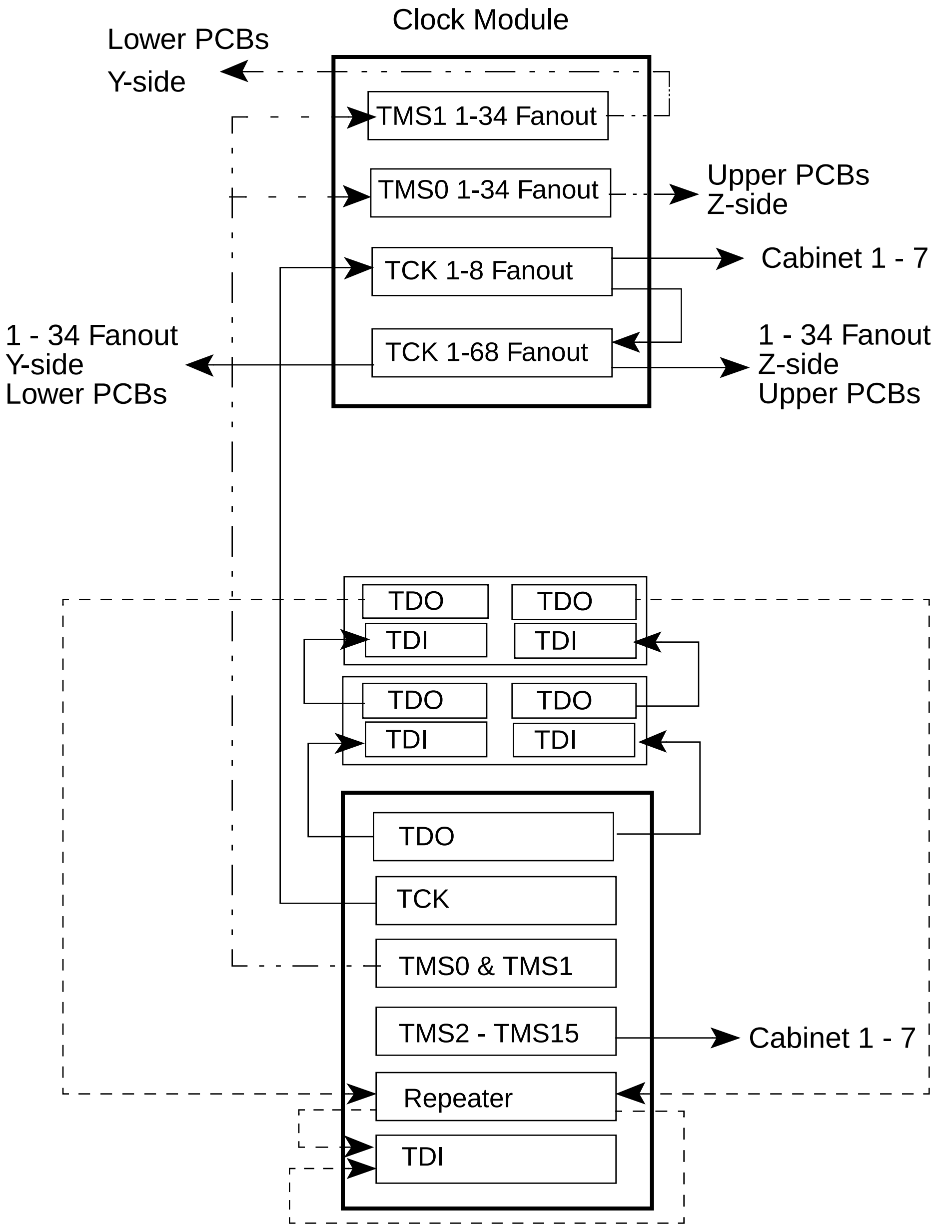
The scan master generates all boundary scan signals. These scan signals are passed to the clock module or other PEMs within the system, where they are fanned out to the other modules in the cabinet. Some of these signals are also passed to adjacent cabinets in a multiple-cabinet system. The signals that the scan master generates include:

- TCK - Test Clock: sent from the scan master to the clock module in chassis 0 for fanout to all clock modules within the system
- TMS - Test Mode Select (16 copies, one for each chain, two per cabinet)
  - Test logic reset
  - Scan operation modes
- TDO - Test Data Out (16 copies, one for each chassis side, two per cabinet)
- TDI - Test Data In (16 copies, one for each chassis side, two per cabinet)
- REPEATO - Repeat Out: used to send signals over a long distance
- REPEATI - Repeat In: used to receive signals over a long distance
- Vdd/SME - Scan Master Enable: jumper for pin 58 of YBH for the module in slot 1 of cabinet 0 (Scan Master)

Scan chains n and n+1 are internal to each cabinet. Their purpose is to daisy chain scan signals TDI and TDO between the modules in the cabinet. Scan chain n daisy chains signals on the Z side of the cabinet between all the upper PCBs of each module. Scan chain n+1 daisy chains signals on the Y side of the cabinet among all the lower PCBs of each module. In a multiple-cabinet system, chains are set for each cabinet: an even-number chain on the Z side, an odd-number chain on the Y side. Each chain starts from the YBI connector of the module in slot 1 of cabinet 0.

The scan master generates TMS signals, one for each chain, and sends those signals to the clock module(s). The scan master also sends the TCK signal to the clock module in chassis 0. The clock module fans out TMS0 and TMS1 (1 to 34 FO) to all PCBs on either the Y side or the Z side. The clock module in chassis 0 fans out TCK to each chassis. The clock module in each chassis then performs a 1-to-68 fanout to all PCBs in the cabinet; refer to Figure 29.

Figure 29. Scan Master Signal Generation



The test data signals require a signal boost because they travel considerable distances between the scan master module and other modules inside the cabinet and other cabinets in a multiple-cabinet system. These signals are fed through repeaters that boost the signal over long distances (refer to Figure 30).

Figure 30. RepeatI and RepeatO Signals

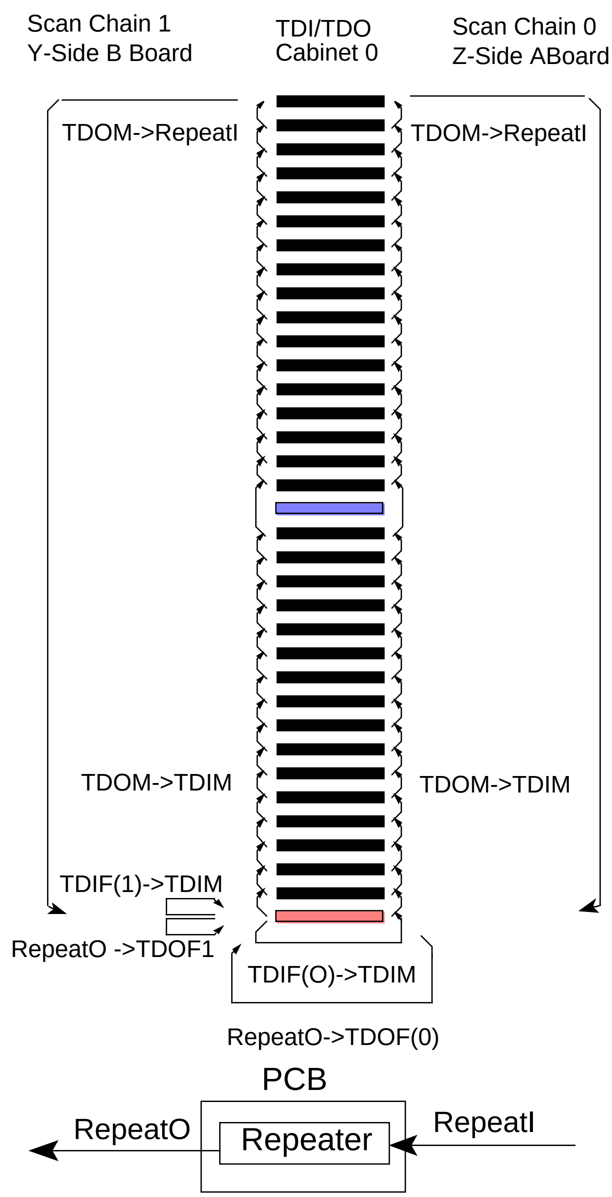


Table 18 lists the three scan signals (TDI, TDO, and TMS) that the scan master generates and their respective pin assignments on the YBI rail connector.

Table 18. Scan Signal Chain - Pin Assignments

	Destination	Source (Scan Master)			Source (CKM0)
Scan Chain	Cabinet	TDI	TDO	TMS	TCK
0 and 1	0	001-ybi 3/4	001-ybi 43/44	001-ybi 23/24	018-zai 42
2 and 3	1	001-ybi 5/6	001-ybi 45/46	001-ybi 25/26	018-zai 41
4 and 5	2	001-ybi 7/8	001-ybi 51/52	001-ybi 27/28	018-zai 40
6 and 7	3	001-ybi 9/10	001-ybi 53/54	001-ybi 29/30	018-zai 39
8 and 9	4	001-ybi 11/12	001-ybi 55/56	001-ybi 35/36	018-zai 38
10 and 11	5	001-ybi 13/14	001-ybi 57/58	001-ybi 37/38	018-zai 37
12 and 13	6	001-ybi 19/20	001-ybi 59/60	001-ybi 39/40	018-zai 36
14 and 15	7	001-ybi 21/22	001-ybi 61/62	001-ybi 41/42	018-zai 35

Table 19 lists the part numbers, lengths, descriptions, and assembly or kit names of the scan cables and wires used in or among LC cabinets.

Table 19. Boundary Scan Cables and Wires

Part Number	Length	Description	Assembly/Kit
15214300	12 in. (31 cm)	Cable Assy, PEM-to-scan Pigtail	Qty. 1 - Rail Assy, PEM
15223701	120 in. (305 cm)	Wire Assy, Clock Internal (100 ohm)	Qty. 1 - Wire Kit, Chassis
15223701 15244600	120 in. (305 cm) 288 in. (732 cm)	Wire Assy, Clock Internal (100ohm) Master System Clock	Qty. 1 - Rail Assy, Clock Z-side Qty. 1 - Slot Kit, Clock
15223802	120 in. (305 cm)	Cable Assy, Scan Jumper	Qty. 2 - Wire Kit, Chassis
15223900	2 in. (5 cm)	Wire Assy, Termination (VDD / SME)	Qty. 1 - Wire Kit, Chassis
15224008	120 in. (305 cm)	Wire Assy, Edge-to-edge	Qty. 2 - Wire Kit, Chassis
15237601	120 in. (305 cm)	Cable Assy, Edge-to-pigtail, 2-position Socket	Qty. 2 - Wire Kit, Chassis
15237700	48 in. (122 cm)	Cable Assy, Edge-to-pigtail, 4-position Pin	Qty. 34 - Rail Assy. Y-side Qty. 34 - Rail Assy. Z-side
15224001	288 in. (732 cm)	Wire Assy, Clock Internal (100 ohm) TCK Fanout	Qty. Determined by the number of cabinets in the system.

Table 19. Boundary Scan Cables and Wires (continued)

Part Number	Length	Description	Assembly/Kit
15237801	120 in. (305 cm)	Cable Assy, Edge-to-pigtail, 2-position Pin	Qty. 2 - Wire Kit, Chassis
15223802	120 in.	Cable Assy, Scan Jumper	Qty. 11 - Wire Kit, Chassis 2-7
15237601	120 in.	Cable Assy, Edge-to-pigtail, 2-position Socket	Qty. 2 - Wire Kit, Chassis 2-7
15237801	120 in.	Cable Assy, Edge-to-pigtail, 2-position Pin	Qty. 2 - Wire Kit, Chassis 2-7

Every rail assembly contains the PEM-to-scan cable, P/N 15214300. The cable assembly contains 5 plug-in connectors (sockets and pins). The connector wires are color coded at the connector end for ease of identification. Refer to Figure 31 and Table 20 for color definitions and signal identification.

Figure 31. PEM-to-scan Cable (P/N 15214300)

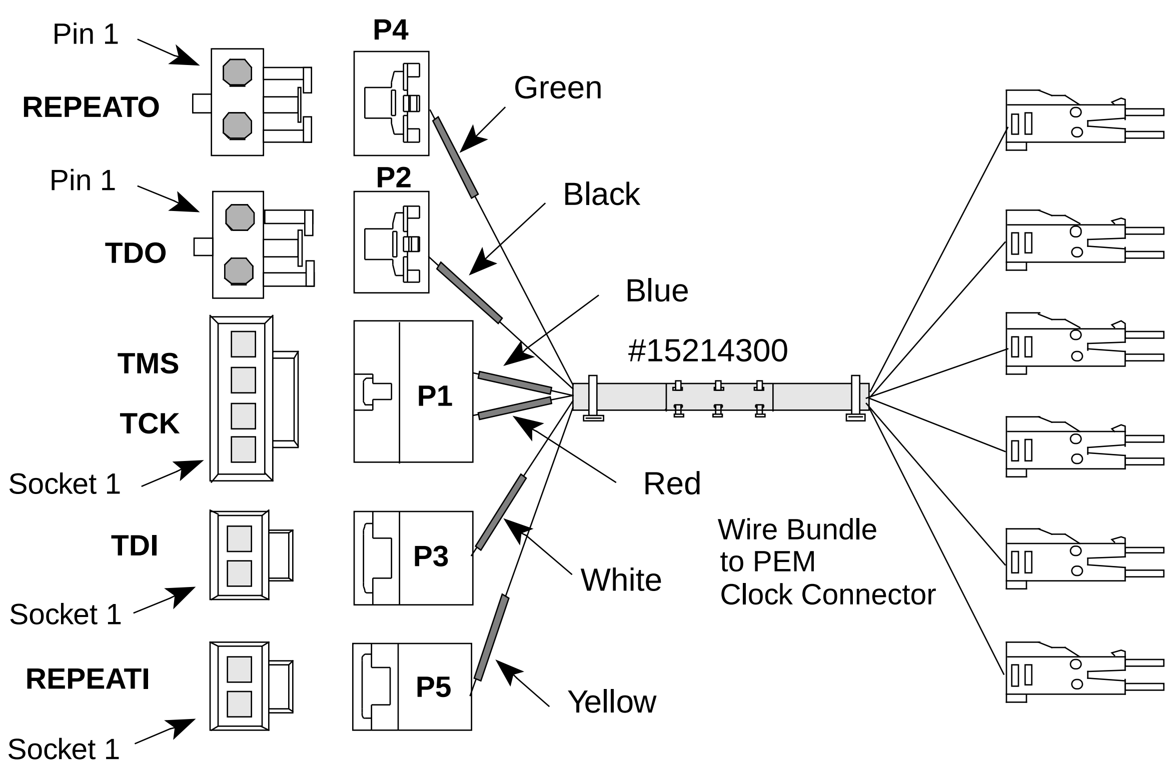


Table 20. PEM-to-scan Cable Connections

Connector	Wire Color	Signal	Notes
P1	Red	TCK	Fanout of TCK and TMS from the clock module to each PCB via cable p/n 15237700
	Blue	TMS	
P2	Black	TDO	Support daisy chained scan data signals between PCBs
P3	White	TDI	
P4	Green	RepeatO	Support feedback of TDOM over longer distances
P5	Yellow	RepeatI	

The other scan cables and wires are shown in Figure 32. The wire used in the CRAY T3E LC cabinet is 34 AWG. Figure 33 shows the pin connection to the rail connector. For clarity, other rail connectors are not shown.

Figure 32. Scan Cables

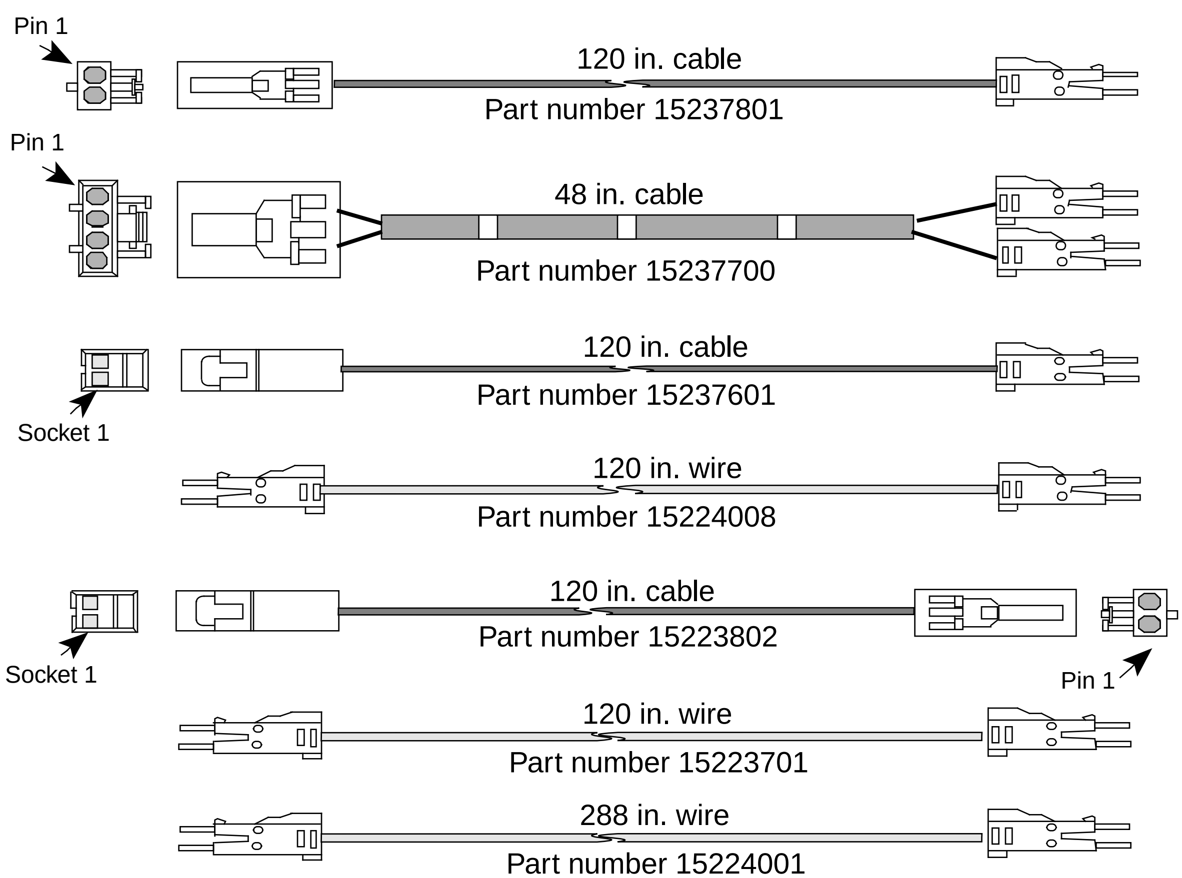
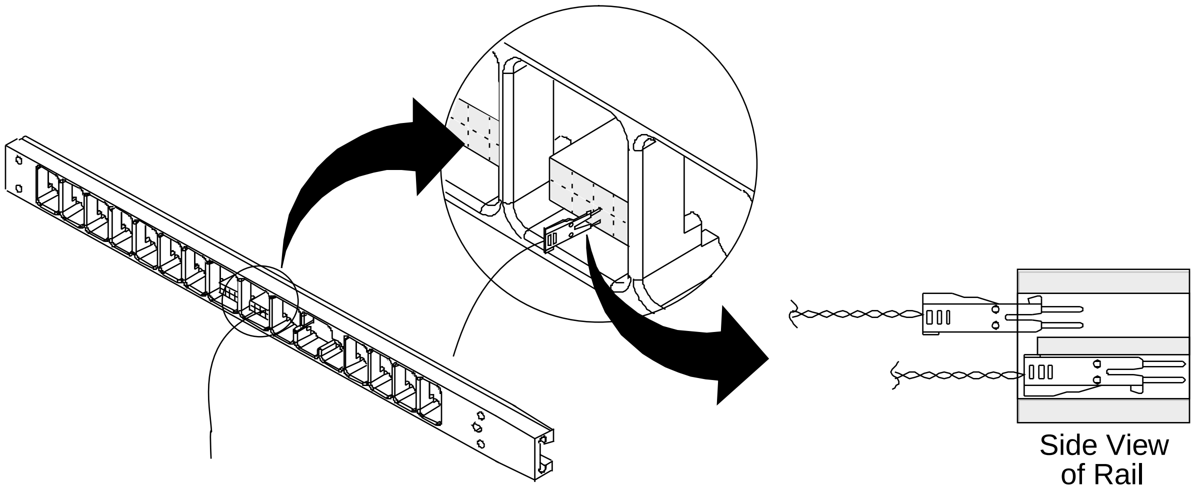


Figure 33. Scan Wire-to-rail Connection

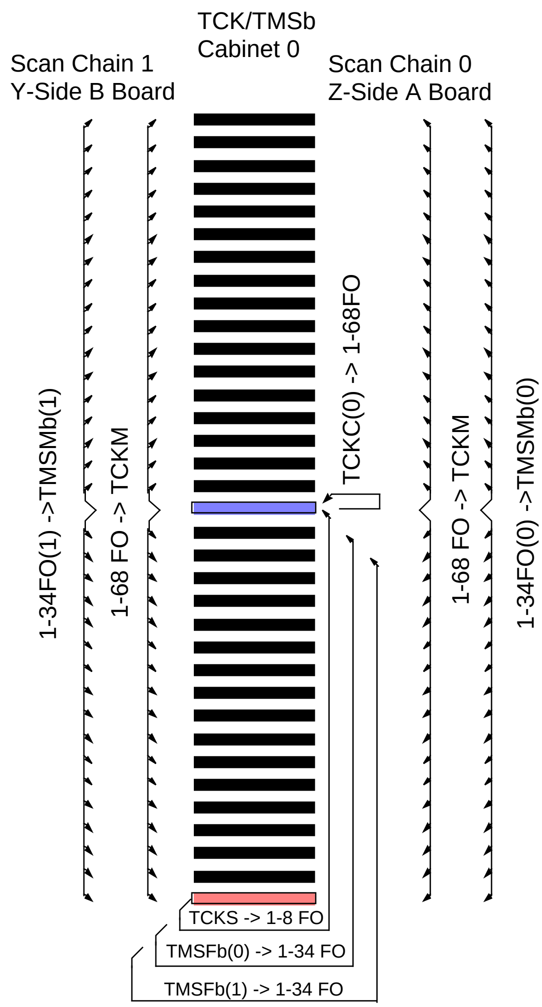


The scan master sends three signals directly to the clock module: TCK, TMS0, and TMS1. The clock module makes 8 copies of the TCK signal. Each copy is sent to an LC cabinet in a multiple-cabinet configuration. Cabinet 0 uses one of the fanout signals to create a 1-to-68 fanout. The clock module generates a 1-to-34 fanout for the TMS0 and TMS1 signals. Refer to Table 21 for connector and pin locations. Figure 34 shows the fanouts.

Table 21. Scan Master Signals

Source		Destination	Signal Description
Slot / Conn / Pin	Wire P/N	Slot / Conn / Pin	
001-ybh58	15223900		Vdd - Scan Master Enable
001-ybh55	15223701	018-zai46	TCKS > 1-8 TCK FO
018-zai42	15223701	018-zaf46	TCKC[0] > 1-68 TCK FO (single chassis only)
018-zai42	15244600	018-zaf46	TCK[0] > 1-68 TCK FO
018-zai59	gnd drain	018-zah14	(2 or more chassis)
001-ybi23	15224008	018-zae61	TMSFb[0] > 1-34 TMS FO
001-ybi24	15224008	018-zae62	TMSFb[1] > 1-34 TMS FO

Figure 34. TCK and TMS Fanout



The standard or smallest CRAY T3E LC system configuration contains 5 PEMs (4 user modules and 1 support module). Table 22 through Table 26 list the scan cabling for this system configuration; the cable connections are shown in Figure 35. Figure 36 defines the engineering specification documentation.

Figure 35. Boundary Scan Cabling

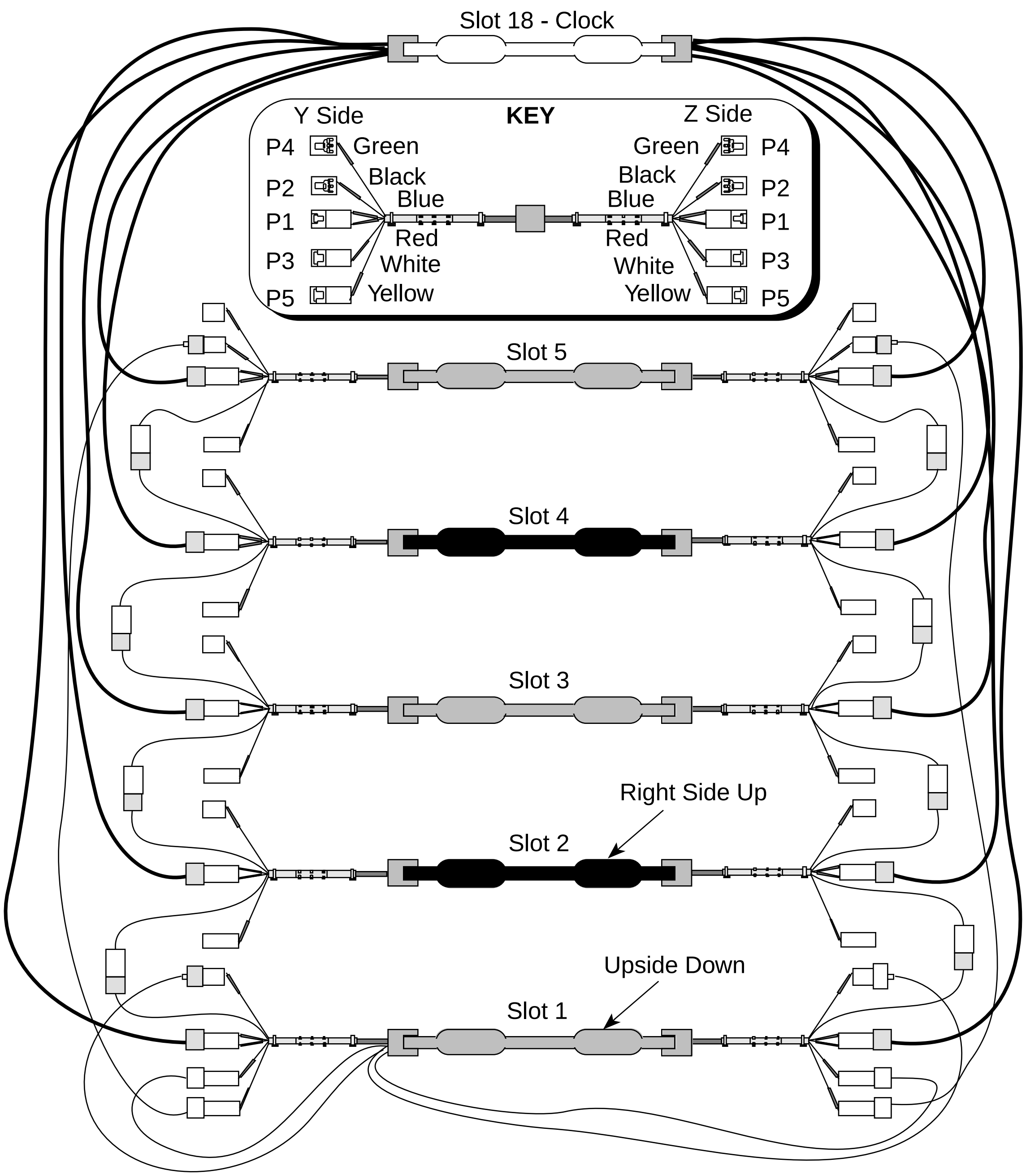


Figure 36. Boundary Scan Engineering Specification

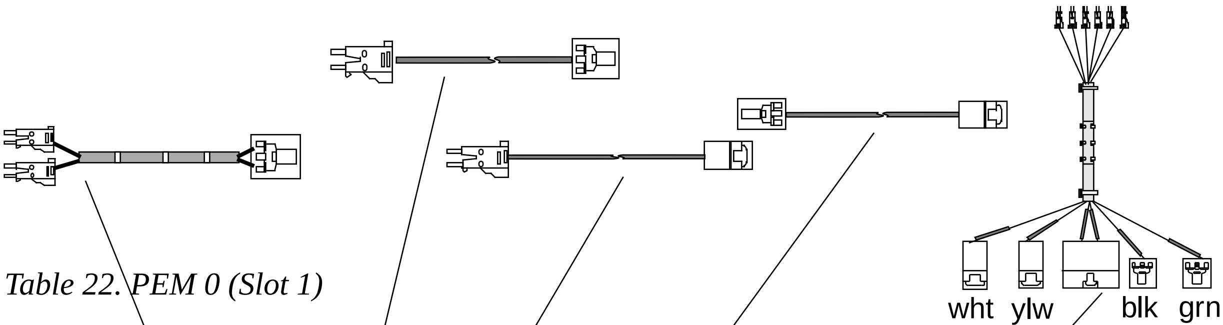


Table 22. PEM 0 (Slot 1)

Source: Slot / Conn / Pin	Source: Wire P/N and Color	Intermediate Wire P/N and Color	Destination: Slot / Conn / Pin	Destination: Wire P/N and Color	Signal Description
018-zaf44	15237700		001-zah52	15214300, red	1-68 TCK FO > TCKM
018-zae55	“		001-zah51	blue	1-34 TMS FO > TBSMb
002-zah53	15214300,wht		001-zah54	black	REPEATI < TDOM [2]
001-ybi03	15237801		001-zah53	white	TDIF[0] > TDIM [1]
001-ybi43	15237601		001-zah57	green	TDOF[0] < REPEATO [1]
005-zah54	15214300,blk	15223802	001-zah56	yellow	REPEATI
018-yaf62	15237700		001-ybh52	15214300, red	1-68 TCK FO > TCKM
018-yae62	“		001-ybh51	blu	1-34 TMS FO > TBSMb
002-ybh53	15214300,wht		001-ybh54	blk	REPEATI < TDOM [2]
001-ybi04	15237801		001-ybh53	wht	TDIF[1] > TDIM
001-ybi44	15237601		001-ybh57	grn	TDOF[1] < REPEATO
005-ybh54	15214300,blk	15223802	001-ybh56	ylw	REPEATI

This column lists the part numbers of the wires and cables.

This column lists the destination cable connectors of the PEM-to-scan cable.

This column lists the source pin locations. One end plugs into the rail(s) at the locations listed above.

This column lists the destination pin locations. One end plugs into the rail(s) at the locations listed above.

This column lists the names of the signals present on each wire or cable.

This column lists any intermediate wires required and their part numbers.

Refer to the cable/wire diagrams for a description of the wire or cable identified.

Table 23. PEM 1 (Slot 2)

Source		Intermediate Wire P/N and Color	Destination		Signal Description
Slot / Conn / Pin	Wire P/N and Color		Slot / Conn / Pin	Wire P/N and Color	
018-zaf43	15237700 P2		002-zah52	15214300, red	1-68 TCK FO > TCKM
018-zae54	P3		002-zah51	blu	1-34 TMS FO > TBSMb
003-zah53	15214300,wht		002-zah54	blk	REPEATI < TDOM
001-zah54	15214300, blk		002-zah53	wht	TDOM > TDIM
018-yaf61	15237700 P2		002-ybh52	15214300, red	1-68 TCK FO > TCKM
018-yae61	P3		002-ybh51	blu	1-34 TMS FO > TBSMb
003-ybh53	15214300,wht		002-ybh54	blk	REPEATI < TDOM
001-ybh54	15214300, blk		002-ybh53	wht	TDOM > TDIM

Table 24. PEM 2 (Slot 3)

Source		Intermediate Wire P/N and Color	Destination		Signal Description
Slot / Conn / Pin	Wire P/N and Color		Slot / Conn / Pin	Wire P/N and Color	
018-zaf42	15237700 P2		003-zah52	15214300, red	1-68 TCK FO > TCKM
018-zae53	P3		003-zah51	blu	1-34 TMS FO > TBSMb
004-zah53	15214300,wht		003-zah54	blk	REPEATI < TDOM
002-zah54	15214300, blk		003-zah53	wht	TDOM > TDIM
018-yaf60	15237700 P2		003-ybh52	15214300, red	1-68 TCK FO > TCKM
018-yae60	P3		003-ybh51	blu	1-34 TMS FO > TBSMb
004-ybh53	15214300,wht		003-ybh54	blk	REPEATI < TDOM
002-ybh54	15214300, blk		003-ybh53	wht	TDOM > TDIM

Table 25. PEM 3 (Slot 4)

Source		Intermediate Wire P/N and Color	Destination		Signal Description
Slot / Conn / Pin	Wire P/N and Color		Slot / Conn / Pin	Wire P/N and Color	
018-zaf41	15237700 P2		004-zah52	15214300, red	1-68 TCK FO > TCKM
018-zae52	P3		004-zah51	blu	1-34 TMS FO > TBSMb
005-zah53	15214300,wht		004-zah54	blk	REPEATI < TDOM
003-zah54	15214300, blk		004-zah53	wht	TDOM > TDIM
018-yaf59	15237700 P2		004-ybh52	15214300, red	1-68 TCK FO > TCKM
018-yae59	P3		004-ybh51	blu	1-34 TMS FO > TBSMb
005-ybh53	15214300,wht		004-ybh54	blk	REPEATI < TDOM
003-ybh54	15214300, blk		004-ybh53	wht	TDOM > TDIM

Table 26. PEM 4 (Slot 5)

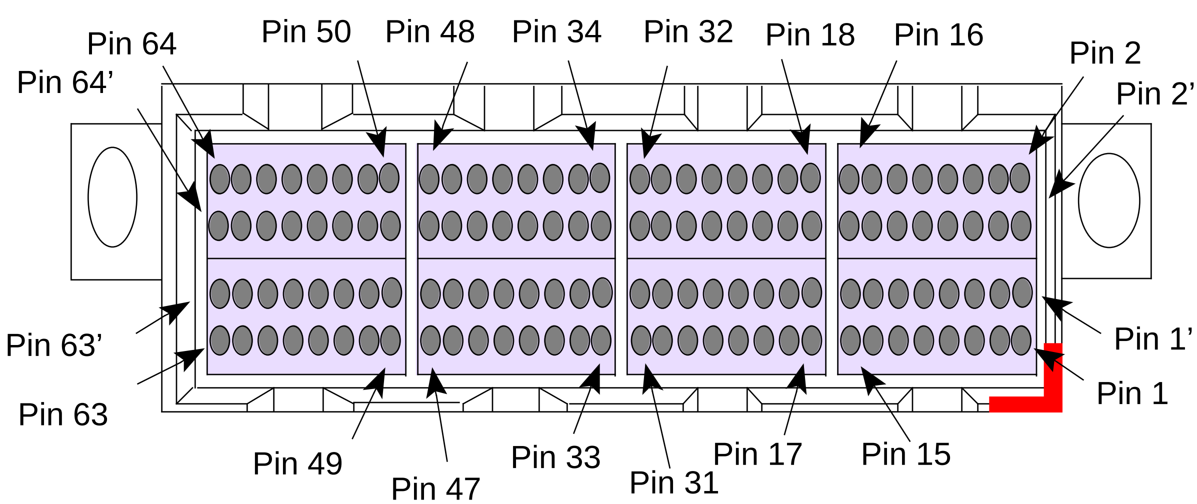
Source		Intermediate Wire P/N and Color	Destination		Signal Description
Slot / Conn / Pin	Wire P/N and Color		Slot / Conn / Pin	Wire P/N and Color	
018-zaf40	15237700		005-zah52	15214300, red	1-68 TCK FO > TCKM
018-zae51	"		005-zah51	blu	1-34 TMS FO > TBSMb
001-zah56	15214300, ylw	15223802	005-zah54	blk	REPEATI < TDOM
004-zah54	15214300, blk		005-zah53	wht	TDOM > TDIM
018-yaf58	15237700		005-ybh52	15214300, red	1-68 TCK FO > TCKM
018-yae58	"		005-ybh51	blu	1-34 TMS FO > TBSMb
001-ybh56	15214300, ylw	15223802	005-ybh54	blk	REPEATI < TDOM
004-ybh54	15214300, blk		005-ybh53	wht	TDOM > TDIM

Scan Connector on PCB

Every PCB has a scan connector. However, only the YBI connector in slot 1 is fully utilized. Most of the boundary scan cables and wires plug into the 4-shuttle PEM clock connector.

Figure 37 shows the clock and scan connector. Both connectors are 64-pin 4-shuttle connectors.

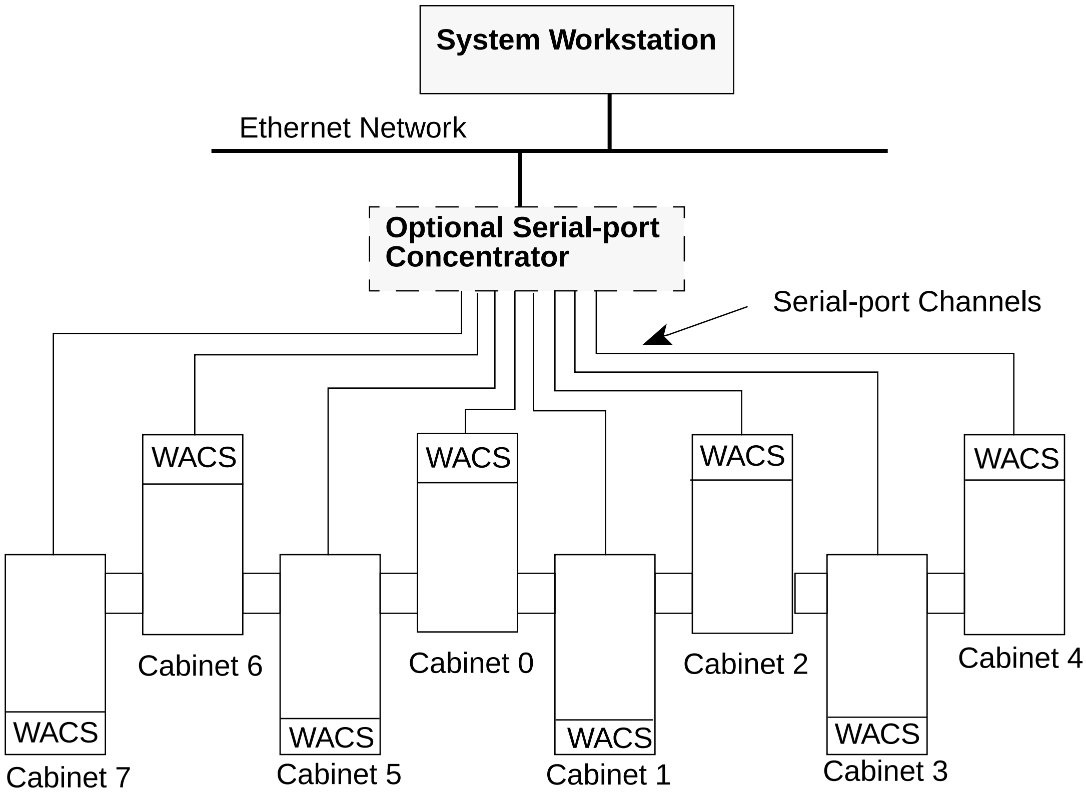
Figure 37. Scan and Clock Connector



WACS Cabling

Each CRAY T3E LC cabinet has a self-contained WACS. The WACS in each cabinet may connect to the system workstation (SWS) in one of two ways: through an RS-232 serial-port connection directly to the SWS or through a serial-port-to-Ethernet concentrator. The scanner on the maintenance monitoring system board (MMS) is responsible for the LC cabinet WACS-to-SWS communication; refer to Figure 38.

Figure 38. WACS-to-SWS Connection



Interconnect Board

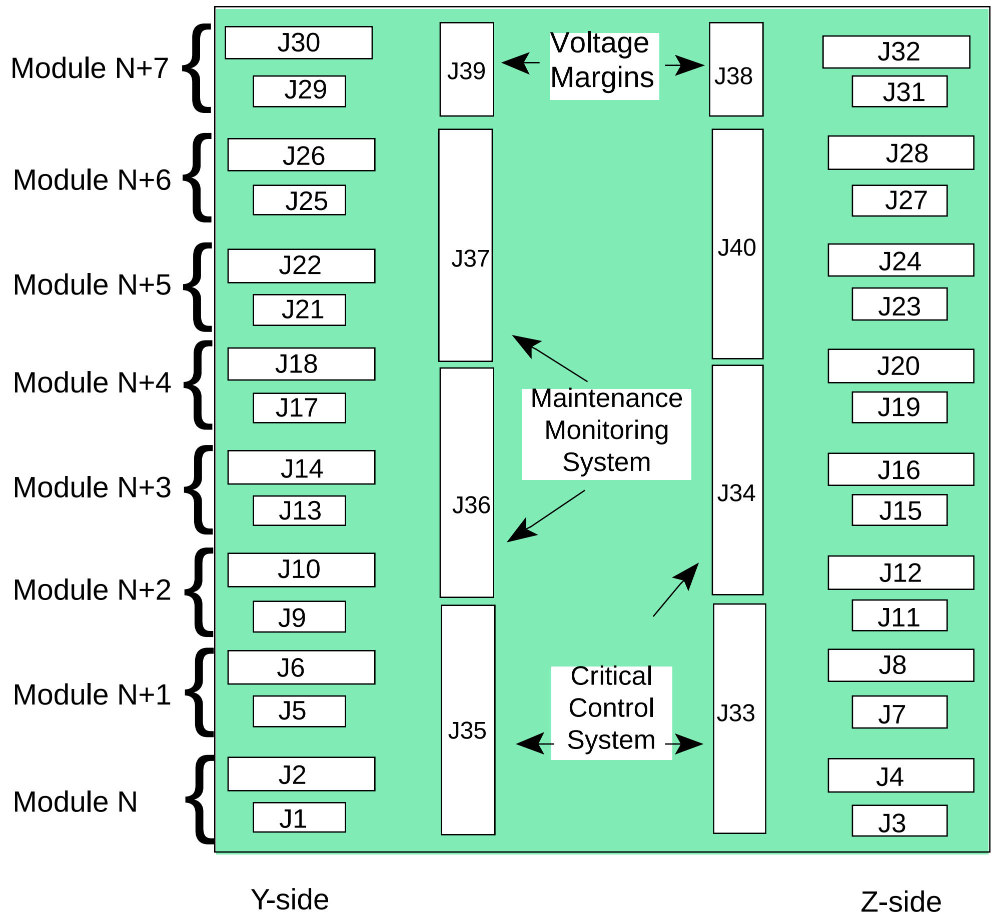
Five interconnect boards reside within the LC cabinet. These boards are located on the back of the power distribution box. The interconnect board carries communication between the WACS and the module power supplies and between the WACS and the PE and clock modules. The interconnect board contains no logic.

Each interconnect board handles information for up to eight modules in the cabinet and the boards are designated as A36 through A40.

Each interconnect board contains 40 cable connections. Connectors J1 through J32 are used for the module power supplies and the PE and clock modules. The odd-numbered connectors are power supply cable connectors; the even-numbered connectors are used for the PE and clock modules. Connectors J33 through J35 connect to the critical control system (CCS) board. Connectors J36 and J37 connect to the MMS board. Connectors J38 and J39 receive or pass on the voltage margin signals from the margin control board. Connector J40 is not used at this time.

Figure 39 shows the interconnect board and its cable connection locations. The module power supply connections use the DB9 connector (J1, J3, etc.). A 20-pin connector is used for the PCB cables (J2, J4, etc.).

Figure 39. Interconnect Board



NOTE: Interconnect boards are laid out in this manner so that service personnel do not need to criss-cross cables when new modules are installed in the system.

Table 27 lists module slot positions and the power supply connector assignments for each interconnect board.

Table 27. Module Slot-to-Connector Assignments

A36	A37	A38	A39	A40	Bottom-board Power Supply	Bottom PCB	Top-board Power Supply	Top PCB
Module Slot								
1	9	17	25	33	J1	J2	J3	J4
2	10	18	26	34	J5	J6	J7	J8
3	11	19	27	35	J9	J10	J11	J12
4	12	20	28		J13	J14	J15	J16
5	13	21	29		J17	J18	J19	J20
6	14	22	30		J21	J22	J23	J24
7	15	23	31		J25	J26	J27	J28
8	16	24	32		J29	J30	J31	J23

NOTE: There is only one PCB on the clock module.

Each PE, clock module, and module power supply communicates with the WACS. The module power supply contains a 9-pin WACS control cable connection, which connects the power supply directly to an interconnect board, then to the WACS. The PE and clock module cables connect the rail (clock connector) to an internal bulkhead connector. From the bulkhead connector, the cable connects directly to the interconnect board, then to the WACS.

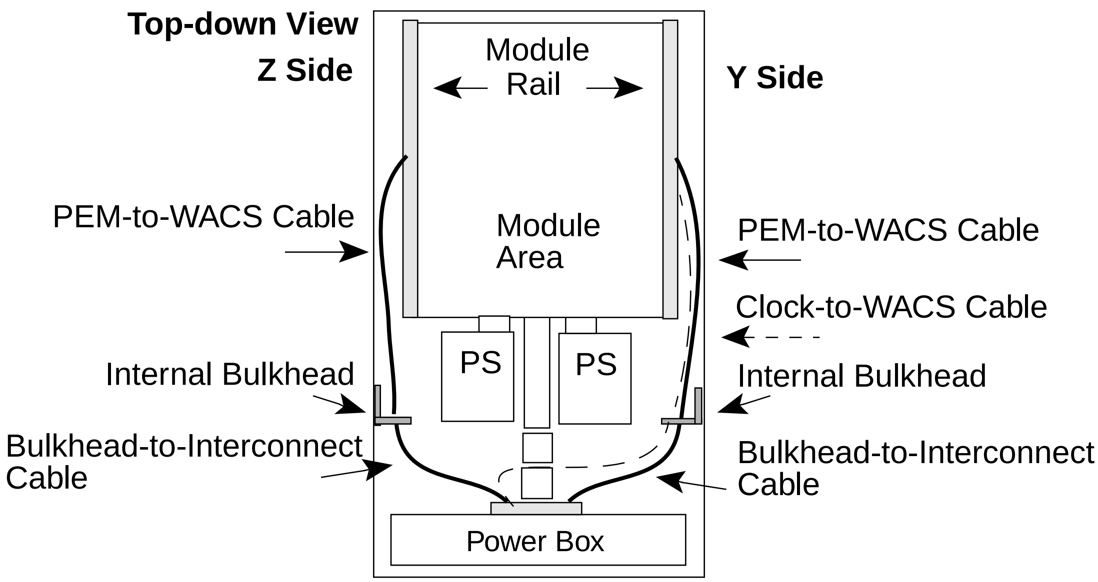
PEM-to-WACS Connection

Each PEM outputs signals to the WACS via the clock connector on the board. Cables connect the clock connector to an internal bulkhead located directly across from the module power supplies on the cabinet frame. From this internal bulkhead, cables connect to the interconnect board. Cables connect both the Y side and Z side of the cabinet.

The PEM-to-WACS cables from each rail attach to the bulkhead with a DB25 connector. You can access the bulkhead wiring through the side door. Cables for installed rails are present when the cabinet is shipped.

Figure 40 and Figure 41 show the PEM-to-WACS connection via the internal bulkheads. This same cabling is also used for the clock-to-WACS connection. The clock-to-WACS cable originates on the Y side of the chassis and passes through the power supply area to the Z-side connector on the interconnect board for slot 18.

Figure 40. WACS Internal Bulkheads



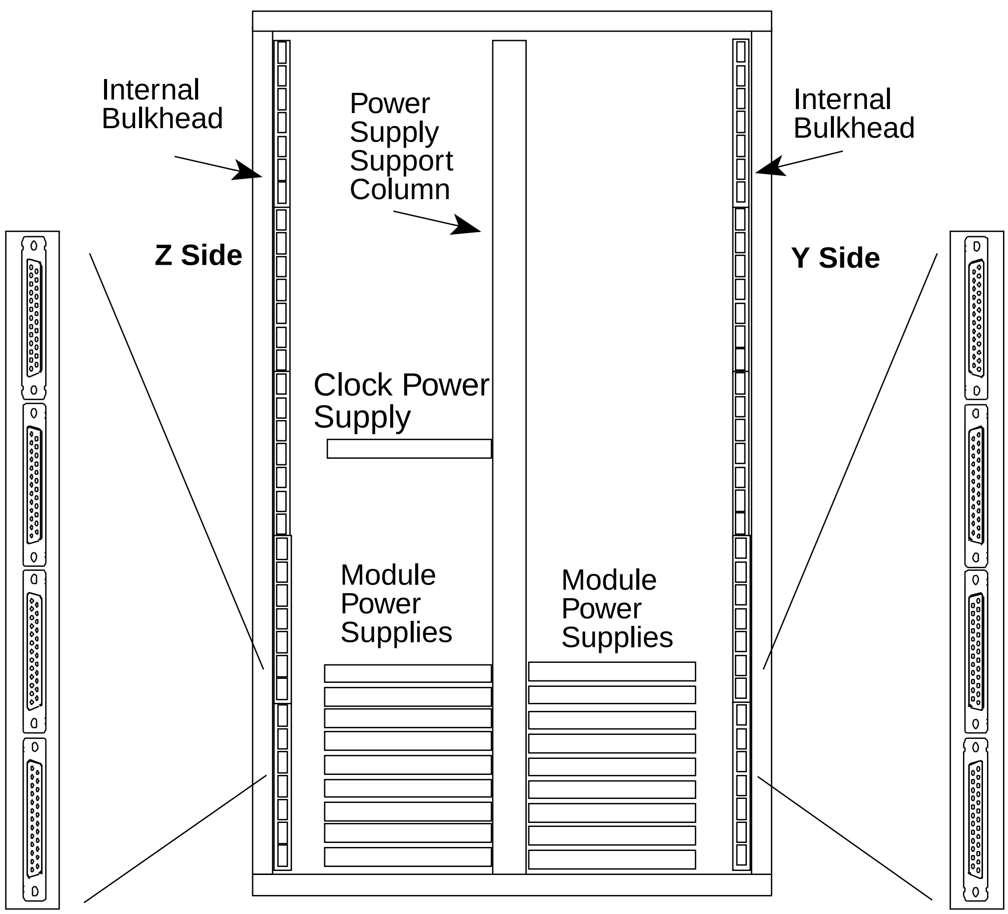


Figure 41. PEM-to-bulkhead-to-interconnect-board Connection

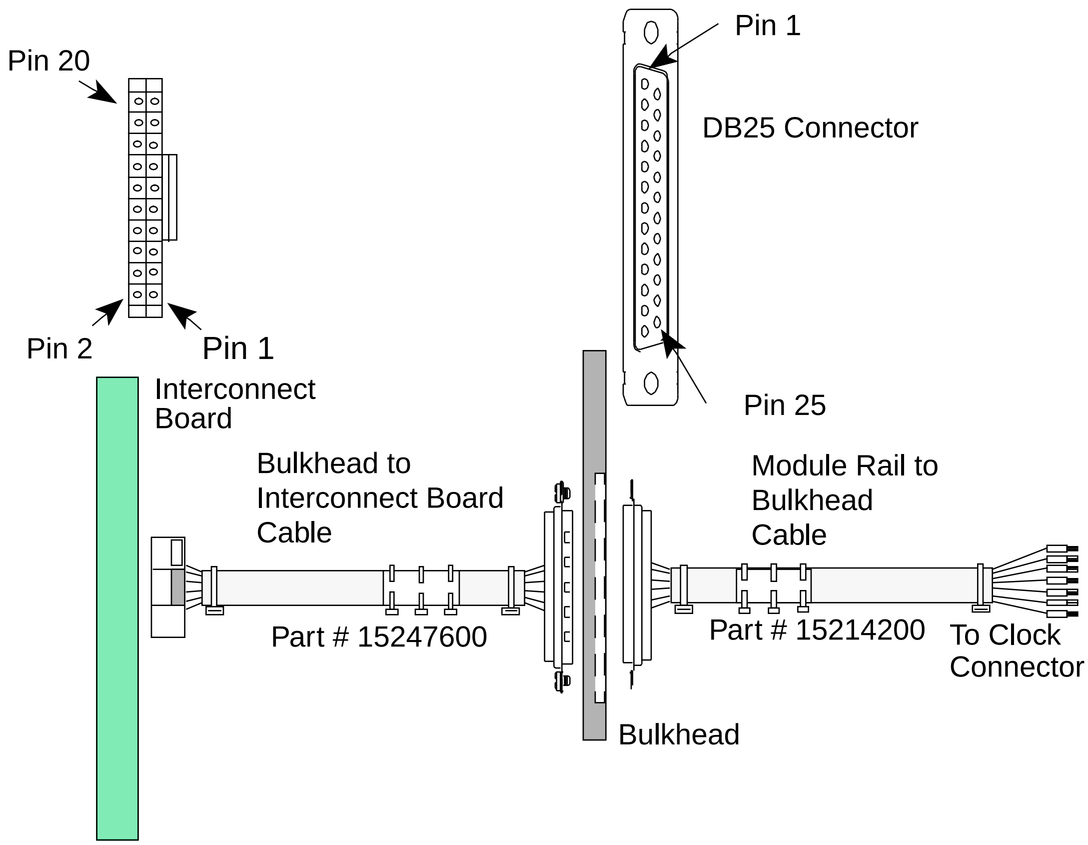


Table 28 lists the cables, part numbers, and locations of WACS control cables within the LC cabinet.

Table 28. WACS Cables

Cable Name	Part Number	Location
Power supply to WACS control	15213600 or 15213601	All module power supplies
PEM-to-WACS	15214200	All rails
PEM Bulkhead-to-Interconnect Board	15247600	All bulkhead openings except clock
Clock-to-WACS	15214200	Clock rail
Clock Bulkhead-to-interconnect board	15247400	Clock bulkhead opening

Power Supply-to-WACS Connection

The module power supply communicates with the WACS and its PCB via a 9-pin cable that connects the power supply and the interconnect board. WACS to PCB communication goes through the interconnect board.

Figure 42 shows the power supply-to-interconnect board cable connection.

Figure 42. Power Supply-to-interconnect-board Connection

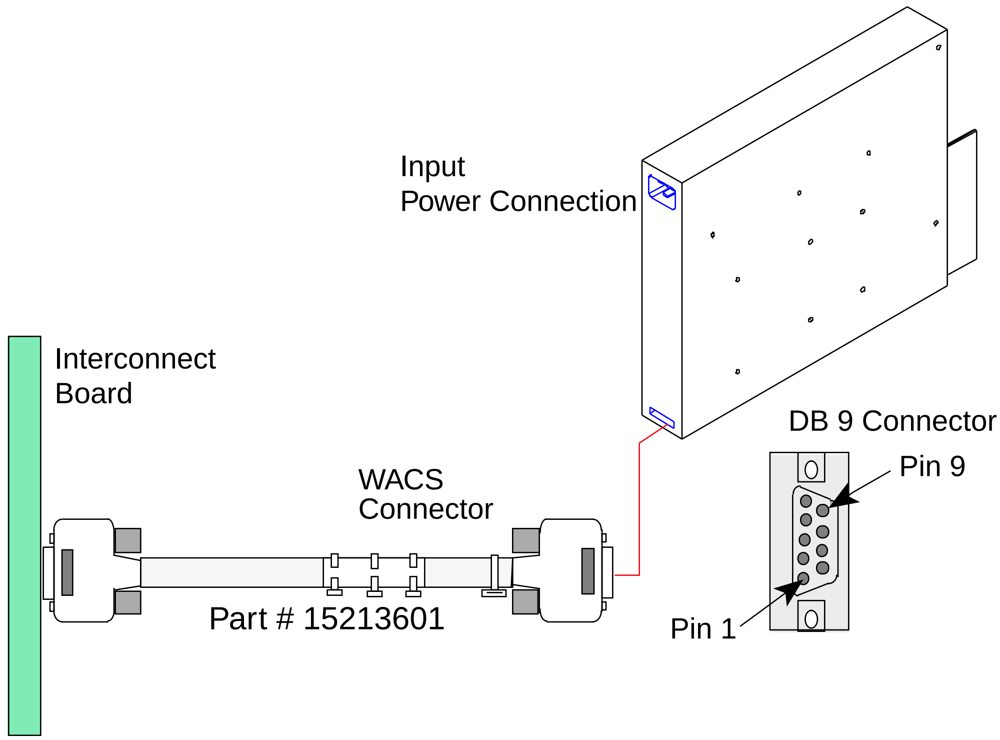


Table 29 and Table 30 list the pin assignments for the power supply 9-pin cable and the PCB 20-pin cable.

Table 29. Power Supply 9-pin Connector

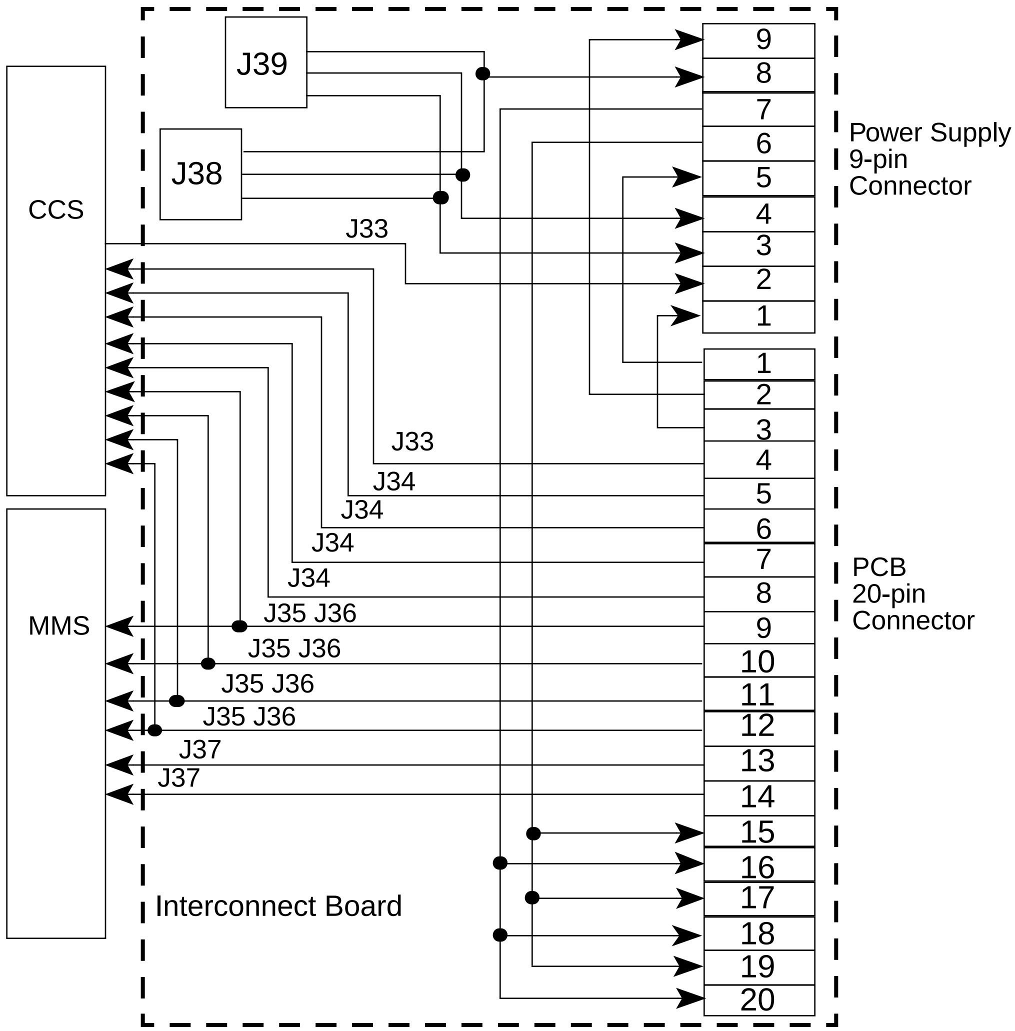
Pin Number	Signal Name
1	Enable +
2	Enable -
3	High Margin
4	Low Margin
5	Sense +
6	Auxiliary +
7	Auxiliary -
8	Margin Common
9	Sense -

Table 30. PCB 25-pin Connector

Pin Number	Signal Name
1	Sense +
2	Sense –
3	Jump 1A
4	Jump 1B
5	Thermistor 1A
6	Thermistor 1B
7	Thermistor 2A
8	Thermistor 2B
9	Meter 3.3 ground
10	Meter –3.3 Vdc
11	Meter 4.5 ground
12	Meter 4.5 Vdc
13	Jump 2A
14	Jump 2B
15	Auxiliary +
16	Auxiliary –
17	Auxiliary +
18	Auxiliary –
19	Auxiliary +
20	Auxiliary –

Figure 43 shows how the power supply and PCB communicate on the interconnect board with each other and with the CCS and MMS board connectors.

Figure 43. Interconnect Board Signal Runs



WACS-to-interconnect Board Connections

The CCS and MMS boards communicate with the module power supplies and the PCBs via cables that connect to the interconnect board. The CCS connects to all five interconnect boards at connectors J33 through J35. The MMS board connects to all five interconnect boards at connectors J36 and J37. In addition, the MMS board connects to J39 on interconnect board A40 to daisy chain the margin control signals.

Table 31 and Table 32 list the CCS and MMS board connectors and their cable destination connectors on the five interconnect boards. One end connects to the CCS or MMS board and the other end connects to several boards.

NOTE: Remember that the interconnect boards are labeled A36 through A40. A60 is a bulkhead designator in the power distribution box.

Table 31. CCS Board to Interconnect Boards

CCS Board Connector	Interconnect Board and Connector	Cable Part Number
J1	Mfging test connector	Not used in the field
J2	Mfging test connector	Not used in the field
P3 (64-pin)	A36, A37, and A38 Connector J33	15212100
P4 (64-pin)	A39 and A40 Connector J33	15212200
J5	CCS switch panel and MMS Board J2	15247700
P6 (64-pin)	A36 and A37 Connector J34	15212300
P7 (64-pin)	A38 and A39 Connector J34	15213000
P8 (64-pin)	A60 Connector J1 A40 Connector J34	15218200
P9 (64-pin)	A60 Connector J3 A36 and A37 Connector J35	15212700
P10 (64-pin)	A60 Connector J2 A38, A39 and A40 Connector J35	15212600
TB2	Primary and Secondary Power Supply Groups	15224400

Table 32. MMS Board to Interconnect Boards

Source	Interconnect Board and Connector	Cable Part Number
P1	Mfging test connector	Not used in the field
P2	CCS Board J5	15247700
J3	MMS switch panel and LCD Display	15247300
P4	WACS access panel for SWS	15073300
P5	Not used	
P6 (64-pin)	A36 and A37 Connector J36	15212800
P7 (64-pin)	A38 and A39 Connector J36	15212900
P8 (64-pin)	A40 Connector J36 and A60 J4	15213100
P9 (64-pin)	WACS access panel for HEU	15247800
P10 (64-pin)	A36 Connector J37 S1-1-J40	15213300
P11 (64-pin)	A37 Connector J37	15213402
P12 (64-pin)	A38 Connector J37	15213401
P13 (64-pin)	A39 Connector J37	15213400
P14 (64-pin)	A40 Connector J37	15213200
P15	Clock module	
P16	Soft switch panel	15249400
P17	Clock Module, Margin Control Board, and A40 Connector J39	15249300
TB1	Primary and Secondary Power Supply Groups	15224400

Board location A60 on the LC schematics refers to a location in the power distribution box. This location is the area just behind the WACS access panel; several cables meet in this area. Table 33 lists the cables and the source, destination, and description of each.

Table 33. Additional WACS Cable Connections

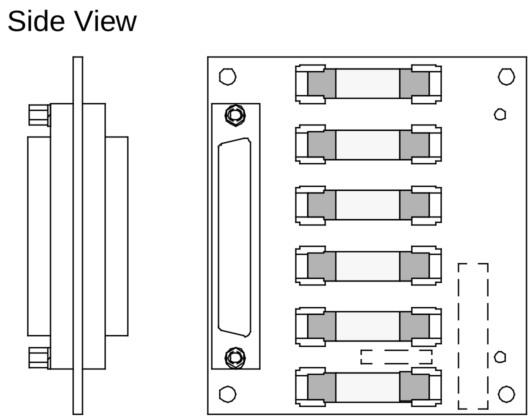
Source	Destination	Description	Cable Part Number
A60 - P4	WACS access panel for HEU J11	Distribute part of the HEU WACS signals to the MMS board	15247800 or 13331000
A60 - J4	MMS board P8	Distribute part of the HEU WACS signals	15213100
A60 - P3	WACS access panel for HEU J11 and Dewpoint sensors	Distribute part of the HEU WACS signals to the MMS board and send dewpoint sensor readings to the CCS board	15247800 or 13331000
A60 - J3	CCS board P9	Receive HEU WACS signals and dewpoint sensor readings	15212700
A60 - J2	CCS board P10	Receive smoke detector and input and output manifold pressure transducer signals	15212600
A60 - P2	Smoke detectors and pressure transducers	Receive smoke detector signals and input manifold thermistor readings	15246300
A60 - J1	CCS board P8	Receive manifold thermistor readings	15218200
A60 - P1	Manifold thermistors	Manifold thermistor readings	15246200

PC Board Assembly, L/C Fuse

Signals received from the WACS of the HEU pass through the new L/C fuse board (P/N 13330700) on the WACS access panel. Figure 44 illustrates the new L/C fuse board and Figure 45 illustrates the L/C fuse board schematic.

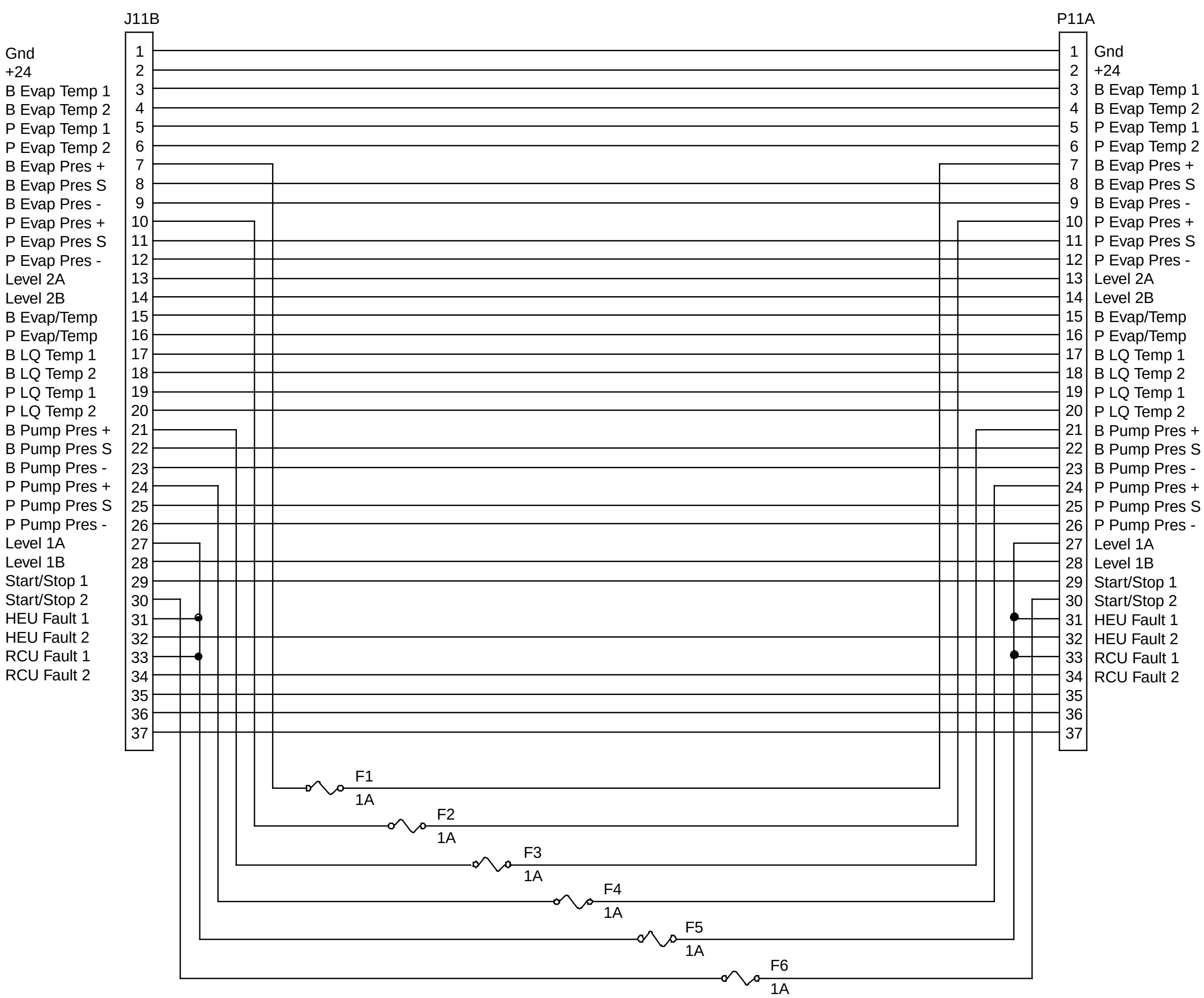
With the incorporation of the L/C fuse board, WACS cable part number 13331000 replaces cable part number 15247800.

Figure 44. L/C Fuse Board



Six field replaceable fuses: (glass tube, 250V, 1.00 Amp)

Figure 45. L/C Fuse Board - Schematic



Connector Views

Figure 46 through Figure 49 show connector views for all three shuttle connector types used in the LC cabinet.

Figure 46. 3-shuttle Molded 36-pin Connector

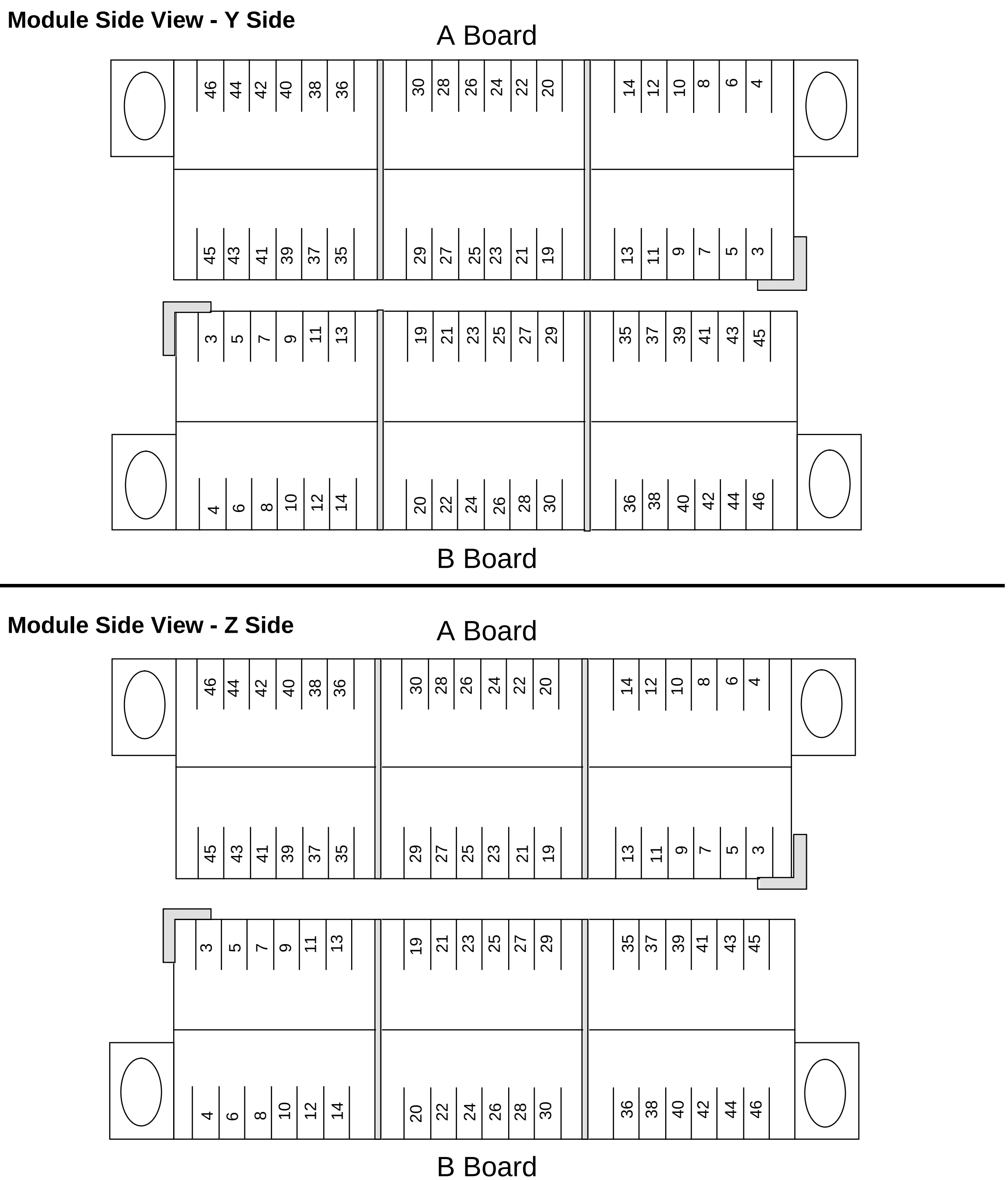
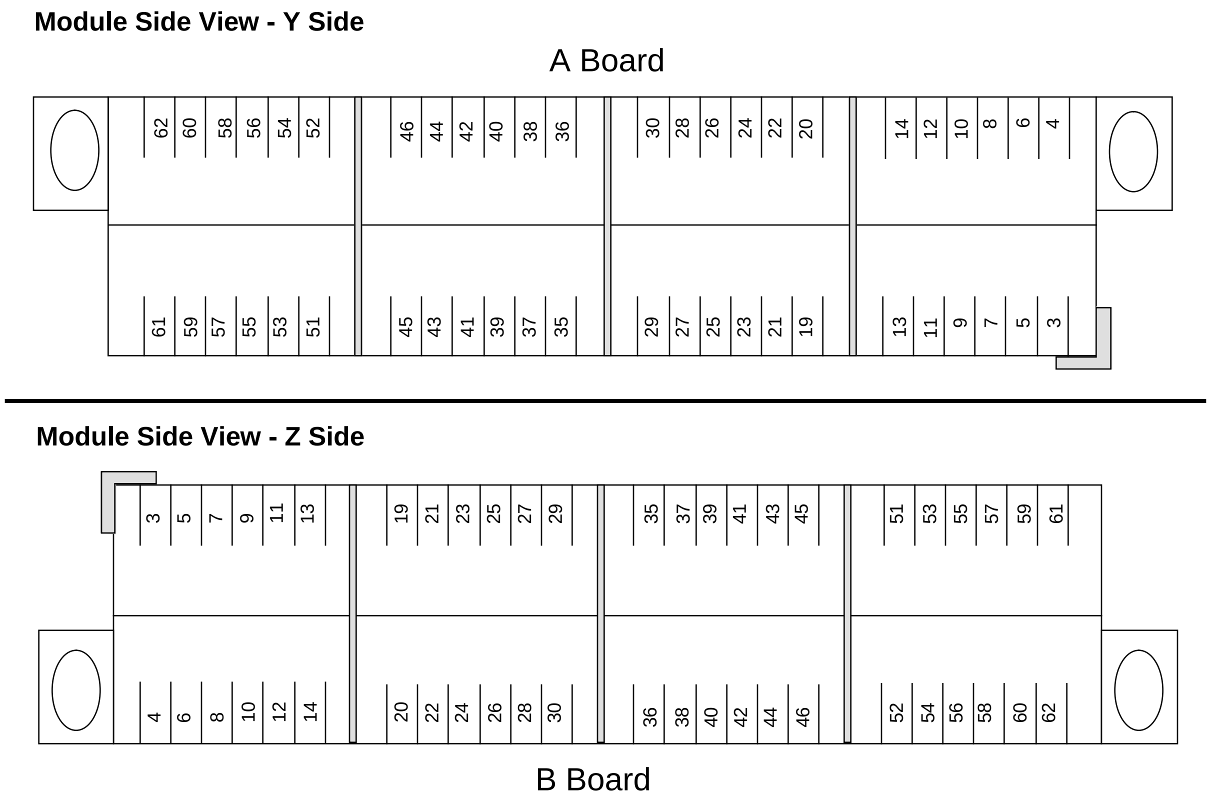


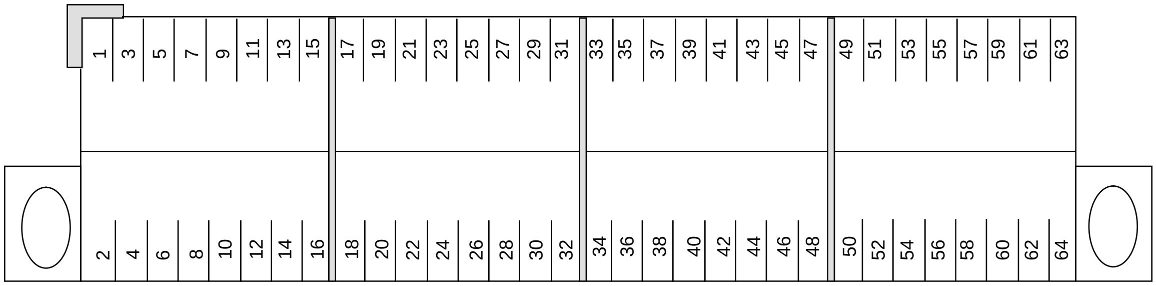
Figure 47. 4-shuttle 48-pin Connector



Pin positions 1, 2, 15, 16, 17, 18, 31, 32, 33, 34, 47, 48, 49, 50, 63, and 64 are not used or numbered.

Figure 48. 4-shuttle 64-pin Connector

Module Side View - Y Side



B Board

Module Side View - Z Side

A Board

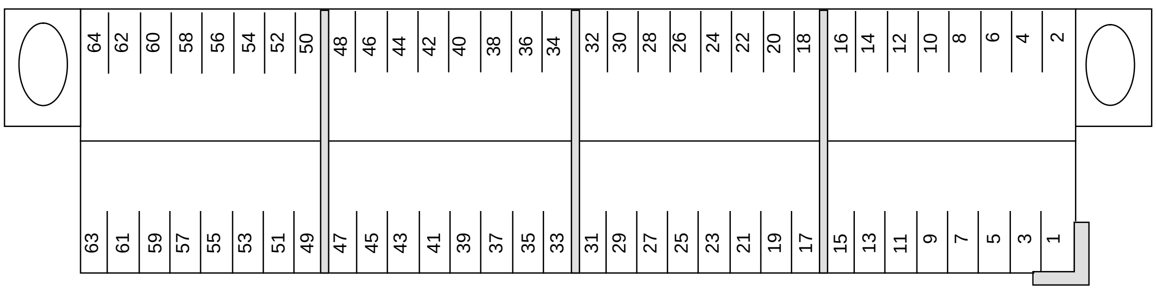
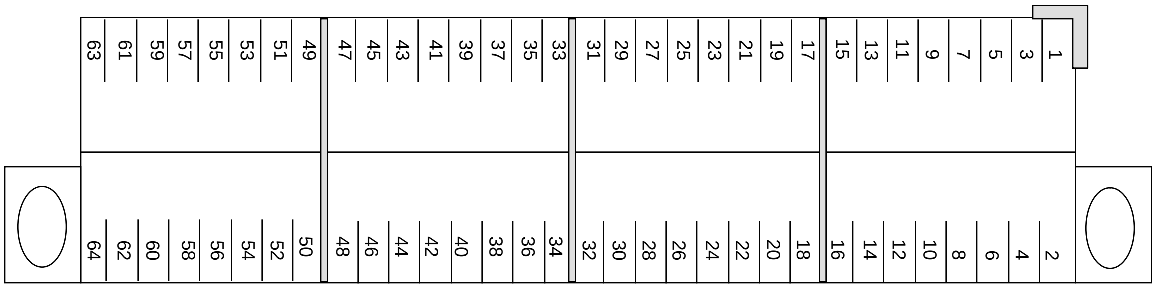


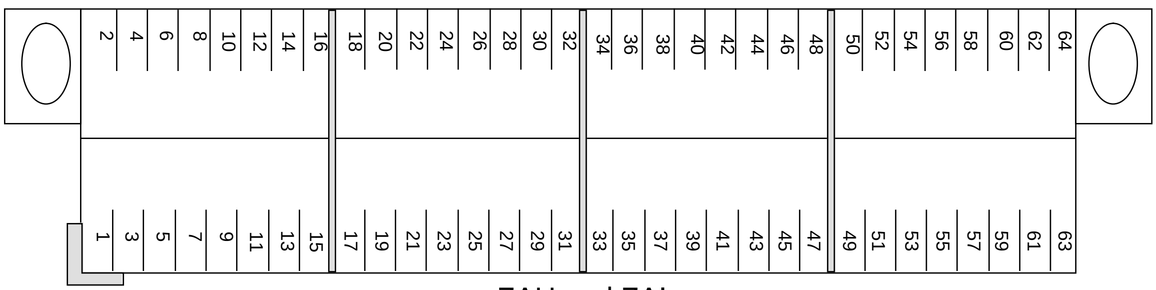
Figure 49. 64-pin Clock and Scan Connector

Connector Insertion View - Y Side



YBH and YBI

Connector Insertion View - Z Side



ZAH and ZAI

Cable Diagrams and Descriptions

This section includes the following information about the WACS cables used within the LC cabinet:

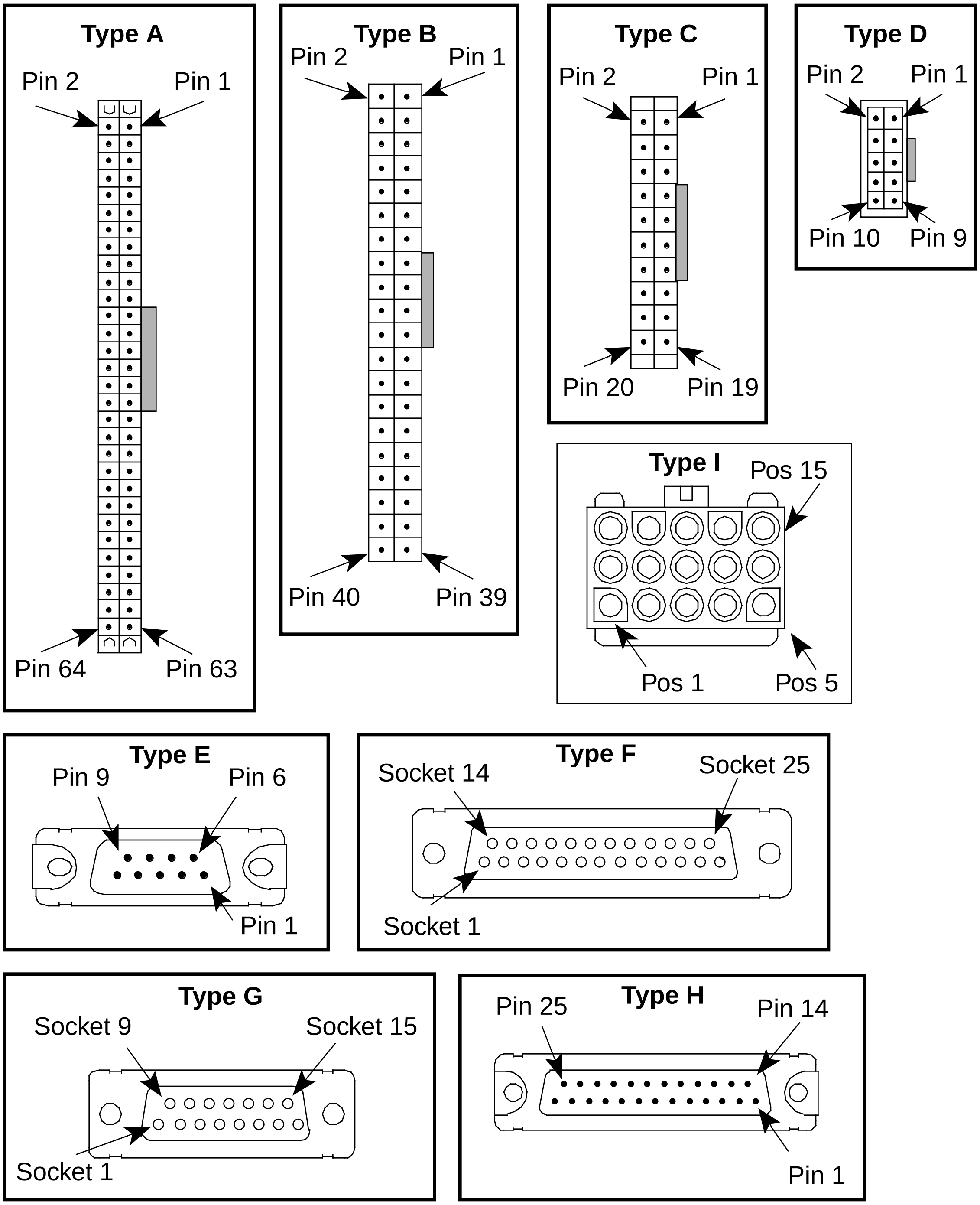
- Name
- Part number
- Usage
- Diagram
- Pin assignments (in a table)

For the convenience of the reader, the WACS cable diagrams are grouped as follows:

- WACS Cables 13303300 through 13331500
- WACS Cables 15073300 through 15212700
- WACS Cables 15212800 through 15218200
- WACS Cables 15213300 through 15246300
- WACS Cables 15247300 through 15249400

Figure 50 shows detail of the pinouts for many of the cable connector types in this section.

Figure 50. WACS Cable Connectors



WACS Cables 13303300 through 13331500

Cable Assy, WACS to SWS - Part number 13303300

Usage: Connects the WACS of the LC cabinet to the system workstation.

Figure 51. WACS Cable 13303300

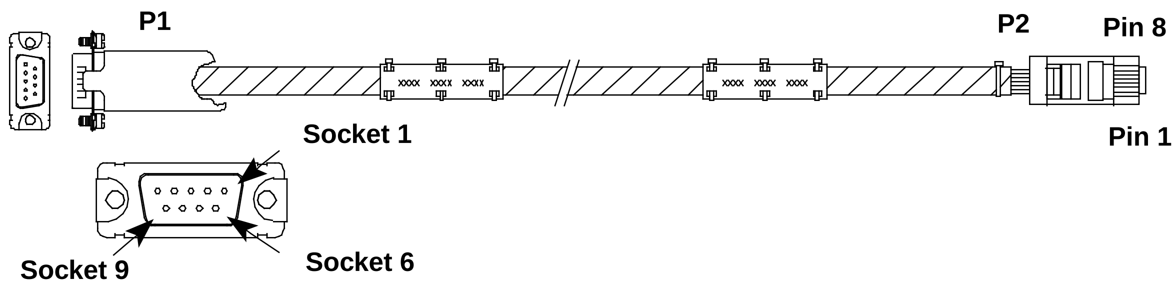


Table 34. 13303300

To	From
P1 - 2	P2 - 2
P1 - 3	P2 - 3
P1 - 5	P2 - 7

Cable Assy, CS to Intcon 40P to 40P - Part number 13315000

Usage: Connects the MMS board to interconnect board A40.

Refer to Figure 50 for cable connector pinouts.

Figure 52. WACS Cable 13315000

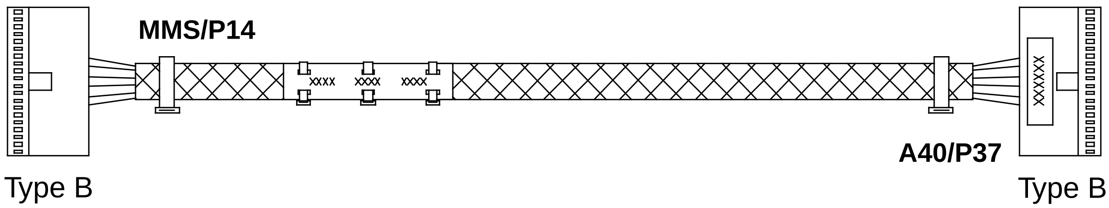


Table 35. 13315000

To	From
A40/P37 - 1	MMS/P14 - 1
A40/P37 - 2	MMS/P14 - 2
A40/P37 - 3	MMS/P14 - 3
A40/P37 - 4	MMS/P14 - 4
A40/P37 - 5	MMS/P14 - 5
A40/P37 - 6	MMS/P14 - 6
A40/P37 - 7	MMS/P14 - 7
A40/P37 - 8	MMS/P14 - 8
A40/P37 - 9	MMS/P14 - 9
A40/P37 - 10	MMS/P14 - 10
A40/P37 - 11	MMS/P14 - 11
A40/P37 - 12	MMS/P14 - 12

Cable Assy, Clock Slot Control - Part number 13315100

Usage: Connects the internal bulkhead to the interconnect board for the clock module in slot 18 and to the clock power fanout cable.

Refer to Figure 50 for cable connector pinouts.

Figure 53. WACS Cable 13315100

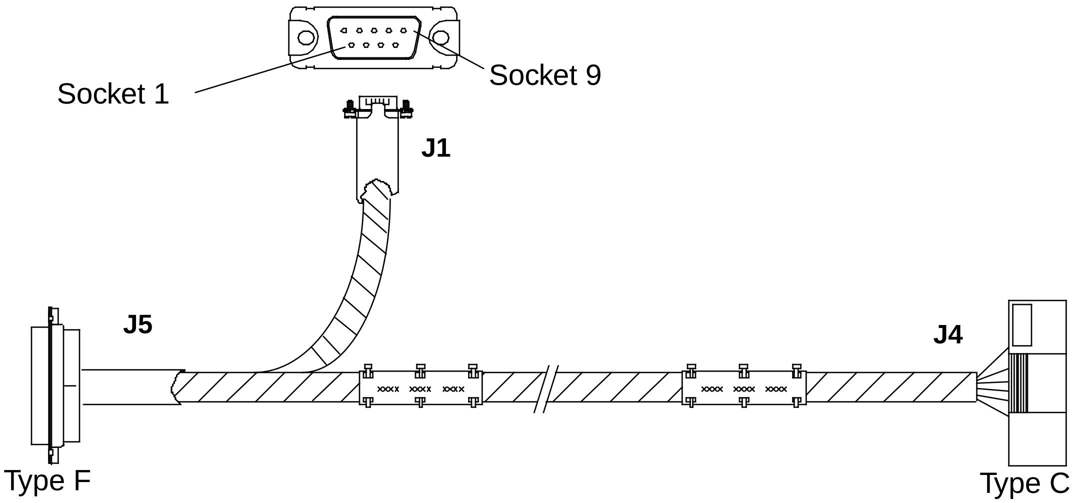


Table 36. 13315100

To	From	To	From
J5 - 1	J4 - 1	J5 - 12	J4 - 12
J5 - 2	J4 - 2	J5 - 13	J4 - 13
J5 - 3	J4 - 3	J5 - 14	J4 - 14
J5 - 4	J4 - 4	J5 - 15	J4 - 15
J5 - 5	J4 - 5	J5 - 16	J4 - 16
J5 - 6	J4 - 6	J5 -17	J4 - 17
J5 - 7	J4 - 7	J5 - 18	J4 - 18
J5 - 8	J4 - 8	J5 - 19	J4 - 19
J5 - 9	J4 - 9	J5 - 20	J4 - 20
J5 - 10	J4 - 10	J1 - 1	J5 - 19
J5 - 11	J4 - 11	J1 - 2	J5 - 20

Cable Assy, HEU Interface - Part Number 13331000

Usage: Connects the CCS and MMS boards to the dewpoint monitors and the fuse board on the WACS access panel door for the HEU.

Refer to Figure 50 for cable connector pinouts.

Figure 54. WACS Cable 13331000

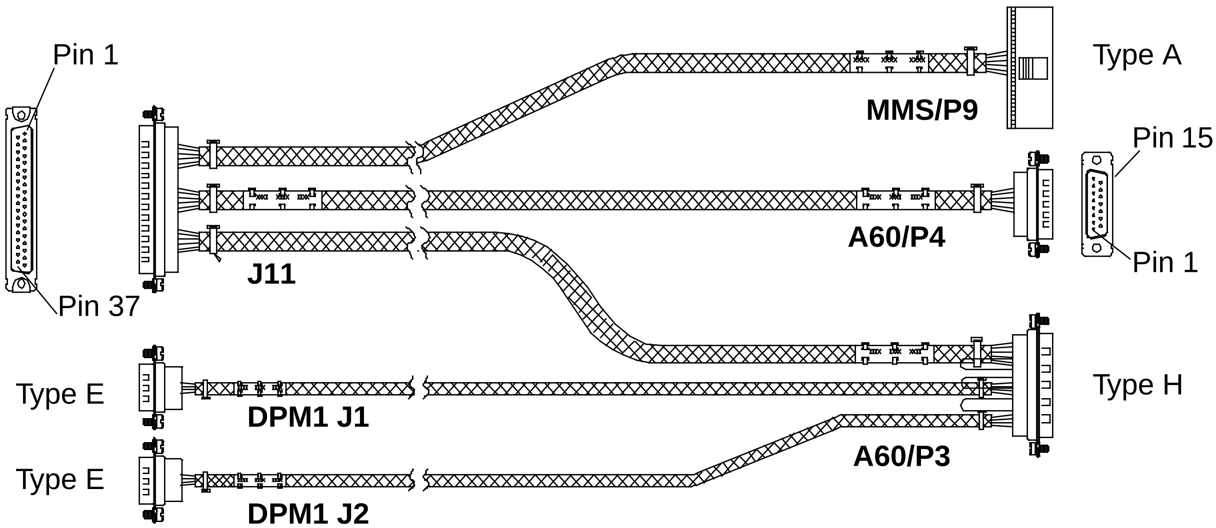


Table 37. 13331000

To	From J11	To	From J11	To	From J11	To	From
	1		14	P3 - 15	27	P3 - 1	DPM1/J1 - 1
	2	P4 - 7	15	P3 - 16	28	P3 - 2	DPM1/J1 - 3
P9 - 1	3	P4 - 8	16	P3 - 24	29	P3 - 3	DPM1/J1 - 6
P9 - 2	4	P9 - 5	17	P3 - 25	30	P3 - 4	DPM1/J1 - 8
P9 - 3	5	P9 - 6	18	P3 - 18	31	P3 - 5	DPM2/J1 - 1
P9 - 4	6	P9 - 7	19	P3 - 19	32	P3 - 6	DPM2/J1 - 3
P4 - 1	7	P9 - 8	20	P3 - 21	33	P3 - 7	DPM2/J1 - 6
P4 - 2	8	P3 - 9	21	P3 - 22	34	P3 - 8	DPM2/J1 - 8
P4 - 3	9	P3 - 10	22	P4 - 13	35		
P4 - 4	10	P3 - 11	23	P4 - 14	36	**Jumper Chart**	
P4 - 5	11	P3 - 12	24	P4 - 15	37	P3 - 16	to P3 - 17
P4 - 6	12	P3 - 13	25			P3 - 19	to P3 - 20
	13	P3 - 14	26			P3 - 22	to P3 - 23

WACS Cables 15073300 through 15212700

Cable Assy, HEU RS232 Port H2O - Part number 15073300

Usage: Connects the MMS board to the WACS access panel door for an external WACS connection.

Refer to Figure 50 for cable connector pinouts.

Figure 55. WACS Cable 15073300

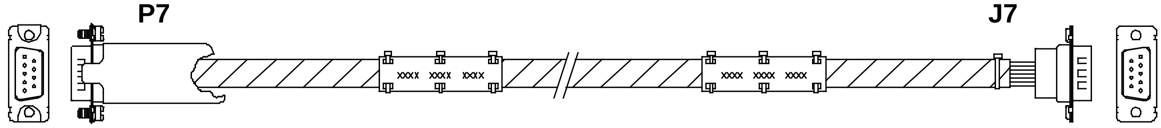


Table 38. 15073300

To	From
P7 - 1	J7 - 1
P7 - 2	J7 - 2
P7 - 3	J7 - 3
P7 - 4	J7 - 4
P7 - 5	J7 - 5
P7 - 6	J7 - 6
P7 - 7	J7 - 7
P7 - 8	J7 - 8
P7 - 9	J7 - 9

Cable Assy, CS to Intcon 20P x 3 - Part Number 15212100

Usage: Connects the CCS board to interconnect boards A36, A37, and A38.

Refer to Figure 50 for cable connector pinouts.

Figure 56. WACS Cable 15212100

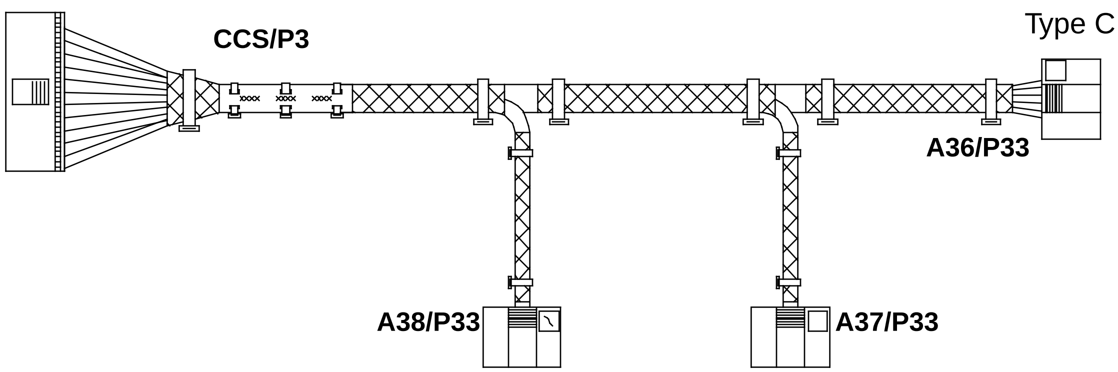


Table 39. 15212100

To	From CCS/P3	To	From CCS/P3	To	From CCS/P3
A36/P33 - 1	1	A37/P33 - 1	17	A38/P33 - 1	33
A36/P33 - 2	2	A37/P33 - 2	18	A38/P33 - 2	34
A36/P33 - 3	3	A37/P33 - 3	19	A38/P33 - 3	35
A36/P33 - 4	4	A37/P33 -4	20	A38/P33 -4	36
A36/P33 - 5	5	A37/P33 - 5	21	A38/P33 - 5	37
A36/P33 -6	6	A37/P33 - 6	22	A38/P33 - 6	38
A36/P33 - 7	7	A37/P33 - 7	23	A38/P33 - 7	39
A36/P33 - 8	8	A37/P33 - 8	24	A38/P33 - 8	40
A36/P33 - 9	9	A37/P33 - 9	25	A38/P33 - 9	41
A36/P33 - 10	10	A37/P33 - 10	26	A38/P33 - 10	42
A36/P33 - 11	11	A37/P33 - 11	27	A38/P33 - 11	43
A36/P33 - 12	12	A37/P33 - 12	28	A38/P33 - 12	44
A36/P33 - 13	13	A37/P33 - 13	29	A38/P33 - 13	45
A36/P33 - 14	14	A37/P33 - 14	30	A38/P33 - 14	46
A36/P33 - 15	15	A37/P33 - 15	31	A38/P33 - 15	47
A36/P33 - 16	16	A37/P33 - 16	32	A38/P33 - 16	48

Cable Assy, CS to Intcon 20P x 2 - Part number 15212200

Usage: Connects the CCS board to interconnect boards A39 and A40.

Refer to Figure 50 for cable connector pinouts.

Figure 57. WACS Cable 15212200

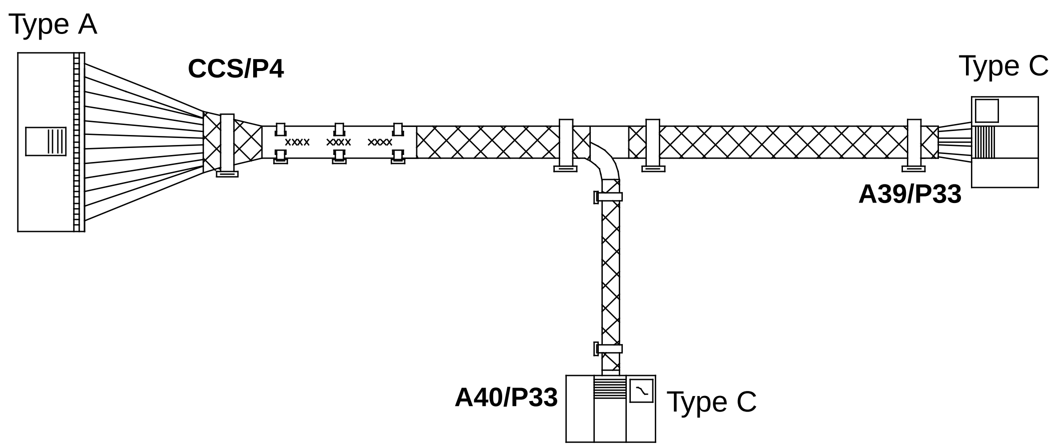


Table 40. 15212200

To	From CCS/P4	To	From CCS/P4
A39/P33 - 1	1	A40/P33 - 1	17
A39/P33 - 2	2	A40/P33 - 2	18
A39/P33 - 3	3	A40/P33 - 3	19
A39/P33 - 4	4	A40/P33 - 4	20
A39/P33 - 5	5	A40/P33 - 5	21
A39/P33 - 6	6	A40/P33 - 6	22
A39/P33 - 7	7		23
A39/P33 - 8	8		24
A39/P33 - 9	9		25
A39/P33 - 10	10		26
A39/P33 - 11	11		27
A39/P33 - 12	12		28
A39/P33 - 13	13		29
A39/P33 - 14	14		30
A39/P33 - 15	15		31
A39/P33 - 16	16		32

Cable Assy, CS to Intcon 40P x 2 - Part number 15212300

Usage: Connects the CCS board to interconnect boards A36 and A37.

Refer to Figure 50 for cable connector pinouts.

Figure 58. WACS Cable 15212300

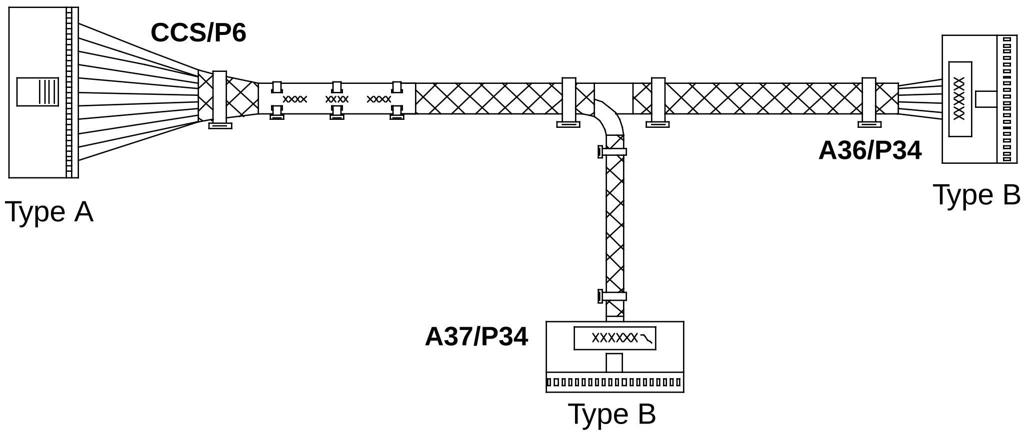


Table 41. 15212300

To	From CCS/P6	To	From CCS/P6	To	From CCS/P6	To	From CCS/P6
A36/P34 1	1	A36/P34 17	17	A37/P34 1	33	A37/P34 17	49
A36/P34 2	2	A36/P34 18	18	A37/P34 2	34	A37/P34 18	50
A36/P34 3	3	A36/P34 19	19	A37/P34 3	35	A37/P34 19	51
A36/P34 4	4	A36/P34 20	20	A37/P34 4	36	A37/P34 20	52
A36/P34 5	5	A36/P34 21	21	A37/P34 5	37	A37/P34 21	53
A36/P34 6	6	A36/P34 22	22	A37/P34 6	38	A37/P34 22	54
A36/P34 7	7	A36/P34 23	23	A37/P34 7	39	A37/P34 23	55
A36/P34 8	8	A36/P34 24	24	A37/P34 8	40	A37/P34 24	56
A36/P34 9	9	A36/P34 25	25	A37/P34 9	41	A37/P34 25	57
A36/P34 10	10	A36/P34 26	26	A37/P34 10	42	A37/P34 26	58
A36/P34 11	11	A36/P34 27	27	A37/P34 11	43	A37/P34 27	59
A36/P34 12	12	A36/P34 28	28	A37/P34 12	44	A37/P34 28	60
A36/P34 13	13	A36/P34 29	29	A37/P34 13	45	A37/P34 29	61
A36/P34 14	14	A36/P34 30	30	A37/P34 14	46	A37/P34 30	62
A36/P34 15	15	A36/P34 31	31	A37/P34 15	47	A37/P34 31	63
A36/P34 16	16	A36/P34 32	32	A37/P34 16	48	A37/P34 32	64

Cable Assy, Intcon Jumper 6 Pos - Part number 15212500

Usage: Connects the interconnect boards A36 through A40 in a daisy chain.

Refer to Figure 50 for cable connector pinouts.

Figure 59. WACS Cable 15212500

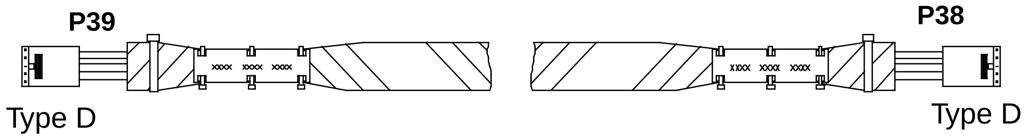


Table 42. 15212500

To	From
P39 - 1	P38 - 1
P39 - 2	P38 - 2
P39 - 3	P38 - 3
P39 - 4	P38 - 4
P39 - 5	P38 - 5
P39 - 6	P38 - 6

Table 43. 15212500 - Daisy Chain Connections

From	To
A40 - J39	A39 - J38
A39 - J39	A38 - J38
A38 - J39	A37 - J38
A37 - J39	A36 - J38

Cable Assy, CCS/P10 - Part number 15212600

Usage: Connects the CCS board to interconnect boards A38, A39, and A40; also connects to plug A60/J2, which connects to smoke detectors and pressure transducers.

Refer to Figure 50 for cable connector pinouts.

Figure 60. WACS Cable 15212600

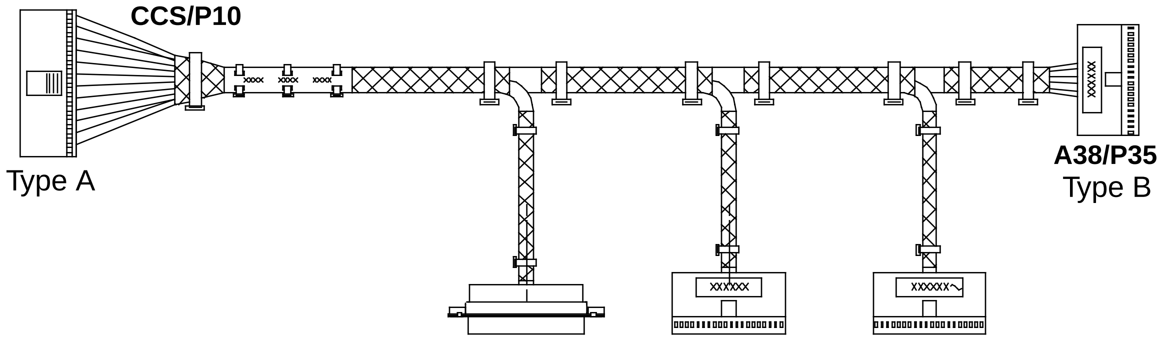


Table 44. 15212600

To	From CCS/P10	To	From CCS/P10
A38/P35 - 1	1	A39/P35 - 1	17
A38/P35 - 3	2	A39/P35- 3	18
A38/P35 - 5	3	A39/P35 - 5	19
A38/P35 - 7	4	A39/P35 - 7	20
A38/P35 - 9	5	A39/P35 - 9	21
A38/P35 - 11	6	A39/P35 - 11	22
A38/P35 - 13	7	A39/P35 - 13	23
A38/P35 - 15	8	A39/P35 - 15	24
A38/P35 - 17	9	A39/P35 - 17	25
A38/P35 - 19	10	A39/P35 - 19	26
A38/P35 - 21	11	A39/P35 - 21	27
A38/P35 - 23	12	A39/P35 - 23	28
A38/P35 - 25	13	A39/P35 - 25	29
A38/P35 - 27	14	A39/P35 - 27	30
A38/P35 - 29	15	A39/P35 - 29	31

Table 44. 15212600 (continued)

To	From CCS/P10	To	From CCS/P10
A38/P35 - 31	16	A39/P35 - 31	32
A40/P35 - 1	33	A60/J2 - 1	49
A40/P35 - 3	34	A60/J2 - 5	50
A40/P35 - 5	35	A60/J2 - 9	51
A40/P35 - 7	36	A60/J2 - 12	52
A40/P35 - 9	37	A60/J2 - 15	53
A40/P35 - 11	38	A60/J2 - 18	54
A60/J2 - 4	39		55
A60/J2- 8	40		56
A60/J2 - 10	41	A60/J2 - 11	57
A60/J2 - 13	42	A60/J2 - 14	58
A60/J2 - 16	43	A60/J2 - 17	59
A60/J2 - 19	44	A60/J2 - 20	60
A60/J2 - 2	45	A60/J2 - 3	61
A60/J2 - 6	46	A60/J2 - 7	62
	47		63
	48		64

Cable Assy, CCS/P9 - Part number 15212700

Usage: Connects the CCS board to interconnect boards A36 and A37; also connects to plug A60/J3, which connects to the dewpoint monitors and bulkhead for HEU faults.

Refer to Figure 50 for cable connector pinouts.

Figure 61. WACS Cable 15212700

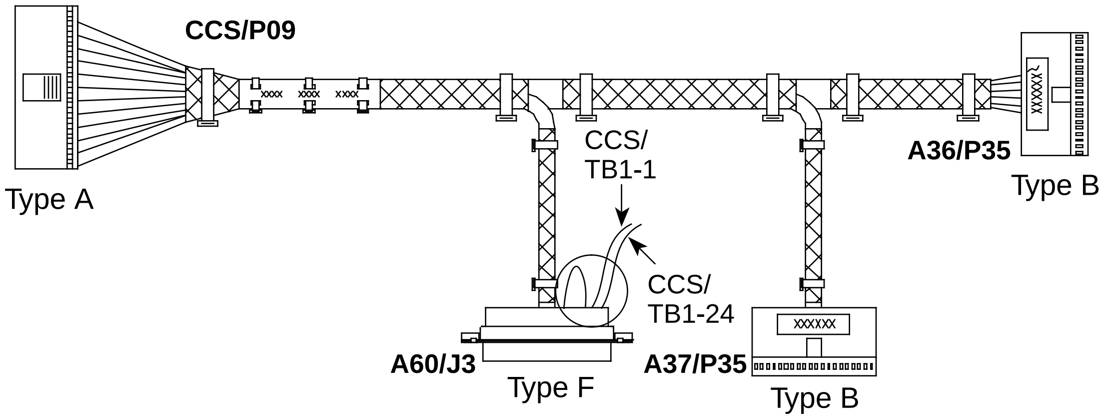


Table 45. 15212700

To	From CCS/P9	To	From CCS/P9
A60/J3 - 17	1	A36/P35 - 1	17
A60/J3 - 16	2	A36/P35 - 3	18
A60/j3 - 10	3	A36/P35 - 5	19
A60/J3 - 13	4	A36/P35 - 7	20
A60/J3 - 2	5	A36/P35 - 9	21
A60/J3 - 6	6	A36/P35 - 11	22
A60/J3 - 19	7	A36/P35 - 13	23
A60/J3 - 20	8	A36/P35 - 15	24
A60/J3 - 22	9	A36/P35 - 17	25
A60/J3 - 23	10	A36/P35 - 19	26
	11	A36/P35 - 21	27
	12	A36/P35 - 23	28
	13	A36/P35 - 25	29
	14	A36/P35 - 27	30
	15	A36/P35 - 29	31

Table 45. 15212700 (continued)

To	From CCS/P9	To	From CCS/P9
	16	A36/P35 - 31	32
A37/P35 - 1	33	A60/J3 - 11	49
A37/P35 - 3	34	A60/J3 - 14	50
A37/P35 - 5	35	A60/J3 - 1	51
A37/P35 - 7	36	A60/J3 - 4	52
A37/P35 - 9	37	A60/J3 - 5	53
A37/P35 - 11	38		54
A37/P35 - 13	39	A60/J3 - 8	55
A37/P35 - 15	40		56
A37/P35 - 17	41	A60/J3 - 9	57
A37/P35 - 19	42	A60/J3 - 12	58
A37/P35 - 21	43		59
A37/P35 - 23	44		60
A37/P35 - 25	45	A60/J3 - 15	61
A37/P35 - 27	46	A60/J3 - 21	62
A37/P35 - 29	47	A60/J3 - 3	63
A37/P35 - 31	48	A60/J3 - 7	64

Wiring and jumpers for connector A60/J3

- Jumper: A60/J3 - 15 with A60/J3 - 18
- Separate wire: A60/J3 - pin 24 to CCS/TB1 - pin 1
- Separate wire: A60/J3 - pin 25 to CCS/TB1 - pin 24

WACS Cables 15212800 through 15218200

Cable Assy, MS to Intcon 40P x 2 - Part number 15212800

Usage: Connects the MMS board to interconnect boards A36 and A37.

Refer to Figure 50 for cable connector pinouts.

Figure 62. WACS Cable 15212800

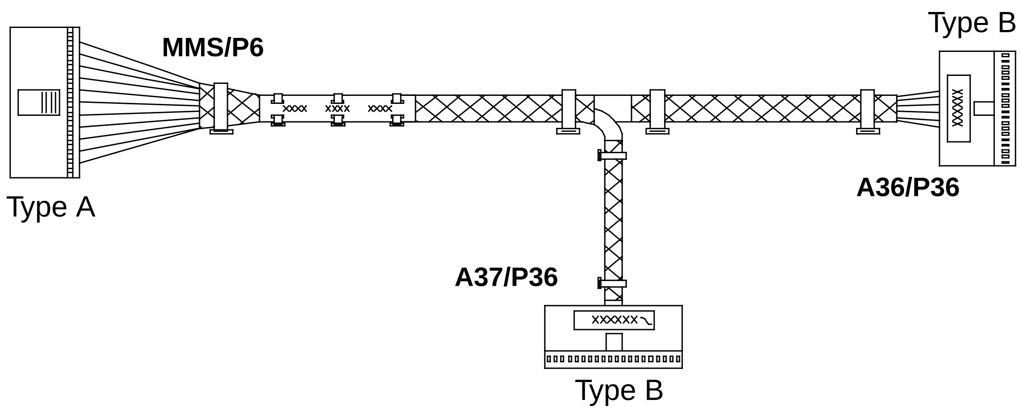


Table 46. 15212800

To	From MMS/ P6	To	From MMS/ P6	To	From MMS/ P6	To	From MMS/ P6
A36/P36 - 1	1	A36/P36 - 17	17	A37/P36 - 1	33	A37/P36 - 17	49
A36/P36 - 2	2	A36/P36 - 18	18	A37/P36 - 2	34	A37/P36 - 18	50
A36/P36 - 3	3	A36/P36 - 19	19	A37/P36 - 3	35	A37/P36 - 19	51
A36/P36 - 4	4	A36/P36 - 20	20	A37/P36 - 4	36	A37/P36 - 20	52
A36/P36 - 5	5	A36/P36 - 21	21	A37/P36 - 5	37	A37/P36 - 21	53
A36/P36 - 6	6	A36/P36 - 22	22	A37/P36 - 6	38	A37/P36 - 22	54
A36/P36 - 7	7	A36/P36 - 23	23	A37/P36 - 7	39	A37/P36 - 23	55
A36/P36 - 8	8	A36/P36 - 24	24	A37/P36 - 8	40	A37/P36 - 24	56
A36/P36 - 9	9	A36/P36 - 25	25	A37/P36 - 9	41	A37/P36 - 25	57
A36/P36 -10	10	A36/P36 - 26	26	A37/P36 -10	42	A37/P36 - 26	58
A36/P36 - 11	11	A36/P36 - 27	27	A37/P36 - 11	43	A37/P36 - 27	59
A36/P36 - 12	12	A36/P36 - 28	28	A37/P36 - 12	44	A37/P36 - 28	60
A36/P36 - 13	13	A36/P36 - 29	29	A37/P36 - 13	45	A37/P36 - 29	61
A36/P36 - 14	14	A36/P36 - 30	30	A37P36 - 14	46	A37/P36 - 30	62

Table 46. 15212800 (continued)

To	From MMS/ P6	To	From MMS/ P6	To	From MMS/ P6	To	From MMS/ P6
A36/P36 - 15	15	A36/P36 - 31	31	A37/P36 - 15	47	A37/P36 - 31	63
A36/P36 - 16	16	A36/P36 - 32	32	A37/P36 - 16	48	A37/P36 - 32	64

Cable Assy, MS to Intcon 40P x 2 - Part number 15212900

Usage: Connects the MMS board to interconnect boards A38 and A39.

Refer to Figure 50 for cable connector pinouts.

Figure 63. WACS Cable 15212900

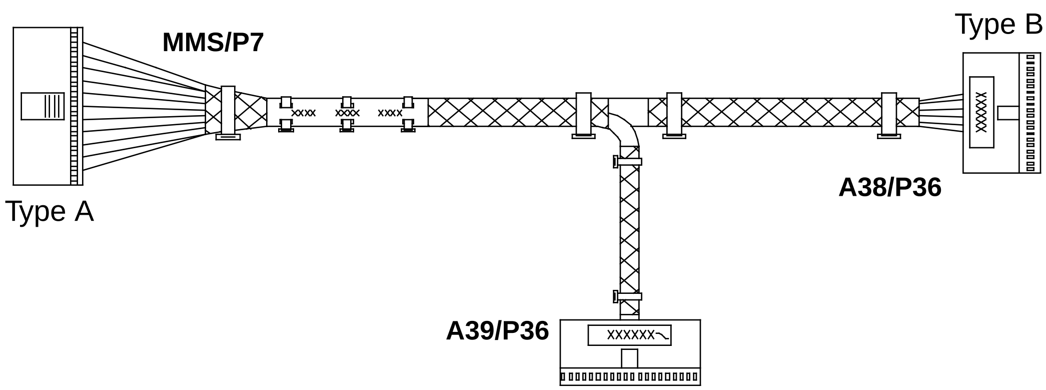


Table 47. 15212900

To	From MMS/ P7	To	From MMS/ P7	To	From MMS/ P7	To	From MMS/P 7
A38/P36 - 1	1	A38/P36 - 17	17	A39/P36 - 1	33	A39/P36 - 17	49
A38/P36 - 2	2	A38/P36 - 18	18	A39/P36 - 2	34	A39/P36 - 18	50
A38/P36 - 3	3	A38/P36 - 19	19	A39/P36 - 3	35	A39/P36 - 19	51
A38/P36 - 4	4	A38/P36 - 20	20	A39/P36 - 4	36	A39/P36 - 20	52
A38/P36 - 5	5	A38/P36 - 21	21	A39/P36 - 5	37	A39/P36 - 21	53
A38/P36 - 6	6	A38/P36 - 22	22	A39/P36 - 6	38	A39/P36 - 22	54
A38/P36 - 7	7	A38/P36 - 23	23	A39/P36 - 7	39	A39/P36 - 23	55
A38/P36 - 8	8	A38/P36 - 24	24	A39/P36 - 8	40	A39/P36 - 24	56
A38/P36 - 9	9	A38/P36 - 25	25	A39/P36 - 9	41	A39/P36 - 25	57
A38/P36 -10	10	A38/P36 - 26	26	A39/P36 -10	42	A39/P36 - 26	58
A38/P36 - 11	11	A38/P36 - 27	27	A39/P36 - 11	43	A39/P36 - 27	59
A38/P36 - 12	12	A38/P36 - 28	28	A39/P36 - 12	44	A39/P36 - 28	60
A38/P36 - 13	13	A38/P36 - 29	29	A39/P36 - 13	45	A39/P36 - 29	61
A38/P36 - 14	14	A38/P36 - 30	30	A39/P36 - 14	46	A39/P36 - 30	62
A38/P36 - 15	15	A38/P36 - 31	31	A39/P36 - 15	47	A39/P36 - 31	63
A38/P36 - 16	16	A38/P36 - 32	32	A39/P36 - 16	48	A39/P36 - 32	64

Cable Assy, CS to Intcon 40P x 2 - Part number 15213000

Usage: Connects the CCS board to interconnect boards A38 and A39.

Refer to Figure 50 for cable connector pinouts.

Figure 64. WACS Cable 15213000

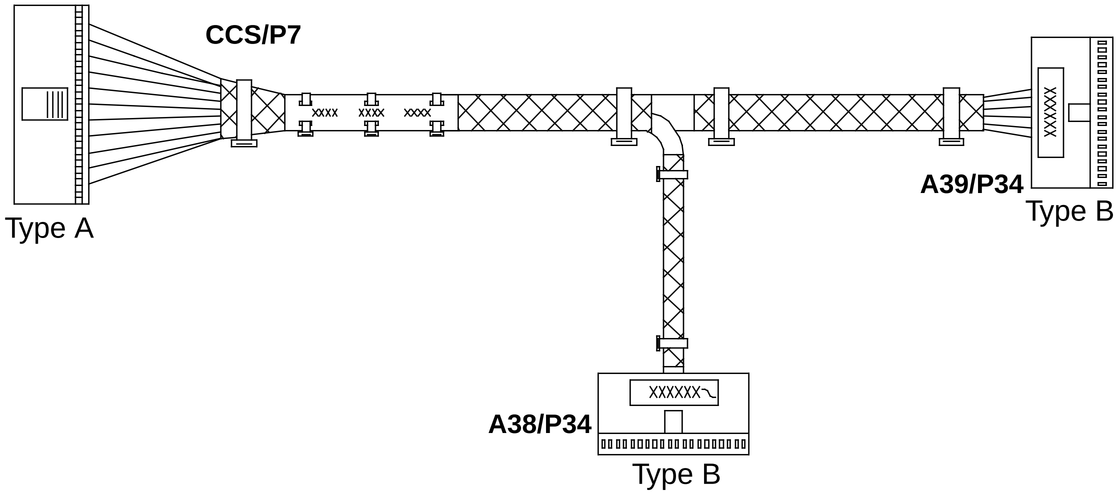


Table 48. 15213000

To	From CCS/P7	To	From CCS/P7	To	From CCS/P7	To	From CCS/P7
A38/P34 1	1	A38/P34 17	17	A39/P34 1	33	A39/P34 17	49
A38/P34 2	2	A38/P34 18	18	A39/P34 2	34	A39/P34 18	50
A38/P34 3	3	A38/P34 19	19	A39/P34 3	35	A39/P34 19	51
A38/P34 4	4	A38/P34 20	20	A39/P34 4	36	A39/P34 20	52
A38/P34 5	5	A38/P34 21	21	A39/P34 5	37	A39/P34 21	53
A38/P34 6	6	A38/P34 22	22	A39/P34 6	38	A39/P34 22	54
A38/P34 7	7	A38/P34 23	23	A39/P34 7	39	A39/P34 23	55
A38/P34 8	8	A38/P34 24	24	A39/P34 8	40	A39/P34 24	56
A38/P34 9	9	A38/P34 25	25	A39/P34 9	41	A39/P34 25	57
A38/P34 10	10	A38/P34 26	26	A39/P34 10	42	A39/P34 26	58
A38/P34 11	11	A38/P34 27	27	A39/P34 11	43	A39/P34 27	59
A38/P34 12	12	A38/P34 28	28	A39/P34 12	44	A39/P34 28	60
A38/P34 13	13	A38/P34 29	29	A39/P34 13	45	A39/P34 29	61
A38/P34 14	14	A38/P34 30	30	A39/P34 14	46	A39/P34 30	62
A38/P34 15	15	A38/P34 31	31	A39/P34 15	47	A39/P34 31	63
A38/P34 16	16	A38/P34 32	32	A39/P34 16	48	A39/P34 32	64

Cable Assy, MMS/P8 - Part number 15213100

Usage: Connects the MMS board to interconnect board A40; also connects to plug A60/J4, which connects to the WACS access panel door for HEU WACS input.

Refer to Figure 50 for cable connector pinouts.

Figure 65. WACS Cable 15213100

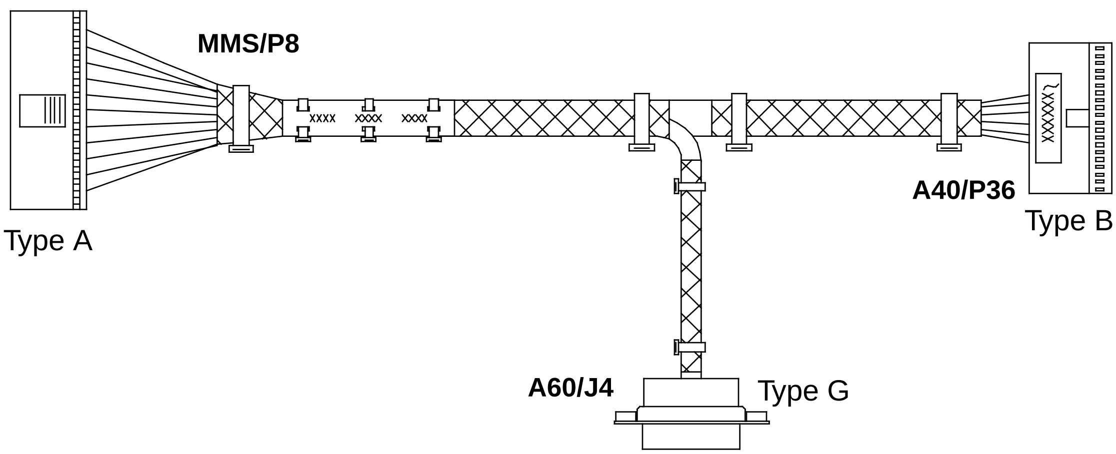


Table 49. 15213100

To	From MMS/P8	To	From MMS/P8
A40/P36 - 1	1	A60/J4 - 1	49
A40/P36 - 2	2	A60/J4 - 2	13
A40/P36 - 3	3	A60/J4 - 3	59
A40/P36 - 4	4	A60/J4 - 4	50
A40/P36 - 5	5	A60/J4 - 5	15
A40/P36 - 6	6	A60/J4 - 6	60
A40/P36 - 7	7	A60/J4 - 7	17
A40/P36 - 8	8	A60/J4 - 8	19
A40/P36 - 9	9	A60/J4 - 9	55
A40/P36 - 10	10	A60/J4 - 10	25
A40/P36 - 11	11	A60/J4 - 11	56
A40/P36 - 12	12	A60/J4 - 12	27
		A60/J4 - 13	57
		A60/J4 - 14	21
		A60/J4 - 15	23

Cable Assy, CS to Intcon - Part number 15213300

Usage: Connects the MMS board to interconnect board A36.

Refer to Figure 50 for cable connector pinouts.

Figure 66. WACS Cable 15213300

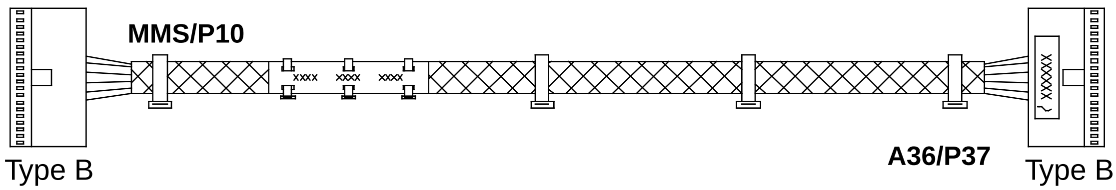


Table 50. 15213300

To	From MMS/P10	To	From MMS/P10
A36/P37 - 1	1	A36/P37 - 17	17
A36/P37 - 2	2	A36/P37 - 18	18
A36/P37 - 3	3	A36/P37 - 19	19
A36/P37 - 4	4	A36/P37 - 20	20
A36/P37 - 5	5	A36/P37 - 21	21
A36/P37 - 6	6	A36/P37 - 22	22
A36/P37 - 7	7	A36/P37 - 23	23
A36/P37 - 8	8	A36/P37 - 24	24
A36/P37 - 9	9	A36/P37 - 25	25
A36/P37 - 10	10	A36/P37 - 26	26
A36/P37 -11	11	A36/P37 - 27	27
A36/P37 - 12	12	A36/P37 - 28	28
A36/P37 - 13	13	A36/P37 - 29	29
A36/P37 - 14	14	A36/P37 - 30	30
A36/P37 - 15	15	A36/P37 - 31	31
A36/P37 - 16	16	A36/P37 - 32	32

Cable Assy, CS to Intcon 40P x 40 P - Part numbers 15213400, 15213401, and 15213402

Usage: Connects the MMS board to interconnect board A37, or A38, or A39.

Refer to Figure 50 for cable connector pinouts.

Figure 67. WACS Cables 15213400, 15213401, and 15213402

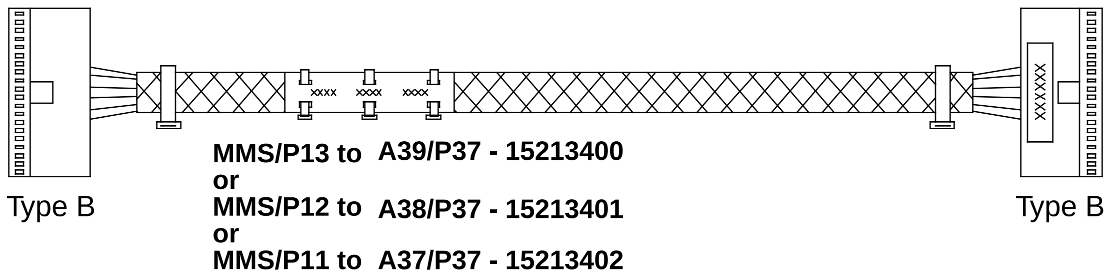


Table 51. 15213400, 15213401, and 15243402

To A37, A38, A39	From P13 or P12 or P11	To A37, A38, A39	From P13 or P12 or P11
P37 - 1	1	P37 - 17	17
P37 - 2	2	P37 - 18	18
P37 - 3	3	P37 - 19	19
P37 - 4	4	P37 - 20	20
P37 - 5	5	P37 - 21	21
P37 - 6	6	P37 - 22	22
P37 - 7	7	P37 - 23	23
P37 - 8	8	P37 - 24	24
P37 - 9	9	P37 - 25	25
P37 - 10	10	P37 - 26	26
P37 - 11	11	P37 - 27	27
P37 - 12	12	P37 - 28	28
P37 - 13	13	P37 - 29	29
P37 - 14	14	P37 - 30	30
P37 - 15	15	P37 - 31	31
P37 - 16	16	P37 - 32	32

Cable Assy, Power supply control - Part number 15213600

Usage: Power supply to interconnect board control cable.

Refer to Figure 50 for cable connector pinouts.

Figure 68. WACS Cable 15213600

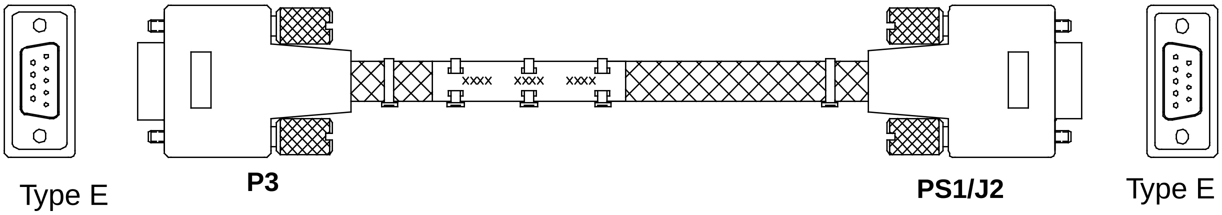


Table 52. 15213600

To	From
PS1/J2 - 1	P3 - 1
PS1/J2 - 2	P3 - 2
PS1/J2 - 3	P3 - 3
PS1/J2 - 4	P3 - 4
PS1/J2 - 5	P3 - 5
PS1/J2 - 6	P3 - 6
PS1/J2 - 7	P3 - 7
PS1/J2 - 8	P3 - 8
PS1/J2 - 9	P3 - 9

Cable Assy, Power supply control - Part number 15213601

Usage: Power supply to interconnect board control cable: replaces cable P/N 15213600.

Refer to Figure 50 for cable connector pinouts.

Figure 69. WACS Cable 15213601

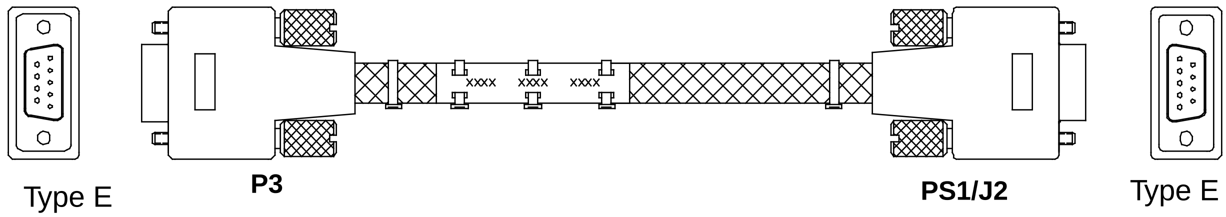


Table 53. 15213601

To	From
PS1/J2 - 1	P3 - 1
PS1/J2 - 2	P3 - 2
PS1/J2 - 3	P3 - 3
PS1/J2 - 4	P3 - 4
PS1/J2 - 5	P3 - 5
PS1/J2 - 6	P3 - 6
PS1/J2 - 7	P3 - 7
PS1/J2 - 8	P3 - 8
PS1/J2 - 9	P3 - 9

Cable Assy, PEM to WACS - Part number 15214200

Usage: Delivers WACS information from any PCB to the CCS and MMS boards. The pin connection is made on the clock connector of the rail. Connector P1 attaches to the internal bulkhead.

Refer to Figure 50 for cable connector pinouts.

Figure 70. WACS Cable 15214200

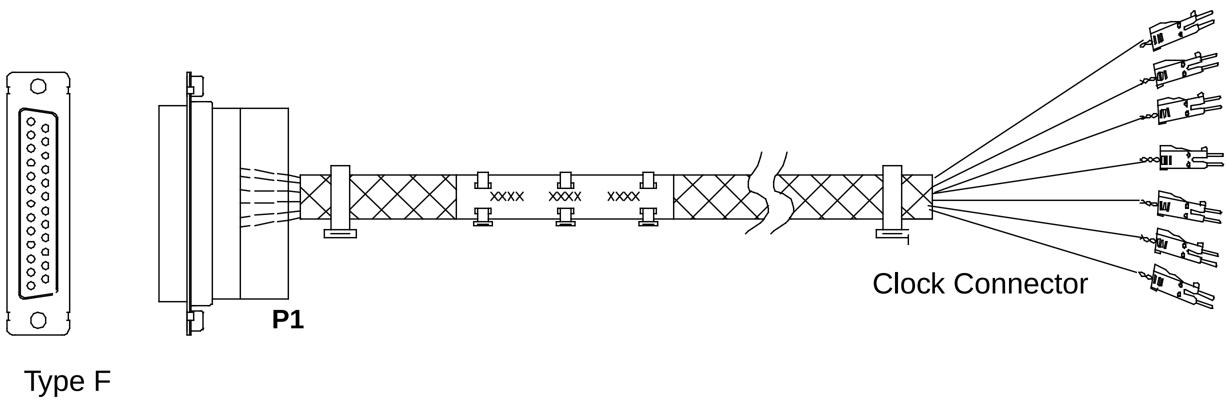


Table 54. 15214200

Pair No.	Wire No.	From	Clock connector on any rail (__h)
1	-	P1 - 1	Pin 19
	-	P1 - 2	
2	-	P1 - 3	Pin 20
	-	P1 - 4	
3	-	P1 - 5	Pin 21
	-	P1 - 6	
4	-	P1 - 7	Pin 22
	-	P1 - 8	
5	-	P1 - 9	Pin 23
	-	P1 - 10	
6	-	P1 - 11	Unused
	-	P1 - 12	
7	-	P1 - 13	Pin 24
	-	P1 - 14	
-	8A	P1 - 15	Pin 12
8B	-		

Table 54. 15214200 (continued)

Pair No.	Wire No.	From	Clock connector on any rail (__h)
-	9A	P1 - 17	Pin 13
9B	-		
-	10A	P1 - 19	Pin 14
10B	-		
-	11A	P1 - 16	Pin 44
11B	-		
-	12A	P1 - 18	Pin 45
12B	-		
-	13A	P1 - 20	Pin 46
13B			

Cable Assy, CCS/P8 - Part number 15218200

Usage: Connects the CCS board to interconnect board A40; also connects to plug A60/J1, which connects to the input manifold thermistors.

Refer to Figure 50 for cable connector pinouts.

Figure 71. WACS Cable 15218200

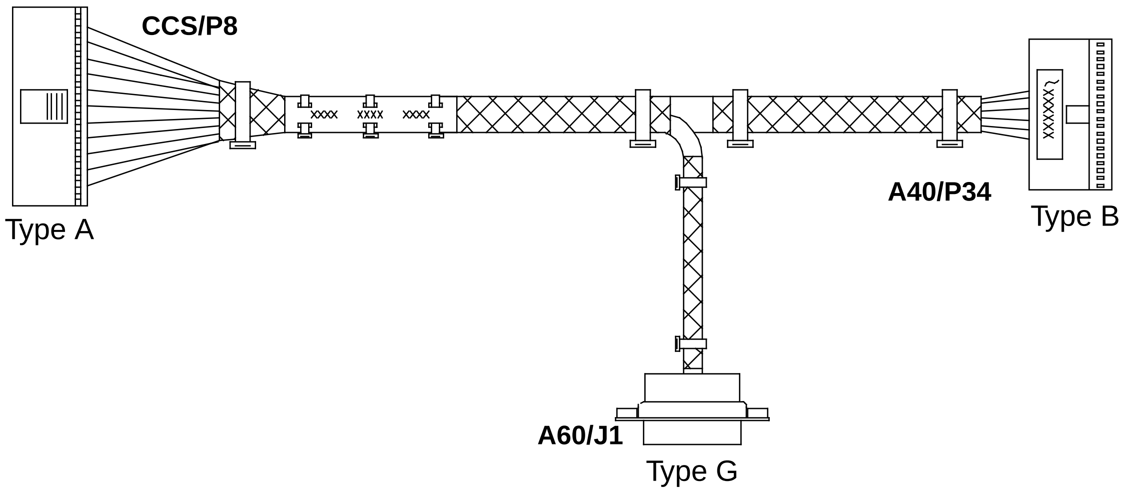


Table 55. 15218200

To	From CCS/P8	To	From CCS/P8
A40/P34 - 1	1	A60/J1 - 1	13
A40/P34 - 2	2	A60/J1 - 2	14
A40/P34 - 3	3	A60/J1 - 3	15
A40/P34 - 4	4	A60/J1 - 4	16
A40/P34 - 5	5	A60/J1 - 5	17
A40/P34 - 6	6	A60/J1 - 6	18
A40/P34 - 7	7	A60/J1 - 7	19
A40/P34 - 8	8	A60/J1 - 8	20
A40/P34 - 9	9		
A40/P34 - 10	10		
A40/P34 - 11	11		
A40/P34 - 12	12		

WACS Cables 15213300 through 15246300

Cable Assy, Power Supply Input - Part numbers 15223300 and 15223301

Usage: Provides input power to WACS power supply groups.

Figure 72. WACS Power Cables 15223300 and 15223301

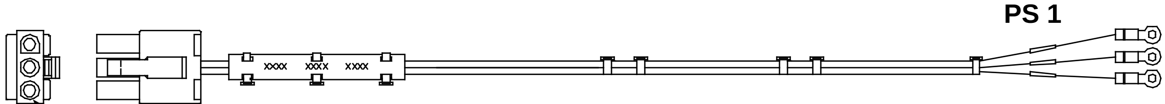


Table 56. 15223300 and 15223301

Primary Power Supply Group 15223300			Secondary Power Supply Group 15223301		
Color	From	T0	? Color	From	To
Red	J7 - 1	PS1 - L	Red	J6 - 1	PS1 - L
White	J7 - 2	PS1 - N	White	J6 - 2	PS1 - N
Grn/Yel	J7 - 3	PS1 - Gnd	Grn/Yel	J6 - 3	PS1 - Gnd

Cable Assy, circuit breaker to power supply - Part numbers 15223400 and 15223401

Usage: Delivers ~208 Vac to the WACS primary and secondary power supply groups from their respective circuit breakers.

Refer to Figure 50 for cable connector pinouts.

Figure 73. WACS Cables 15223400 and 15223401

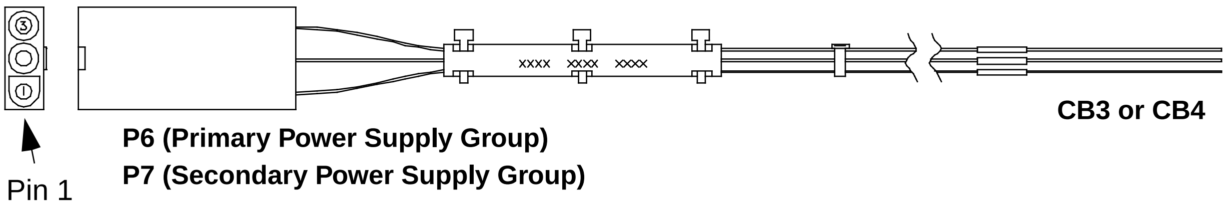


Table 57. 15223400 and 15223401

Color	To	From
Red	P7 - 1	CB3 - L1
White	P7 - 2	CB3 - L2
Green/Yellow	P7 - 3	Chassis Ground
Red	P6 - 1	CB4 - L1
White	P6 - 2	CB4 - L2
Green/Yellow	P6 - 3	Chassis Ground

Cable Assy, Power Supply Output - Part numbers 15223500 and 15223501

Usage: Distributes output power from the WACS power supply groups.

Figure 74. WACS Power Cables 15223500 and 15223501

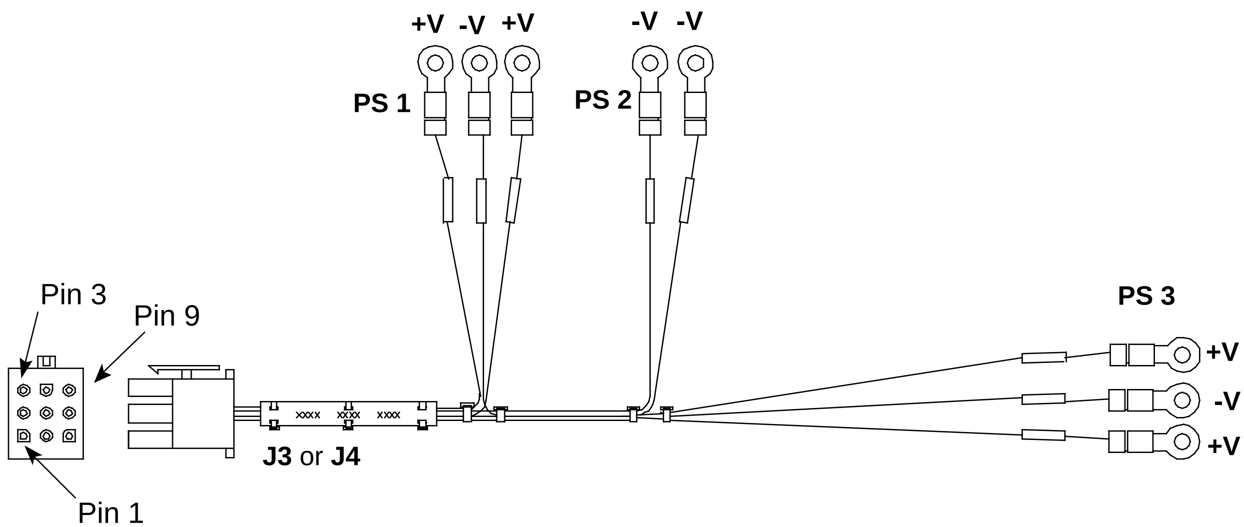


Table 58. 15223500 and 15223501

Primary Power Supply Group 15223500			Secondary Power Supply Group 15223501		
Color	To	From	Color	To	From
Red	J3 - 2	PS3 +V	Red	J4 - 2	PS3 +V
Red	J3 - 3	PS2 -V	Red	J4 - 3	PS2 -V
Red	J3 - 4	PS3 -V	Red	J4 - 4	PS3 -V
Red	J3 - 5	PS1+V	Red	J4 - 5	PS1 +V
Red	J3 - 6	PS3 +V	Red	J4 - 6	PS3 +V
Red	J3 - 7	PS2 -V	Red	J4 - 7	PS2 -V
Red	J3 - 8	PS1 -V	Red	J4 - 8	PS1 -V
Red	J3 - 9	PS1 +V	Red	J4 - 9	PS1 +V

Cable Assy, Control contacts - Part number 15223600

Usage: Provides power distribution for control line filters.

Refer to Figure 50 for cable connector pinouts.

Figure 75. WACS Cable 15223600

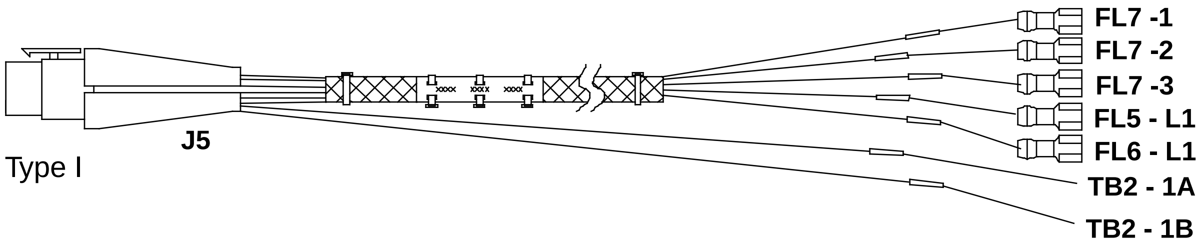


Table 59. 15223600

To	From
J5 - 1	TB2 - 1A
J5 - 2	FL6 - L1
J5 - 8	TB2 - 1B
J5 - 9	FL5 - L1
J5 - 10	FL7 - 1
J5 - 11	FL7 - 2
J5 - 12	FL7 - 3

Cable Assy, WACS power interconnect - Part number 15224400

Usage: Distributes power from WACS power supply groups to the CCS and MMS boards.

Refer to Figure 50 for cable connector pinouts.

Figure 76. WACS Cable 15224400

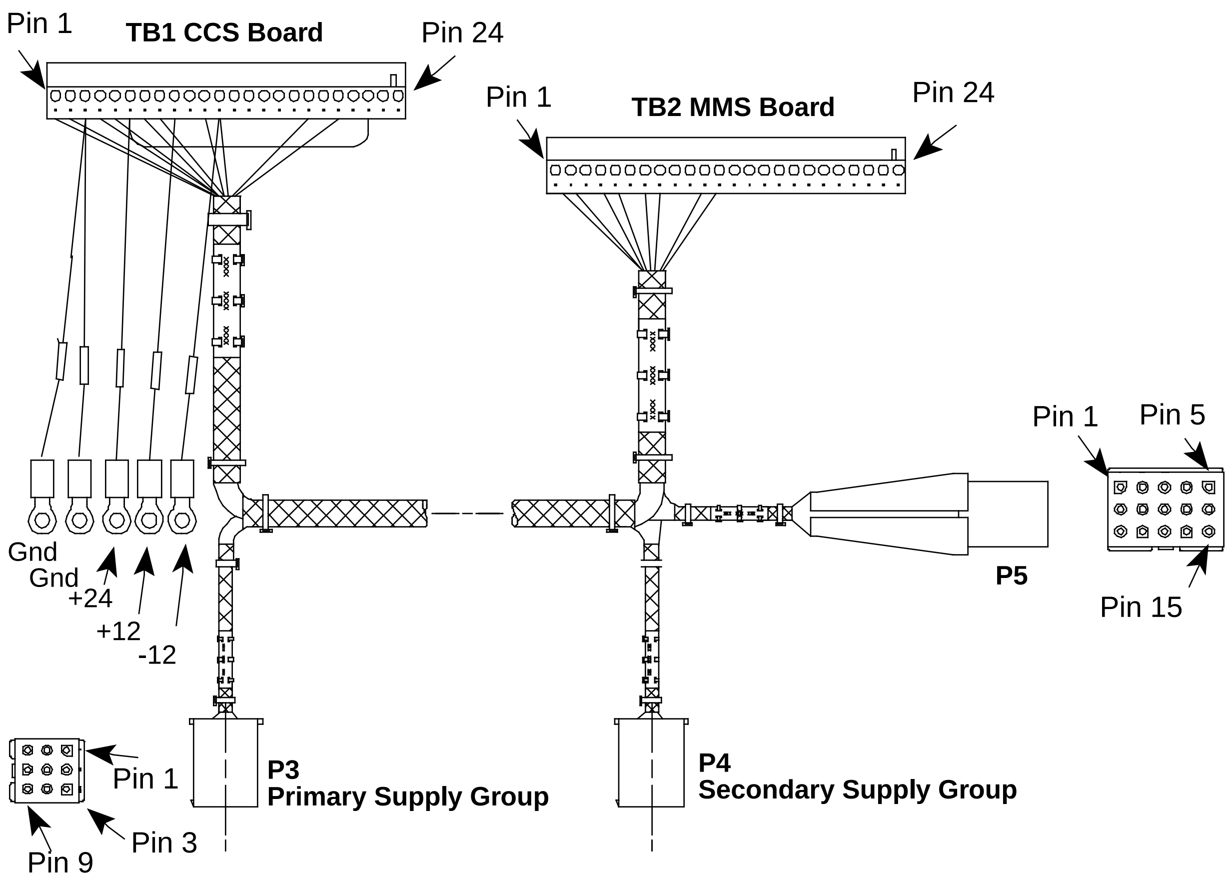


Table 60. 15224400

To	From	To	From
TB1 - 1	P3 - 4	TB2 - 8	P4 - 9
TB1 - 2	P4 - 4	TB2 - 11	P4 - 7
TB1 - 4	P3 - 2	TB2 - 10	P3 - 7
TB1 - 5	P4 - 2	TB2 - 20	P5 - 8
TB1 - 7	P3 - 5	TB2 - 18	P5 - 9
TB1 - 8	P4 - 5	TB2 - 14	P5- -10

Table 60. 15224400 (continued)

To	From	To	From
TB1 - 11	P3 - 3	TB2 - 15	P5 - 11
TB1 - 12	P4 - 3	TB2 - 16	P5 - 12
TB1 - 18	P5 - 2	TB1 - 6	TB1 - 22
TB1 -20	P5 - 1	TB1 - 3	Ground
TB2 - 1	P3 - 8	TB1 - 3	Ground
TB2 - 2	P4 - 8	TB1 - 9	+12
TB2 - 4	P3 - 6	TB1 - 6	+24
TB2 -5	P4 - 6	TB1 - 12	-12
TB2 - 7	P3 - 9		

Cable Assy, Clock to WACS - Part number 15241200

Usage: Delivers WACS information from the clock PCB to the CCS and MMS boards. The pin connection is made on the clock connector of the rail. Connector P1 attaches to the internal bulkhead.

Refer to Figure 50 for cable connector pinouts.

Figure 77. WACS Cable 15241200

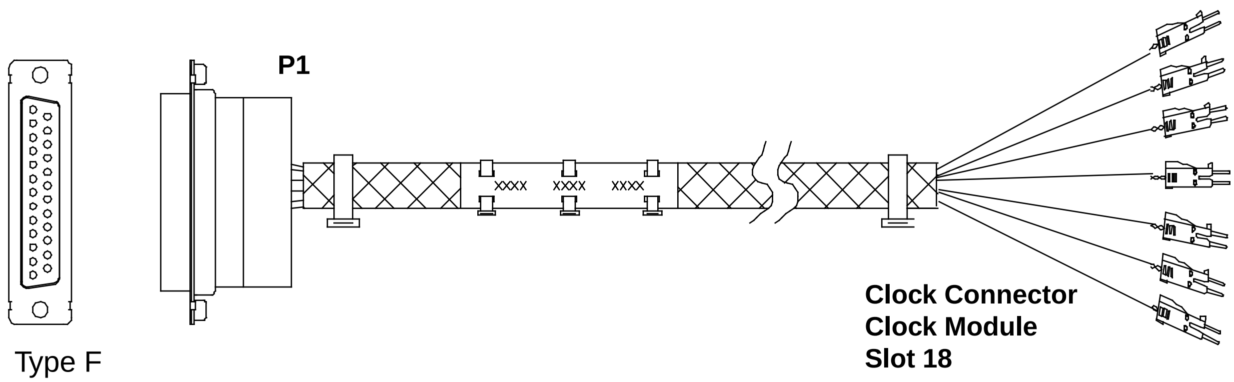


Table 61. 15241200

Pair No.	Wire No.	From	To Connector 018 -yai
1	-	P1 - 1	Pin 35
	-	P1 - 2	
2	-	P1 - 3	Pin 36
	-	P1 - 4	
3	-	P1 - 5	Pin 37
	-	P1 - 6	
4	-	P1 - 7	Pin 38
	-	P1 - 8	
5	-	P1 - 9	Pin 39
	-	P1 - 10	
6	-	P1 - 11	Pin 40
	-	P1 - 12	
7	-	P1 - 13	Pin 41
	-	P1 - 14	
-	8A	P1 - 16	
8B	-		Pin 3

Table 61. 15241200 (continued)

Pair No.	Wire No.	From	To Connector 018 -yai
8C	-		Pin 4
-	9A	P1 - 18	
9B	-		Pin 5
9C	-		Pin 6
-	10A	P1 - 20	
10B	-		Pin 7
10C	-		Pin 8
-	11A	P1 - 15	
11B	-		Pin 19
11C	-		Pin 20
-	12A	P1 - 17	
12B	-		Pin 21
12C	-		Pin 22
-	13A	P1 - 19	
13B			Pin 23
13C	-		Pin 24

Cable Assy, Temp Input Sensor - Part number 15246200

Usage: Connects the input manifold temperature sensors to A60/J1, which connects to the CCS board.

Refer to Figure 50 for cable connector pinouts.

Figure 78. WACS Cable 15246200

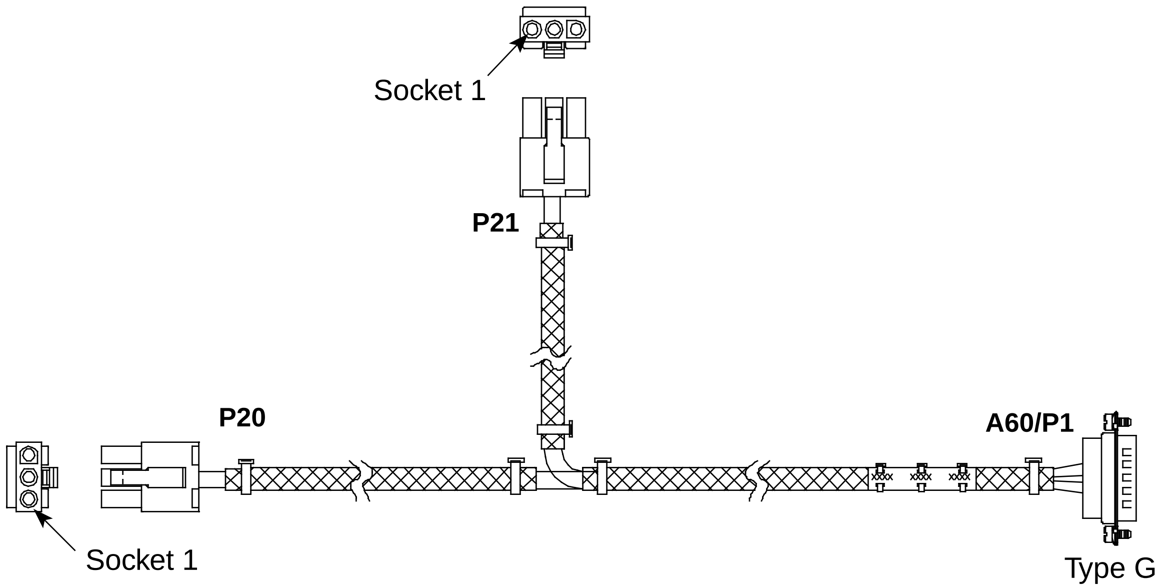


Table 62. 15246200

To	From A60/P1
P20 - 1	1
P20 - 2	2
P21 - 1	3
P21 - 2	4

Cable Assy, Pressure Input Sensor - Part number 15246300

Usage: Connects the smoke detectors and pressure transducers to A60/J2, which connects to the CCS board plug P10.

Refer to Figure 50 for cable connector pinouts.

Figure 79. WACS Cable 15246300

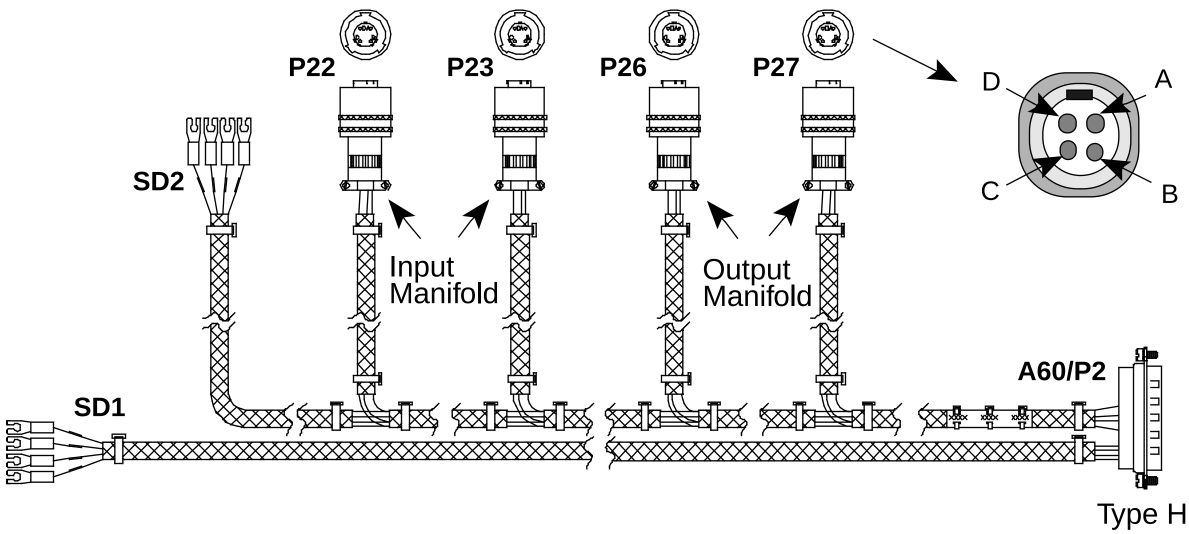


Table 63. 15246300

To	From A60/P2	To	From A60/P2
SD1 - 1	1	P22 - D	9
SD1 - 2	2	P22 - B	10
SD1 - 4	3	P22 - A	11
SD1 - 6	4	P23 - D	12
SD2 - 1	5	P23 - B	13
SD2 - 2	6	P23 - A	14
SD2 - 4	7	P26 - D	15
SD2 - 6	8	P26 - B	16
		P26 - A	17
		P27 - D	18
		P27 - B	19
		P27 - A	20

WACS Cables 15247300 through 15249400

Cable Assy, WACS Intcon MMS - Part number 15247300

Usage: Connects the MMS board to the WACS display board and to the WACS display select switches.

Refer to Figure 50 for cable connector pinouts.

Figure 80. WACS Cable 15247300

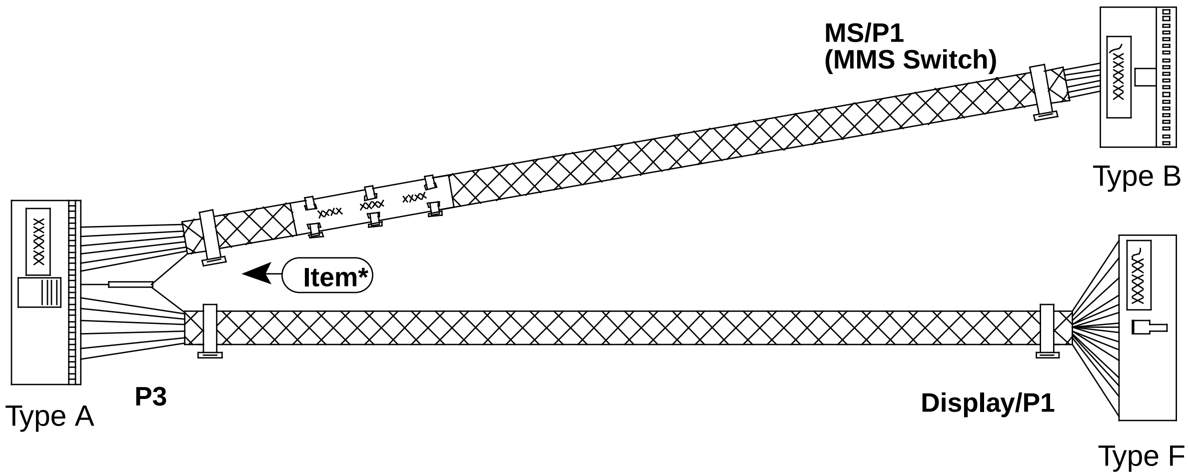


Table 64. 15247300

To	From P3	To	From P3
MS/P1 -2	24	Display/P1 - 10	40
MS/P1 -5	25	Display/P1 - 11	41
MS/P1 -8	26	Display/P1 - 12	42
MS/P1 -11	27	Display/P1 - 13	43
MS/P1 -20	30	Display/P1 - 14	44
Display/P1 - 15	32	Item*	55
Display/P1 - 4	33	Display/P1 - 19	Item*
Display/P1 - 5	34	MS/P1	Item*
Display/P1 - 6	35	Display/P1 - 2	56
Display/P1 - 16	36	MS/P1 - 29	59
Display/P1 - 7	37	MS/P1 - 30	60
Display/P1 - 8	38	Display/P1 - 1	61
Display/P1 - 9	39	Display/P1 - 20	62

Cable Assy, Clock slot control - Part number 15247400

Usage: Connects the internal bulkhead to the interconnect board for the clock module in slot 18.

Refer to Figure 50 for cable connector pinouts.

Figure 81. WACS Cable 15247400

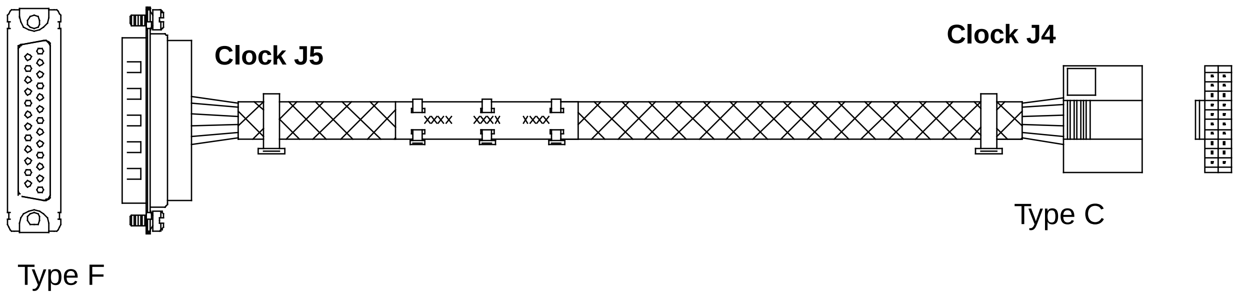


Table 65. 15247400

To	From	To	From
J5 - 1	J4 - 1	J5 - 11	J4 - 11
J5 - 2	J4 - 2	J5 - 12	J4 - 12
J5 - 3	J4 - 3	J5 - 13	J4 - 13
J5 - 4	J4 - 4	J5 - 14	J4 - 14
J5 - 5	J4 - 5	J5 - 15	J4 - 15
J5 - 6	J4 - 6	J5 - 16	J4 - 16
J5 - 7	J4 - 7	J5 - 17	J4 - 17
J5 - 8	J4 - 8	J5 - 18	J4 - 18
J5 - 9	J4 - 9	J5 - 19	J4 - 19
J5 - 10	J4 - 10	J5 - 20	J4 - 20

Cable Assy, Pem slot control - Part number 15247600

Usage: Connects the internal bulkhead to the interconnect board for all PCBs.

Refer to Figure 50 for cable connector pinouts.

Figure 82. WACS Cable 15247600

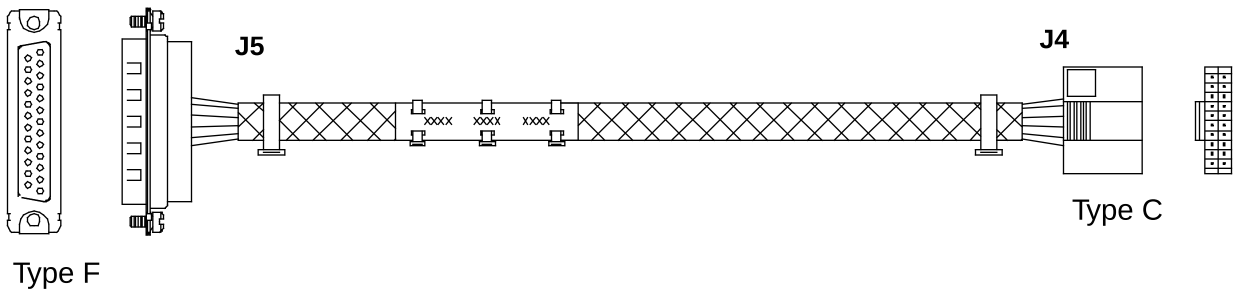


Table 66. 15247600

To	From	To	From
J5 - 1	J4 - 1	J5 - 12	J4 - 12
J5 - 2	J4 - 2	J5 - 13	J4 - 13
J5 - 3	J4 - 3	J5 - 14	J4 - 14
J5 - 4	J4 - 4	J5 - 15	J4 - 15
J5 - 7	J4 - 5	J5 - 16	J4 - 16
J5 - 8	J4 - 6	J5 - 17	J4 - 17
J5 - 9	J4 - 9	J5 - 18	J4 - 18
J5 - 10	J4 - 10	J5 - 19	J4 - 19
J5 - 11	J4 - 11	J5 - 20	J4 - 20

Cable Assy, WACS Intcon CCS - Part number 15247700

Usage: Connects the CCS board to the MMS board and to the CCS switch panel (START, STOP, REMOTE ENABLE).

Refer to Figure 50 for cable connector pinouts.

Figure 83. WACS Cable 15247700

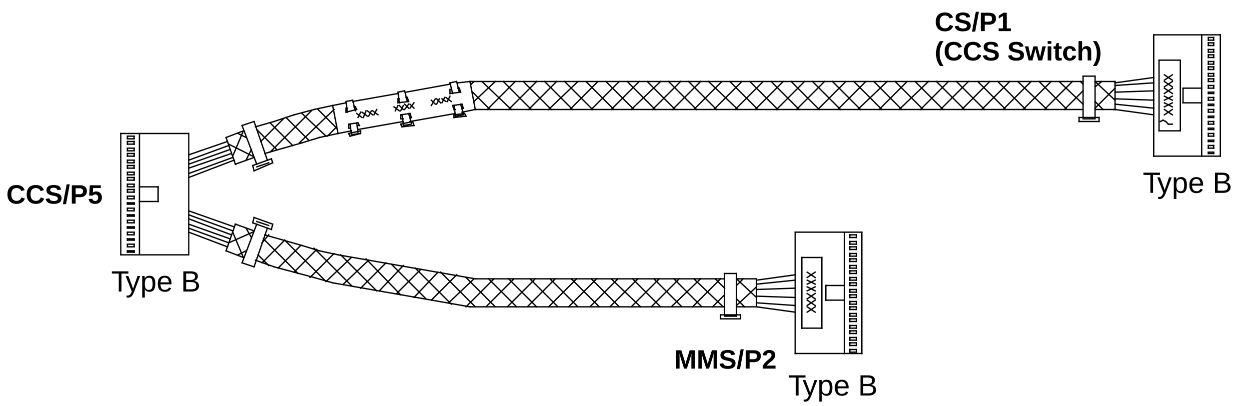


Table 67. 15247700

To	From P5	To	From P5
MMS/P2 - 1	1	CCS/P1 - 18	20
MMS/P2 - 2	2	CCS/P1 - 21	23
MMS/P2 - 3	3	CCS/P1 - 24	24
MMS/P2 - 4	4	CCS/P1 - 25	31
CCS/P1 - 2	6	CCS/P1 - 26	32
CCS/P1 - 14	9	CCS/P1 - 29	35
CCS/P1 - 17	10	CCS/P1 - 30	36
CCS/P1 - 20	13	CCS/P1 - 31	37
CCS/P1 - 23	14	CCS/P1 - 32	38
CCS/P1 - 3	16	MMS/P2 - 39	39
CCS/P1 - 15	19	MMS/P2 - 40	40

Cable Assy, HEU Interface - Part number 15247800

Usage: Connects the CCS and MMS boards to the WACS access panel door for the HEU and the dewpoint monitors.

Refer to Figure 50 for cable connector pinouts.

Figure 84. WACS Cable 15247800

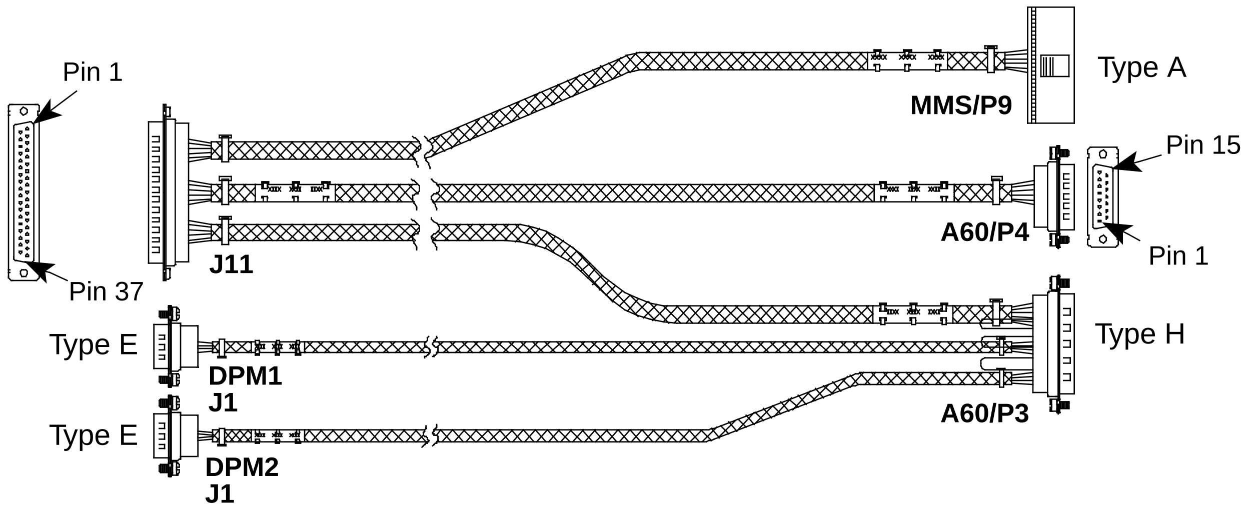


Table 68. 15247800

To	From J11	To	From J11	To	From J11	To	From
	1		14	P3 - 15	27	P3 - 1	DPM1/J1 - 1
	2	P4 - 7	15	P3 - 16	28	P3 - 2	DPM1/J1 - 3
P9 - 1	3	P4 - 8	16	P3 - 24	29	P3 - 3	DPM1/J1 - 6
P9 - 2	4	P9 - 5	17	P3 - 25	30	P3 - 4	DPM1/J1 - 8
P9 - 3	5	P9 - 6	18	P3 - 18	31	P3 - 5	DPM2/J1 - 1
P9 - 4	6	P9 - 7	19	P3 - 19	32	P3 - 6	DPM2/J1 - 3
P4 - 1	7	P9 - 8	20	P3 - 21	33	P3 - 7	DPM2/J1 - 6
P4 - 2	8	P3 - 9	21	P3 - 22	34	P3 - 8	DPM2/J1 - 8
P4 - 3	9	P3 - 10	22	P4 - 13	35		
P4 - 4	10	P3 - 11	23	P4 - 14	36	**Jumper Chart**	
P4 - 5	11	P3 - 12	24	P4 - 15	37	P3 - 16	to P3 - 17
P4 - 6	12	P3 - 13	25			P3 - 19	to P3 - 20
	13	P3 - 14	26			P3 - 22	to P3 - 23

Cable Assy, Switch Panel to Clock - Part number 15249300

Usage: Connects the clock select switches to the clock module and MMS board.

Refer to Figure 50 for cable connector pinouts.

Figure 85. WACS Cable 15249300

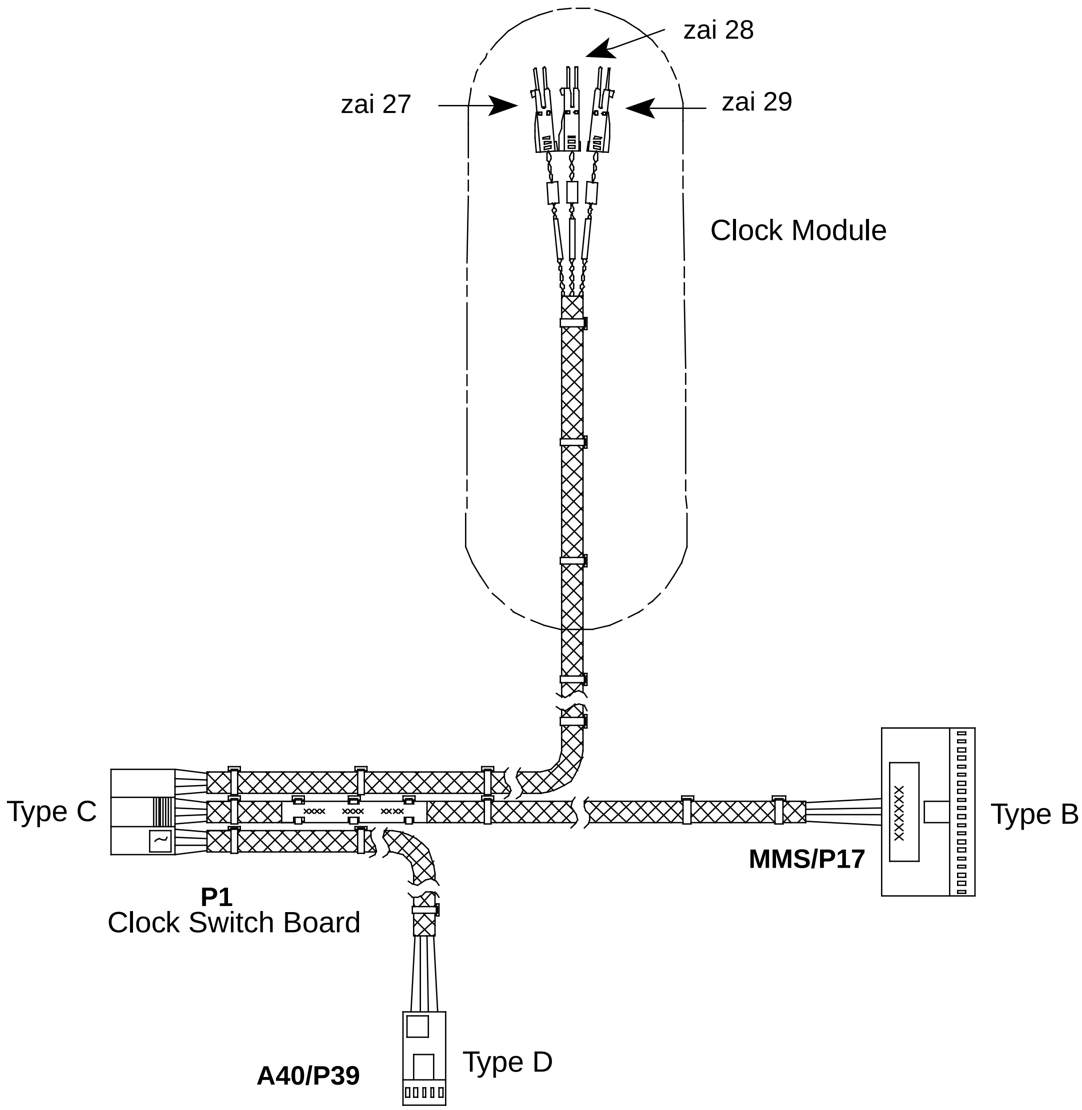


Table 69. 15249300

To	From P1	To	From P1
018 zai 27c	1	P17 -33	11
018 zai 27t	2	P17 - 34	12
018 zai 29c	3	P39 - 1	13
018 zai 29t	4	P39 - 2	14
018 zai 28c	5	P39 - 5	15
018 zai 28t	6	P39 - 6	16
P17 -37	7	P17 - 7	17
P17 -38	8	P17 - 8	18
P17 -11	9	P39 - 3	19
P17 - 12	10	P39 - 4	20

Cable Assy, WACS to Clk Soft Switch - Part number 15249400

Usage: Connects the MMS board to the clock module.

Refer to Figure 50 for cable connector pinouts.

Figure 86. WACS Cable 15249400

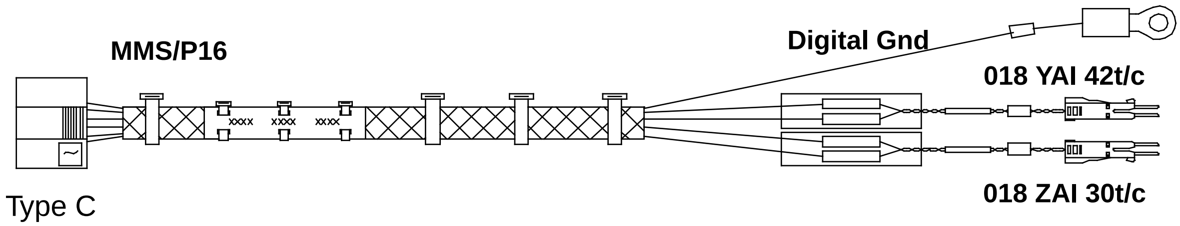


Table 70. 15249400

Color	To	From	Color
Green	018 zai - 30t	MMS/P16 - 2	White
White	018 zai - 30c	MMS/P16 - 1	White
Green	018 yai - 42t	MMS/P16 - 4	White
White	018 yai - 42c	MMS/P16 - 3	White
	Digital Gnd	MMS/P16 - 20	White

Cable Assy, Clock Fanout Power Supply - Part number 15256400

Usage: Provide power output from the clock power supply to the clock module and the clock slot control cable.

Refer to Figure 50 for cable connector pinouts.

Figure 87. Clock Fanout Power Supply

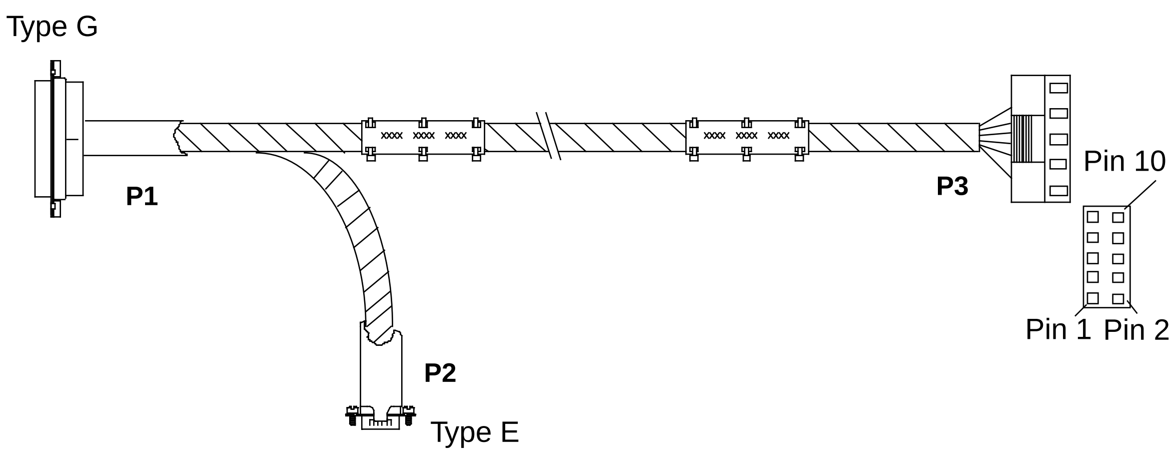


Table 71. 15256400

To	From
P2 - 1	P1 - 1
P2 - 2	P1 - 2
P3 - 9	P1 - 4
P3 - 10	P1 - 5
P3 - 5	P1 - 6
P1 - 10	P1 - 7
P1 - 9	P1 - 8
P3 - 6	P1 - 11
P3 - 1	P1 - 12
P3 - 2	P1 - 13

Index