

**Lucent Technologies**  
Bell Labs Innovations



***CPS 4024 Frame Mount for  
Wireless Applications  
H569-424***

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*Lucent Technologies*  
*CPS 4024 Frame Mount for*  
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**Notice:**

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.



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# ***1 Introduction***

## ***CPS 4024***

### ***Overview***

The H569-424 CPS 4024 Frame Mount System for Wireless Applications is a fully integrated, front access, +24V power system for use with wireless communications systems. This power system includes the following elements:

- Cabinet Power System (CPS)
- Batteries
- DC Distribution

### ***Cabinet Power System***

The 24-volt Cabinet Power System (CPS) is an extremely flexible power system designed for cabinet applications where space conservation and environmental considerations are critical. By limiting the system depth to 12 inches, the 24V CPS architecture permits the cabinet designer to locate revenue-generating equipment behind the power system in 24-inch deep cabinets. By designing the power modules to operate in ambient temperatures of -40° to 65° Celsius (-40° to 149° Fahrenheit) and providing self-contained cooling fans, the 24V CPS 4024 furnishes a reliable power solution for cellular applications in uncontrolled temperature environments.

### ***Batteries***

One to sixteen 12IR125 battery strings provide battery back-up for the power system. The 12IR125 Battery is a valve regulated, rechargeable, stationary, lead-acid battery designed to meet specific and often unique application requirements. The 12IR125 Battery was designed to ensure long life, to provide reliable service and to reduce lifetime maintenance costs.

As an option, the H569-424 may be ordered with EVR Batteries/Stand.

### ***DC Distribution***

There are three distribution panels available with the CPS 4024. These panels are described in Table 2-F.

## ***Customer Assistance Contacts***

***Customer Training*** Lucent Technologies offers customer training on many Power Systems products. For information call 1-972-284-2163. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

***Customer Service*** For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-THE-1PWR (1-800-843-1797). Services provided through this contact include initiating the spare parts procurement process for out of service emergencies, ordering Lucent Technologies documents, and providing other product and service information.

For other customers worldwide, call 001-972-840-0382. This number is answered from 8:00 a.m. until 4:30 p.m., Central Time Zone (Zone 6), Monday through Friday.

***Technical Support*** Technical support for Lucent Technologies customers is available around the world during the normal product warranty period and also while specific contractual agreements extend this service.

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-CAL-RTAC (1-800-225-7822) to contact a product specialist to answer your technical questions and assist in troubleshooting problems.

For other customers worldwide, contact your local field support center or your sales representative to discuss your specific needs.

***Product Repair and Return*** Repair and return service is provided for Lucent Technologies customers around the world.

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call 1-800-255-1402 for information on returning of products for repair.

For other customers worldwide, contact your sales representative to discuss your particular circumstances.

## ***Customer Assistance Contacts, continued***

### ***Warranty Service***

For domestic warranty service, contact your Warranty Service Manager (WSM). For international warranty service, contact your sales representative.

### ***On-Line Power Systems Product Manuals***

For Lucent Technologies users logging in from inside the corporate firewall, the address of the “Power Systems On-Line Product Manuals” page is *<http://www.cic.lucent.com/lineage.html>*.

For customers logging in from outside the firewall, the address is *<http://www.lucent8.com/lineage.html>*. The annual subscription fee for access to this site is \$25. To obtain a password, follow the instructions on-line or call 1-888-Lucent8 (1-888-582-3688). When prompted for an order number, enter or say “167-790-010.”



## 2 *Ordering Information*

### *System*

#### *Components*

CPS 4024 is a 24-volt frame mounted system designed for use in wireless applications. It incorporates the J85500N-1 Cabinet Power System, the H569-424 Group 15, 16, or 17 Distribution Panel, and 12IR125 Batteries into a complete system.

### *Planning*

#### *Introduction*

For planning purposes, Tables 2-A, 2-B, and 2-C provide information related to equipment size, heat release, and floor load.

#### *Physical Data*

**Table 2-A: Physical Data**

<b>H569-424 Group</b>	<b>Height</b>	<b>Depth</b>	<b>Width</b>	<b>Weight Without Batteries (Lbs)</b>	<b>Weight With Batteries (Lbs)</b>	<b>Front Aisle Space Required</b>	<b>Rear Aisle Space Required</b>
2, 33	7' - 2-2/3"	1' - 7-5/8"	2' - 8-1/4"	233	2153	2' - 6"	6"
51,33	7' - 0"	1' - 7-5/8"	2' - 8-1/4"	240	2160	2' - 6"	6"
52, 34	7' - 0"	1' - 4-6/25"	2' - 7-6/25"	250	2170	2' - 6"	6"

#### *Heat Release Information*

**Table 2-B: Heat Release Information**

<b>Item</b>	<b>Watts</b>
ES661B Rectifier	111
ES682 Converter	87
KS23616 L41 50 Amp Breaker	9
15900 AT Fuse Holder	3

## *Planning, continued*

### *Floor Load Area*

**Table 2-C: Floor Load Area**

<b>Item</b>	<b>Weight (Lbs)</b>	<b>Floor Area, Frame Outline (Ft<sup>2</sup>)</b>	<b>Floor Area, Including Aisle (Ft<sup>2</sup>)</b>
Group 1 Frame	84	2.1	7.8
CPS Shelf Equipped With 5 ES661B Rectifiers	85	--	--
Group 15 Panel Equipped With 22 Circuit Breakers	18	--	--
Group 16 Panel Equipped With 22 Circuit Breakers	23	--	--
Group 17 Panel Equipped With 22 Circuit Breakers	35	--	--
Group 2, 33 Frame	233	4.4	10.6
Group 51, 33 Frame	233	4.4	10.6
12IR125 Battery	120	--	--
Group 52, 34	250	4.2	11.3

## Ordering Tables

### Introduction

The following tables provide a summary of the H569-424 group structure and ordering information. For additional information, refer to drawing H569-424.

### Framework and Battery Trays/ Stands

**Table 2-D: Framework and Battery Trays/Stand**

Group	Description
2	42-inch high framework suitable for mounting on top of a group 33 battery stand.
51	39.25-inch high framework suitable for mounting on top of a group 33 battery stand.
52	39.25-inch high framework which creates a 7-foot plant when mounted on top of a group 34 battery stand.
4	Equipment in addition to group 2 for a 42-inch high, 4 shelf battery stand for 3-cell type batteries (2VR375E)
33	Equipment in addition to group 2 or 51 for a 44.6-inch high, 4 shelf battery stand for eight strings of 12IR125 batteries. Qualified for seismic zone 3.
34	Equipment in addition to group 52 for a 44.6-inch high, 4 shelf battery stand for eight strings of 12IR125 batteries. Qualified for seismic zone 4.

### CPS Shelves

**Table 2-E: CPS Shelves**

Group	Description
5	Configuration suitable for a single or multiple shelf plant where low voltage disconnect is not required Input: Five 200-240 VAC plugs which separately power each equipment slot. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum.
6	Configuration suitable for a single shelf plant. Input: Five 200-240 VAC plugs which separately power each equipment slot. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum. Low voltage disconnect contactor rating: 150 Amps.

**Table 2-E: CPS Shelves**

<b>Group</b>	<b>Description</b>
7	Configuration suitable for a single-shelf plant or as the initial shelf in a multiple-shelf plant: Input: Five 200-240 VAC plugs which separately power each equipment slot. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum. Provides control cable for external contactor.
8	Configuration suitable for supplementary shelf in a multiple-shelf plant. Input: Five 200-240 VAC plugs which separately power each equipment slot. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum.
9	Configuration suitable for a single or multiple-shelf plant where low voltage disconnect is not required. Input: One 200-240 VAC conduit feed which powers all equipment slots. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum.
10	Configuration for a single-shelf plant. Input: One 200-240 VAC conduit feed which powers all equipment slots. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum. Low voltage disconnect contactor rating 150 amp.
11	Configuration suitable for a single-shelf plant or as the initial shelf in a multiple-shelf plant: Input: One 200-240 VAC conduit feed which powers all equipment slots. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum. Provides control cable for external contactor, alarm cable (50 feet long).
12	Configuration suitable for supplementary shelf in a multiple-shelf plant. Input: One 200-240 VAC conduit feed which powers all equipment slots. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum.

**Table 2-E: CPS Shelves**

<b>Group</b>	<b>Description</b>
13	Upgrade Kit including heat baffle for 3rd CPS Shelf (installed in the center position) in a 3 shelf plant. Input: One 200-240 VAC conduit feed which powers all equipment slots. Output 1: +24 Volt rectifiers, 135 Amps maximum. Output 2: -48 Volt converters, 50 Amps maximum.
Z1	Equipment to provide one ES643 control unit, AC lugs and office alarm wiring. ES 643 Alarm unit switch settings are different from factory default. Can only be ordered with G6, G7, G10, or G11.
Z2	Equipment to provide AC lugs and interconnecting signal wiring for a three shelf plant. Can only be ordered with G8 or G12.
<b>Note:</b> Groups 11, 12, and 13 are the preferred configurations and are available on relatively shorter delivery intervals than Groups 5-10.	

*Distribution Panels*

**Table 2-F: Distribution Panels**

<b>Group</b>	<b>Description</b>
15	Front access distribution panel with 22 positions for plug-in circuit breakers and/or fuses from 0-50 amps. Suitable for use with one CPS shelf with low voltage disconnect or two CPS shelves where low voltage disconnect is not required. Panel is rated at 300 amps maximum.
16	Front access distribution panel with 22 positions for plug-in circuit breakers and/or fuses from 0-50 amps. Panel includes shunt and 400 amp low voltage disconnect contactor. This panel requires front and rear access. Suitable for two CPS shelves where low voltage disconnect is required. The panel is rated at 300 amps.
17	Distribution panel with 22 positions for plug-in style circuit breakers and/or fuses from 0-100 amps each. Includes shunt and 600 amp low voltage disconnect contactor. Front access suitable for use with three CPS shelves where low voltage disconnect is required. Panel is rated at 420 amps.
<b>Note:</b> Groups 16 and 17 are the preferred configurations and are available on relatively shorter delivery intervals than Group 15.	

Wiring

**Table 2-G: Wiring**

<b>Group</b>	<b>Description</b>
A	Equipment and wiring required in <b>addition to Group 15</b> to interconnect distribution panel in position 1 and CPS Shelf in position 2. This group must be ordered for each single or dual shelf application which uses a group 15 distribution panel.
B	Equipment and wiring required in <b>addition to Group 8 or 12</b> to interconnect a supplemental CPS shelf and an initial CPS shelf when a <b>Group 15 or 16</b> is used in the plant. This group must be ordered for each dual-shelf application
C	Equipment and wiring required in <b>addition to Group 16</b> to interconnect distribution panel in position 1 and a CPS shelf in position 2. This group must be ordered for each single or dual-shelf application which uses a group 16 distribution panel.
D	Equipment and wiring required for <b>-24V operation</b> . This group must be ordered in addition to <b>Group 15</b> to interconnect the distribution panel in position 1 and a CPS shelf in position 2.
E	Equipment and wiring required in addition to <b>Group 17</b> to interconnect a distribution panel in position 1 and a CPS shelf in position 4.
F	Equipment and wiring required in addition to <b>Group 8 or 12</b> to connect a supplemental CPS shelf mounted in position 3 to the <b>Group 17</b> distribution panel in position 1.
G	Equipment and wiring required in addition to <b>Group 8 or 12</b> to connect a supplemental CPS shelf mounted in position 2 to the <b>Group 17</b> distribution panel in position 1.
H	Equipment in addition to <b>Groups 17 or 51</b> to supply lugs and hardware for frame and CO grounding.
AA	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 1 and 2</b> (the bottom shelf of batteries) to the group 17 distribution panel <b>without battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M.
AB	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 3 and 4</b> (the second shelf of batteries) to the group 17 distribution panel <b>without battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M.
BA	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 1 and 2</b> (the bottom shelf of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M. Battery Disconnects are rated at 100A. For use only with group 33.

**Table 2-G: Wiring**

<b>Group</b>	<b>Description</b>
BB	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 3 and 4</b> (the second shelf of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M. Battery Disconnects are rated at 100A. For use only with group 33.
BC	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 1 and 2</b> (the bottom shelf of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M. Battery Disconnects are rated at 100A. For use only with group 34.
BD	Equipment and wiring required to connect the 12IR125 battery strings in <b>positions 3 and 4</b> (the second shelf of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes with cable tie wrapped to the frame. Cables for field wiring a string of 12IR125 batteries are available in Table 2-M. Battery Disconnects are rated at 100A. For use only with group 34.
CA	Equipment and wiring required to connect shelves one 2VR375E battery string in <b>shelves 1 and 2</b> (the bottom shelves of batteries) to the group 17 distribution panel <b>without battery disconnects</b> . This group comes factory wired with the cables tie wrapped to the frame.
CB	Equipment and wiring required to connect shelves one 2VR375E battery string in <b>shelves 3 and 4</b> (the bottom shelves of batteries) to the group 17 distribution panel <b>without battery disconnects</b> . This group comes factory wired with the cables tie wrapped to the frame.
DA	Equipment and wiring required to connect shelves one 2VR375E battery string in <b>shelves 1 and 2</b> (the bottom shelves of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes factory wired with the cables tie wrapped to the frame.
DB	Equipment and wiring required to connect shelves one 2VR375E battery string in <b>shelves 3 and 4</b> (the bottom shelves of batteries) to the group 17 distribution panel <b>with battery disconnects</b> . This group comes factory wired with the cables tie wrapped to the frame.

**Field-Installed  
Components for  
CPS Shelves**

**Table 2-H: Field-Installed Components for CPS Shelves**

<b>Code</b>	<b>Comcode</b>	<b>Description</b>
ES661B	107675373	+24VDC Rectifier, 27 Amps
ES643	107318941	+24VDC Input Alarm Control Unit
ES682	107306045	+24V/-48V Converter, 8.5 Amps
ES612	107826760	-48V Distribution Module for Output 2 Voltage on CPS Shelf
BSP1	107322976	Low Voltage Disconnect/Temperature Control Board
--	847439833	AC Input Wiring Kit for One AC Conduit
--	847415874	Office Alarm Output Wiring Kit
--	847803012	50 Foot Office Alarm Output Cable
--	847541653	150 Foot Office Alarm Output Cable
--	847638731	AC Input Wiring Cable for one AC Conduit
--	847541646	Five Plugs for 200-240V Service
--	847540772	Secondary Output Wiring Kit
--	847541638	Five Plugs for 120V Service

**Field-Installed  
Components for  
Frames**

**Table 2-I: Field-Installed Components for Frames**

<b>Comcode</b>	<b>Description</b>
407155399	One 12IR125 Battery (2 are required for one string)
847580529	Thermistor Kit (1/4" Ring Terminal Type, 9' cable) (one per 12IR125 battery string)
848221552	5/16" Ring Type Thermal Probe/Cable Assembly, 10' (one per 12IR125 battery string)
848221560	5/16" Ring Type Thermal Probe/Cable Assembly, 25' (one per 12IR125 battery string)
847582871	One Alarm Wireset for 12IR125 Battery String Disconnect to Provide "Power Major" Alarm to CPS Shelf (one per disconnect switch)
847802949	One battery cable kit (provides 1 pair of 2 AWG cables and lugs for connecting 1 string of 12IR125 batteries directly to group 17 distribution panel). Only for use with group 33.
601832546	One battery cable kit (provides 2 AWG cable, battery disconnect switch and lugs for connecting 2 strings of 12IR125 batteries to the group 17 distribution panel). Provides all cables from battery to disconnect and from disconnect to distribution panel. Only for use with group 33.
601824899	Upgrade kit for second shelf in a 2 or 3 shelf plant used with Group 17 distribution. Kit consists of H569-424 Group 12, G, Z2, and miscellaneous AC hardware.
601825698	Upgrade kit for third shelf in a 3 shelf plant used with Group 17 distribution. Kit consists of H569-424 Group 13 and F and miscellaneous AC hardware.
107977159	One battery cable upgrade kit (provides 2 AWG cable, battery disconnect switch and lugs for connecting 2 strings of 12IR125 batteries to the group 17 distribution panel). Provides all cables from battery to disconnect and from disconnect to distribution. Only for use with group 34.

**Circuit Breakers,  
Fuse Holder, and  
Fuses**

**Table 2-J: Circuit Breakers, Fuse Holder, and Fuses**

<b>Comcode</b>	<b>Amperage</b>	<b>Description</b>
<b>Circuit Breakers</b>		
407098417	3	KS23616 L31
407098425	5	KS23616 L32
407098433	10	KS23616 L33
407098458	15	KS23616 L34
407098474	20	KS23616 L36
407098482	25	KS23616 L37
407098490	30	KS23616 L38
407245448	40	KS23616 L48
407098516	45	KS23616 L40
407098524	50	KS23616 L41
407098532	60	KS23616 L42
407098540	70	KS23616 L43
407098557	80	KS23616 L44
407098565	90	KS23616 L45
407098573	100	KS23616 L46
<b>Fuse Holder and Fuses</b>		
406980797	--	Fuse Holder, 15900-AT
407006329	5	Fuse, TPA-5
407006337	10	Fuse, TPA-10
407006345	15	Fuse, TPA-15
407006352	20	Fuse, TPA-20
407006360	25	Fuse, TPA-25
407006378	30	Fuse, TPA-30
407006386	40	Fuse, TPA-40
407006394	50	Fuse, TPA-50

**Anchor Bolts**

**Table 2-K: Anchor Bolts**

Seismic Zone	H569-424 Group	Comcode	Anchor Type (Hilti)	Hole Size	Wrench	Torque (Ft-Lbs)
0,1	ALL	847135662	(4) HDI-1/2	5/8" Bit/3" Deep	3/4"	18
2, 3	2, 33	847320835	(4) HSLG M12/0 TN	18mm Bit/100mm Deep	19mm	50
	51, 33					
2, 3	52, 34	847320835	(4) HSGL M12/0 TN	18mm Bit/100mm Deep	19mm	50
4	52, 34	847221074	(4) HSLG M16/25	24mm Bit/125mm Deep	30mm	125

**Terminal Lugs**

Table 2-L lists the Terminal Lug Kits for use with circuit breakers and fuse holders for the Group 15 Distribution Panel. The screw for securing the load lug is provided with the distribution panel

Table 2-M lists the Terminal Lugs for connecting battery cables to the CPS Shelf or to the Group 17 Distribution Panel.

**Table 2-L: Terminal Lug Kits for Group 15 Distribution Panel**

<b>847301660 10-12 AWG Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
Description	Qty	Used With
WP91412 L73 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L93 Single Hole Lug	1	
10-32X7/16 Screw	2	
WP91767 L3 1/4 Tubing, 2 Inch	2	
<b>847301678 8 AWG Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
Description	Qty	Used With
WP91412 L52 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L1 Single Hole Lug	1	
10-32X7/16 Screw	2	
WP91767 L4 3/8 Tubing, 2 Inch	2	

**Table 2-L: Terminal Lug Kits for Group 15 Distribution Panel**

<b>847301686 6 AWG Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
<b>Description</b>	<b>Qty</b>	<b>Used With</b>
WP91412 L108 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L2 Single Hole Lug	1	
10-32X7/16 Screw	2	
WP91767 L5 1/2 Tubing, 2 Inch	2	
<b>847301694 4 AWG Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
<b>Description</b>	<b>Qty</b>	<b>Used With</b>
WP91412 L5 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L4 Single Hole Lug	1	
10-32X7/16 Screw	2	
WP91767 L5 1/2 Tubing, 2 Inch	2	
<b>847591583 6 AWG 45 Degree Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
<b>Description</b>	<b>Qty</b>	<b>Used With</b>
WP91412 L108 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L15 Single Hole 45 Deg. Lug	1	
10-32X7/16 Screw	2	
WP91767 L5 1/2 Tubing, 2 Inch	2	
<b>847591575 4 AWG 45 Degree Termination Lug Kit</b>		
<b>Each Kit Contains the Following:</b>		
<b>Description</b>	<b>Qty</b>	<b>Used With</b>
WP91412 L5 Double Hole Lug	1	Single Position Circuit Breaker or Fuse Holder
WP91412 L6 Single Hole 45 Deg. Lug	1	
10-32X7/16 Screw	2	
WP91767 L5 1/2 Tubing, 2 Inch	2	

**Table 2-M: Terminal Lugs for Connecting Battery Cables to CPS Shelf or to Group 17 Distribution Panel**

<b>Stranded Wire</b>	<b>Flex Wire</b>	<b>WP-91412 List</b>	<b>Comcode</b>	<b>Stud Size</b>
<b>Single Hole Angled Connectors for Battery</b>				
14-10	14-10	97	406338186	0.25
8	8	76	406021642	0.25
6	6	15	405347774	0.25
4	4	6	405347618	0.25
2	-	16	405347782	0.25
-	2	9	405347709	0.25
<b>Single Hole Connectors for CPS Shelf</b>				
14-10	14-10	94	406338152	0.25
8	8	74	405356189	0.25
<b>Double Hole Connectors for CPS Shelf</b>				
8	8	75	406021626	0.25
6	6	3	405347519	0.25
4	4	5	405347576	0.25
2	-	54	405348202	0.25
-	2	8	405347683	0.25

## ***Upgrade Kits***

### ***Shelves***

**Table 2-0: Upgrade Shelf Kits**

1st Upgrade Shelf Kit Comcode 601824899	Contains the CPS shelf and equipment required to add a 2nd shelf to a single shelf system. Refer to the enclosed packing list for specific contents of the kit.
2nd Upgrade Shelf Kit Comcode 601825698	Contains the CPS shelf and equipment required to add a 3rd shelf to a two shelf system. Refer to the enclosed packing list for specific contents of the kit.

## Upgrade Kits, continued

**Battery Cable Kits  
for Group 33  
Battery Stands**

**Table 2-P: Battery Upgrade Cable Kits for Group 33  
Battery Stands**

Qty	Description
<b>Battery Upgrade Cable Kit Without Disconnect - 847802949</b>	
1	Pair of 2 AWG wires, one with red tape, one without red tape
1	2 hole, 2 AWG, straight lug for distribution end of wire without red tape
1	2 hole, 2 AWG, 45° lug for distribution end of wire with red tape
2	Pieces of heat shrink tubing for covering loose lugs
4	1/4-20 nuts with sems washer for attaching cables to distribution panel
2	Battery spacers
<b>Battery Upgrade Cable Kit With Disconnect - 601832546</b>	
1	Battery disconnect switch
2	Pairs of 2 AWG wires, one with red tape, one without red tape that run from the battery to the battery disconnect
1	Pair of 2 AWG wires, one with red tape, one without red tape with single hole straight lugs on the battery disconnect end of the wire
1	2 hole, 2 AWG, straight lug for the distribution end of the wire without red tape
1	2 hole, 2 AWG, 45° lug for distribution end of wire with red tape
2	Pieces of heat shrink tubing for covering loose lugs
14	1/4-20 nuts with sems washer for attaching cables to distribution panel
2	Battery Spacers

## Upgrade Kits, continued

**Battery Cable Kits  
for Group 34  
Battery Stands**

**Table 2-Q: Battery Upgrade Cable Kits for Group 34  
Battery Stands**

Qty	Description
<b>Battery Upgrade Cable Kit With Disconnect - 107977159</b>	
1	Battery disconnect switch
2	Pairs of 2 AWG wires, one with red tape, one without red tape that run from the battery to the battery disconnect
1	Pair of 2 AWG wires, one with red tape, one without red tape with single hole straight lugs on the battery disconnect end of the wire
1	2 hole, 2 AWG, straight lug for the distribution end of the wire without red tape
1	2 hole, 2 AWG, 45° lug for distribution end of wire with red tape.
2	Pieces of heat shrink tubing for covering lugs
4	1/4-20 nuts with sems washer for attaching cables to distribution panel
2	Screws, Comcode 901079426
6	Cable Ties
1	Disconnect Alarm Wire, Comcode 847582871

## Documentation

### Ordering Information

Table 2-N lists additional documentation associated with the H569-424 CPS.

**Table 2-N: Documentation**

<b>Document Number</b>	<b>Description</b>
H569-424	Assembly and Ordering Drawing
T83261-30	CPS Shelf Wiring Diagram
T83269-30	Distribution Panel Wiring Diagram
T83280-30	Battery Disconnect Wiring
SD83261-01	CPS Shelf Schematic Diagram
SD83269-01	Distribution Panel Schematic Diagram
ED83135-30	Distribution Panel Assembly Drawing
167-102-120	H569-424 Product Manual
167-102-121	H569-424 Upgrade Kits Product Manual
167-790-071	J85500N-1 24V CPS Product Manual
157-622-025	12IR125 Battery Product Manual
157-622-011	EVR Battery Product Manual

## **3                      *Safety***

### ***Safety Statements***

Please read and follow all safety instructions and warnings before installing, maintaining, or repairing the power system. Reference the individual module product manuals for additional safety statements specific to the modules.

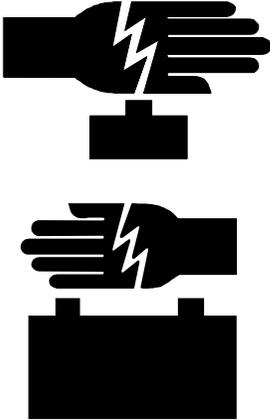
- The H569-424, including the CPS power shelves, batteries and distribution, is Underwriters Laboratories (UL) Listed per Subject Letter 1801, DC Power Distribution Centers for Telecommunications Equipment. Rectifiers and converters are also individually UL Recognized and/or CSA Certified to UL1950 and CSA C22.2 No. 234/950. Rectifiers are also approved to IEC-950/EN60950 by an EC Notified Body and have outputs classified as SELV. CPS power shelves, including the above modules, are individually UL Listed to UL Subject 1801. For input and output ratings, refer to the individual shelves.
- Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the U.S. National Electric Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.
- This equipment is to be used in controlled environments (an area where the humidity is maintained at levels that can not cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified).
- This equipment has been evaluated for use in a continuous ambient temperature of up to 50°C. Short term excursions to 65°C is allowed.
- This equipment must not be installed over combustible surfaces.

## ***Safety Statements, continued***

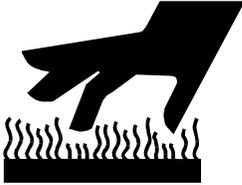
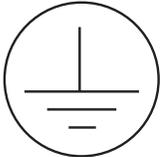
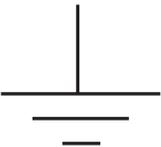
- For installations in the United States, Listed compression connectors are to be used to terminate Listed field-wired conductors where required. For all installations, the appropriate connector is to be applied only to the correct size conductor as specified by the connector manufacturer using only the connector manufacturer's recommended tooling or tooling approved for that connector.
- If the proper connector for the country of installation is not provided, obtain appropriate connectors and follow manufacturer's and all local requirements for proper connections. All national and local rules are to be followed when making field connections.
- Torque electrical connections to the values specified on labels or in the product documentation.
- Battery input cables must be dressed to avoid damage to the conductors (caused by routing around sharp edges or routed in areas where wires could get pinched) and undue stress on the connectors.
- The short circuit current capability of the battery input to the distribution panel shall not exceed 10,000A.
- Fuses/circuit breakers may not be provided with the equipment. Refer to the product documentation for proper hardware. Use only the parts specified in the equipment documentation. Installing fused or circuit breakers not specified for use in this equipment may result in injury to service personnel or equipment damage.
- External loading must not exceed 80% of its fuse rating.
- AC branch circuits to this equipment must be protected with either fuses or circuit breakers sized as required by the National Electrical Code (NEC) and/or local codes. Refer to the individual equipment product manuals to determine acceptable branch circuit protection ratings and to assure rating of equipment will not exceed 80% of the value of the protector chosen.
- Insulation on field-wired power conductors should be rated no less than 90° Centigrade. Wire conductor size should be no less than allowed by electrical codes for 60° Centigrade wire (regardless of insulation temperature rating used) and based on the ampacity of the associated protection device. Insulation on conductors used within outside telephone equipment cabinets should be rated at least 105° Centigrade.
- An accessible AC disconnect/protection device to remove power from the equipment in the event of emergency must be provided.

## Warning Statements and Safety Symbols

The symbols may sometimes be accompanied by some type of statement; e.g., “Hazardous voltage/energy inside. Risk of injury. This unit must be accessed only by qualified personnel.”

	<p>This symbol identifies the need to refer to the equipment instructions for important information.</p>
	<p>These symbols (or equivalent) are used to identify the presence of hazardous ac mains voltage.</p>
	<p>This symbol is used to identify the presence of hazardous ac or dc voltages. It may also be used to warn of hazardous energy levels.</p>
	<p>One of these two symbols (or equivalent) may be used to identify the presence of rectifier and battery voltages. The symbol may sometimes be accompanied by some type of statement, for example: “Battery voltage present. Risk of injury due to high current. Avoid contacting conductors with uninsulated metal objects. Follow safety precautions.”</p>

## Warning Statements and Safety Symbols, continued

 A black silhouette of a hand reaching down towards a series of wavy lines representing heat or a hot surface.	<p>This symbol is used to identify the presence of a hot surface. It may also be accompanied by a statement explaining the hazard. A symbol like this with a lightning bolt through the hand also means that the part is or could be at hazardous voltage levels.</p>
 A black triangle containing three wavy lines representing heat.	<p>This symbol may also be used to identify the presence of a hot surface. The marked item should not be touched without taking care.</p>
 A circle containing a vertical line that meets a horizontal line, which is above another horizontal line, representing a protective safety earth ground.	<p>This symbol is used to identify the protective safety earth ground for the equipment.</p>
 A vertical line meeting a horizontal line, which is above another horizontal line, representing other bonding points within the equipment.	<p>This symbol is used to identify other bonding points within the equipment.</p>
 A black silhouette of a person's head and shoulders wearing safety glasses, enclosed in a circle.	<p>This symbol is used to identify the need for safety glasses and may sometimes be accompanied by some type of statement, for example: "Fuses can cause arcing and sparks. Risk of eye injury. Always wear safety glasses."</p>

## ***Precautions***

When working on or using this type of equipment, the following precautions should be noted:

- This unit must be installed, serviced, and operated only by skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment.
- The power system can be powered by multiple AC inputs. Ensure that the appropriate circuit protection device for each AC input being serviced is disconnected before servicing equipment.
- For equipment connected to batteries, disconnecting the AC alone will not necessarily remove power to the equipment. Make sure the equipment is not also powered by the batteries or the batteries are not connected to the output of the equipment.
- High leakage currents may be possible on this type of equipment. Make sure the equipment is properly safety earth grounded before connecting power.
- Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment. Exercise care when servicing this area.
- Batteries may be connected in parallel with the output of the rectifiers. Turning off the rectifiers will not necessarily remove power from the bus. Make sure the battery power is also disconnected and/or follow safety procedures while working on any equipment that contains hazardous energy/voltage.

## ***Precautions, continued***

- In addition to proper job training and safety procedures, the following are some basic precautions that should always be used:
  - Use only properly insulated tools.
  - Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
  - Wear safety glasses.
  - Test circuits before touching.
  - Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn on.
  - Be aware of potential hazards before servicing equipment.
  - Identify exposed hazardous electrical potentials on connectors, wiring, etc. (note the condition of these circuits - especially any wiring).
  - Use care when removing or replacing any covers - avoid any circuits.

## Handling Batteries

- To direct attention to the possible source of danger from battery gases, post one or more warning signs, lettered in large characters, in a conspicuous location near the battery. For example:



- Fully brief anyone who is permitted access to battery areas on the hazards of handling lead-acid batteries. Make it clear to anyone handling, unpacking, or installing lead-acid batteries that they contain electrolyte (sulfuric acid and water). Everyone must wear protective equipment such as rubber gloves, rubber aprons, full face mask, and splash-proof goggles when performing any activity involving handling of batteries or cells containing electrolyte.
- A storage battery gives no indication by its appearance of the potential energy stored in it. All lead-acid storage cells/batteries have enormous short circuit capability which can result in serious burns. Use extreme care to avoid shorting out cell and/or battery terminals. Shorting a cell or battery with a non insulated tool can vaporize or throw the tool.

## ***Handling Batteries, continued***

- All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. NEVER tamper with or block the vent caps of the 12IR125 battery modules. A damaged gas vent cap could become clogged, resulting in an explosion due to internal pressure may result. Such an explosion could short circuit other battery modules and result in a fire. ALWAYS place batteries in a well-ventilated area. NEVER place battery modules in a sealed environment.
- In case of electrolyte contact with the skin, remove the electrolyte **immediately** by flushing the affected area with large amounts of plain tap water. In case of electrolyte in the eye, pour water into the inner corner of the eye and allow at least one quart of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician **immediately**.

# 4 *Installation*

## *Preparation*

### *Introduction*

This section outlines the sequence for installing the H569-424 +24V battery plant as well as a test procedure for verifying the integrity of the installation.

### *Tools and Hardware*

You will need the following tools and hardware to install and test the CPS plug-in modules:

- socket wrenches: 5/16", 3/8", 7/16"
- drive socket wrench: 1/2"
- deep socket wrenches: 1/2", 15/16"
  - 19 mm for zones 2, 3 anchor kit
  - 3/4" for zone 0, 1 anchor kit
  - 30mm for zone 4 anchor kit
- Allen wrenches: 3/16", 5 mm
- torque wrenches (refer to Table 4-A)
- 12" extension for socket
- small screw driver
- masonry drill kit as required (Refer to Table 2-K)
- compression tooling for installation of various compression lugs
- test loads: 24V @ 2 amperes, 48V @ 2 amperes
- test cable
- digital meter with an accuracy of  $\pm 0.05\%$  (Fluke 87 or equivalent)
- ESD strap
- heat shrink gun
- protective canvas
- insulating rubber mat

### **Caution**

Due to the possibility of working on energized circuits during these procedures, all tools and test equipment must be insulated in an approved manner.
--

## ***H569-424 System Overview***

### ***Components***

The +24V plant consists of some or all of the following components (Zone 2 and 3 frame shown in Figure 4-1A; Zone 4 frame shown in Figure 4-1B):

- 12IR125 battery stand which holds 8 strings of 12IR125 batteries (G 33 or G 34)
- 39.25" tophat for mounting equipment above the battery stand (G 51 or G 52)
- Initial J85500N-1 power shelf with control for external LVD contactor (G 7, G 11)
- Up to two supplemental J85500N-1 power shelves arranged for +24V rectifiers and +24V to -48V converters (G 8, G 12, G 13)
- 22 position circuit breaker panel rated for 415 equipped with an LVD contactor and shunt for monitoring load current (G 17)
- Battery disconnects with interconnecting wiring from batteries to distribution panel (G BA or G BC)- for strings 1 and 2, G BB or G BD- for strings 3 and 4, ED-83123-30G11 or G14 - for 2 strings in positions 5 through 8 added in the field)

## H569-424 System Overview, continued

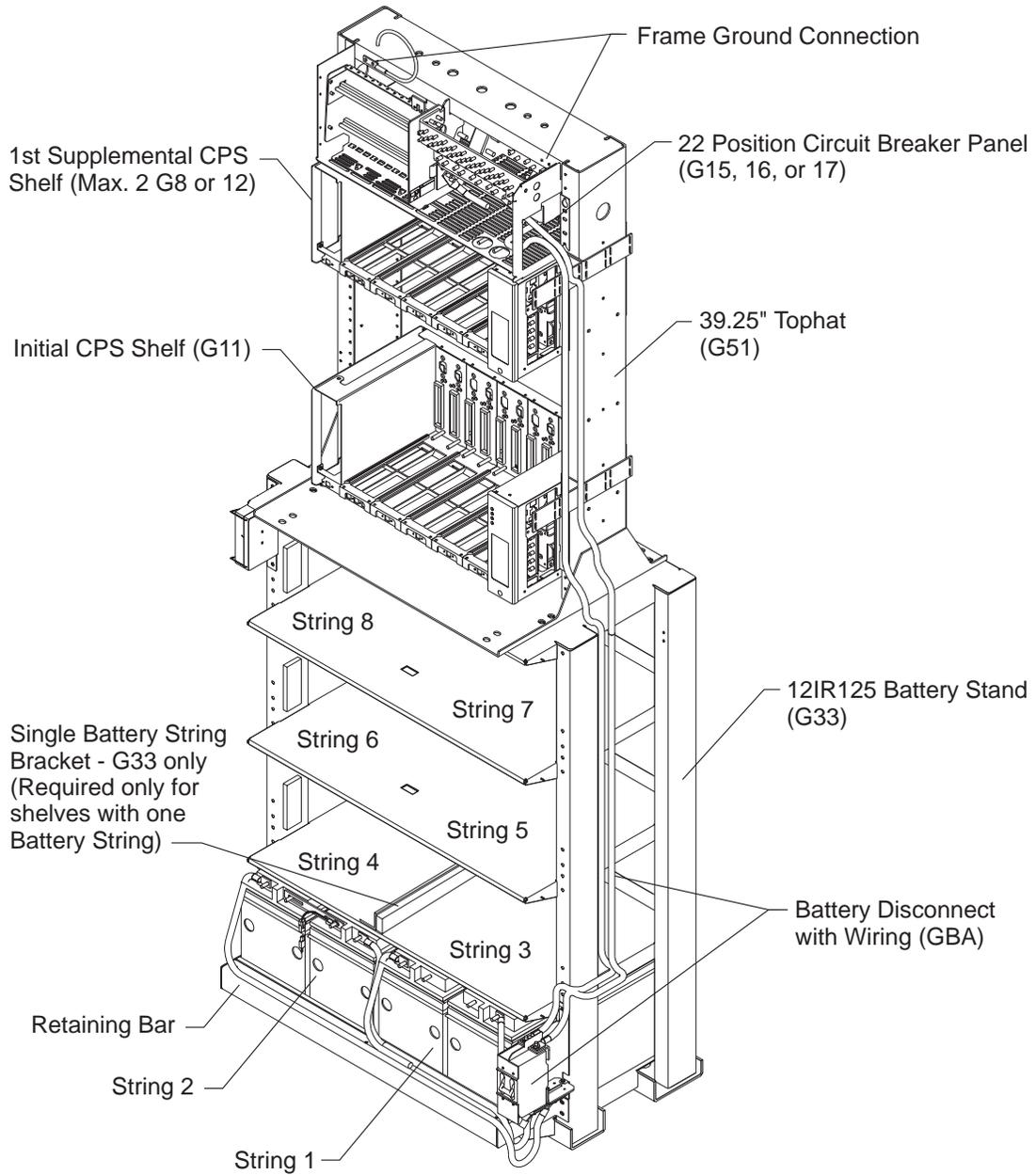


Figure 4-1A: H569-424 Plant, Zone 2 and 3 Frame

## H569-424 System Overview, continued

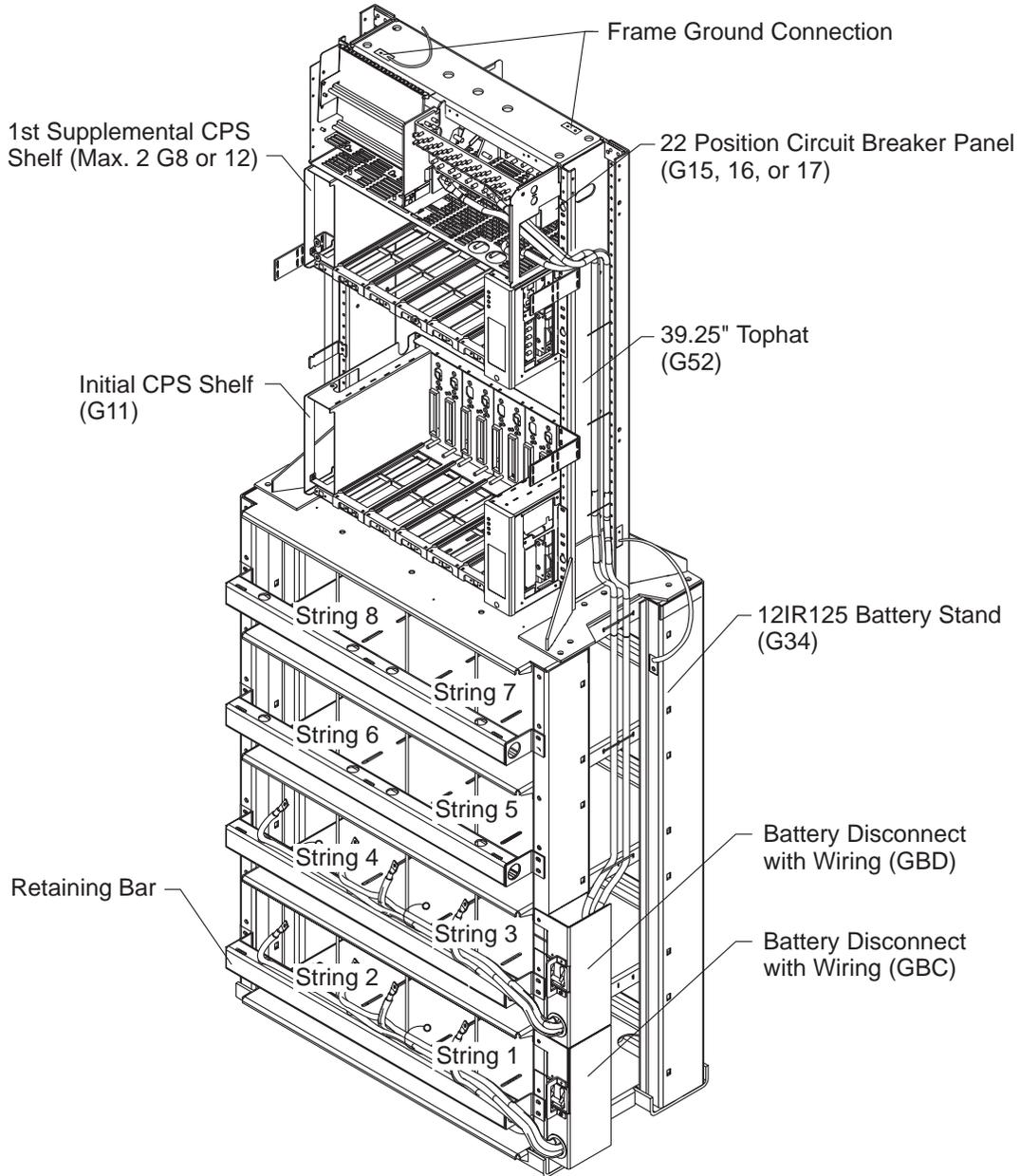


Figure 4-1B: H569-424 Plant, Zone 4 Frame

## H569-424 System Overview, continued

### Wiring

The commercial ac power input wiring enters the rectifier/converter shelves on the left. The plant output wiring exits the plant on the right. Power connections between rectifier shelves and the DC distribution panel are on the right. The CPS intershelf signal connector and the office alarm cable are on the left. Fuse alarm and LVD contactor control wiring between the distribution panel and the initial CPS shelf is on the right. The batteries are connected to the distribution through wiring that may be ordered with or without battery disconnect switches on the right side.

Note: Miscellaneous interconnection and load wiring are described elsewhere in this manual.

### Torque Requirements

Table 4-A identifies the torque requirements to be followed when making power connections throughout these procedures:

**Table 4-A: Minimum Torque for All Electrical Connections**

Screw Size	Torque - lb-in or (lb-ft)					
	Wire Connections		Head Tightened		Nut Tightened	
	Slotted Machine	Hex or Socket Cap	Slotted Machine	Hex or Socket Cap	Slotted Machine	Hex or Socket Cap
8-32	15	15	19	19	19	23
10-24	21	21	27	27	27	33
1/4-20	50	50	65	65	65	80
5/16-18	-	100	-	135	135	165
3/8-16	-	180	-	240	240	290
7/16-14	-	280	-	385	385	465
1/2-13	-	500	-	585	585	710
5/8-11	-	(71)	-	(97)	(97)	(118)
3/4-10	-	(125)	-	(172)	(172)	(209)

## ***Installation and Turn Up Sequence***

### ***Introduction***

Please review all safety warnings before beginning the installation process. Observe all warnings and labels on the equipment.

When handling the plug-in modules, wear an ESD strap. You must be properly grounded in order to prevent ESD damage to the unit(s).

### **Warning**

<p>Only qualified personnel should install and service the CPS shelf and plug-in modules. Hazardous energy and voltages are present in the unit and on the interface cables and will shock or cause serious injury or death if safety precautions are ignored. Follow all safety warnings and practices when servicing this equipment.</p>
--

### ***Frame Anchoring***

The method of securing the H569-424 to the floor will depend on the seismic zone the equipment is installed in as well as the type of floor in the installing location. A template for drilling anchor holes is supplied with the frame and should be used as a guide for drilling holes. For specific information regarding the size and depth of holes to be drilled, refer to the job specification and Table 2-K.

### ***CO Ground Connection***

Figure 4-2 shows the studs for making the CO ground connection for Group 17. There are two sets of 1/4" studs, spaced 5/8" apart arranged for 2 AWG lugs. The C.O. ground connection for a system with a Group 15 distribution panel is made on TB1 of the CPS shelf.

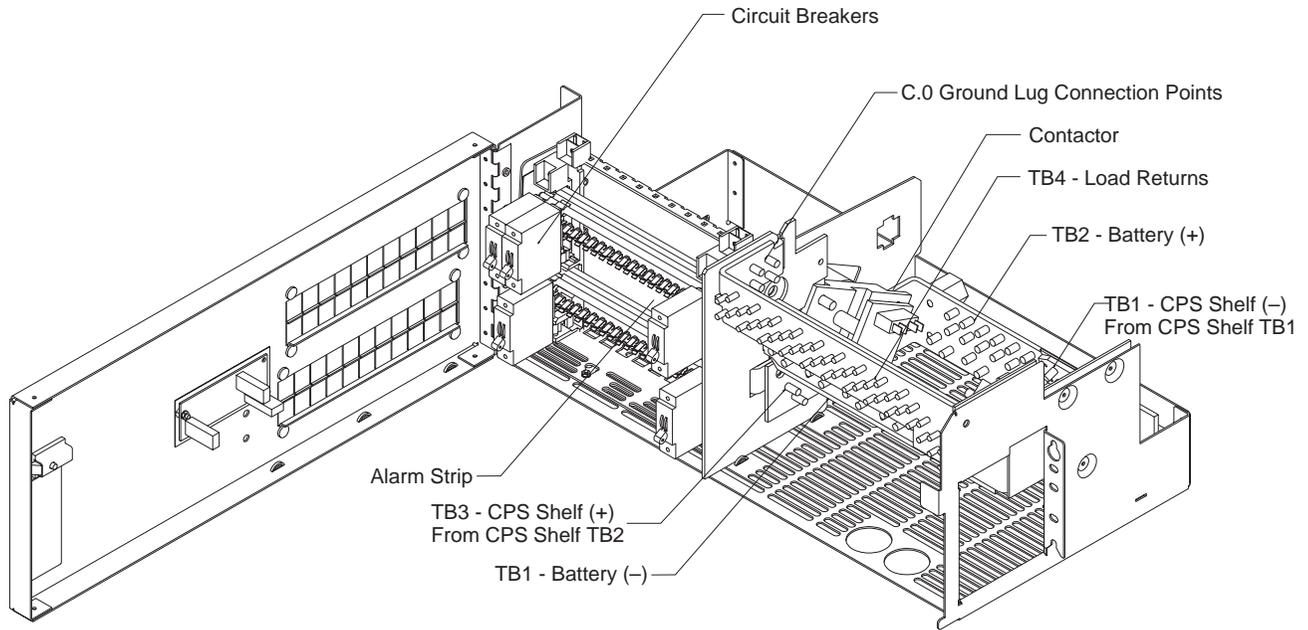
### ***Frame Ground Connection***

Figure 4-1A shows the frame ground connection locations for a Group 51 tophat. Landings are provided for 2 two hole lugs where the holes are threaded for #12 screws and are spaced .75 inches apart.

A Group 2 tophat has only 1 frame ground location on the left side in the identical location as Group 51.

The Group 52 tophat has the same grounding location as Group 51 but has one additional frame ground on top of the frame. See Figure 4-1B.

## Installation and Turn Up Sequence, continued



**Figure 4-2: Group 17 Office Ground Connection**

## ***Installation and Turn Up Sequence, continued***

### ***AC Connection***

Note: Branch circuits to the rectifier shelf in the H569-424 plant must be protected using circuit breakers sized as required by the National Electric Code.

#### **Warning**

- High leakage currents are possible. Earth ground connection is essential before connecting the commercial ac power to the rectifier shelf.
- Interconnecting control/logic circuits are at hazardous voltage levels with respect to ground.
- Ensure that the circuit breaker for each ac input is disconnected while installing this equipment.

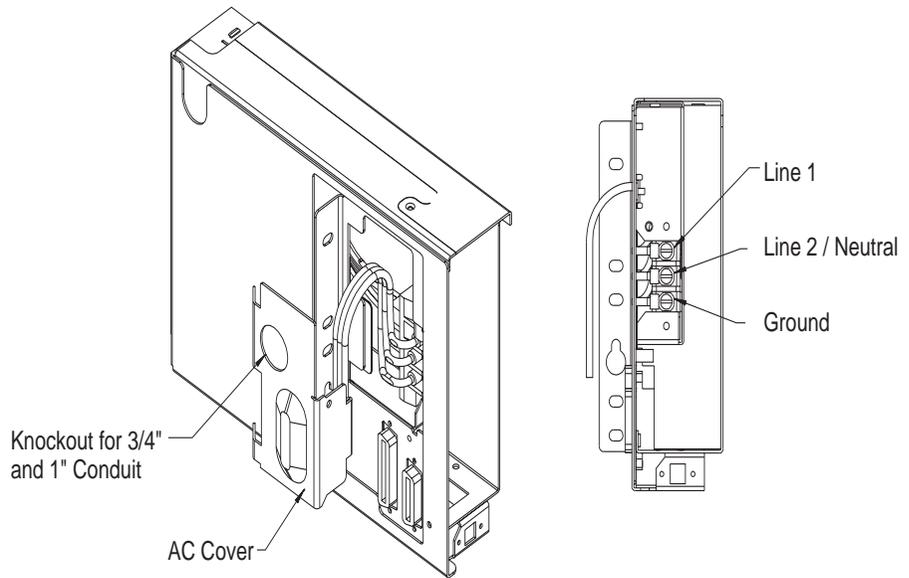
AC is connected on the left hand side of the J85500N-1 CPS shelf. Figure 4-3 shows the AC input section of the Group 9-13 power shelf. The wiring cover which has knockouts for both 3/4" and 1" conduit is removed and the wiring connected to the terminal block as shown in the figure as well as on the insulator in the wiring compartment itself. The safety ground must be connected first. The wiring cover is replaced, and the conduit attached. Secure the conduit or flexible conduit to the cable bracket on the left side of the frame.

Up to 3 power shelves may be mounted in the frame, and each shelf typically draws 26A at 208V input. The total input current for 3 fully loaded rectifier shelves can be up to a maximum of 78A.

**AC Input Wiring:** The ac input wire gauge recommended is 10 AWG. If the distance from the bay to the circuit breaker is large, the bay can accommodate wire up to 8 AWG.

**Fuse or circuit breaker powering the shelf:** A circuit breaker with a rating of 30 amps is required. If a fuse is used, a 35 amp, slow blow is required.

## ***Installation and Turn Up Sequence, continued***



***Figure 4-3: CPS Shelf Terminal Block (Groups 9-13)***

## Installation and Turn Up Sequence, continued

### Control Unit

The ES643 ACU (alarm control unit) ships installed in the initial (bottom) CPS shelf when a Group Z1 is ordered. Figure 4-4 shows the location of the ACU. The Battery on Discharge (BD) threshold on the ACU is pre-set in the factory at 25.0 volts. On switch SW440, the following switch settings support a 25V BD threshold: DIP switches 1, 2, 4, 5 and 6 are closed; switch 3 is open. Refer to “Voltage Threshold for the BD Alarm” in Section 5 for more information. The ACU may be removed/installed using the 3/16 inch Allen wrench, the recommended torque for the module’s mounting fastener is 12 in-lbs maximum.

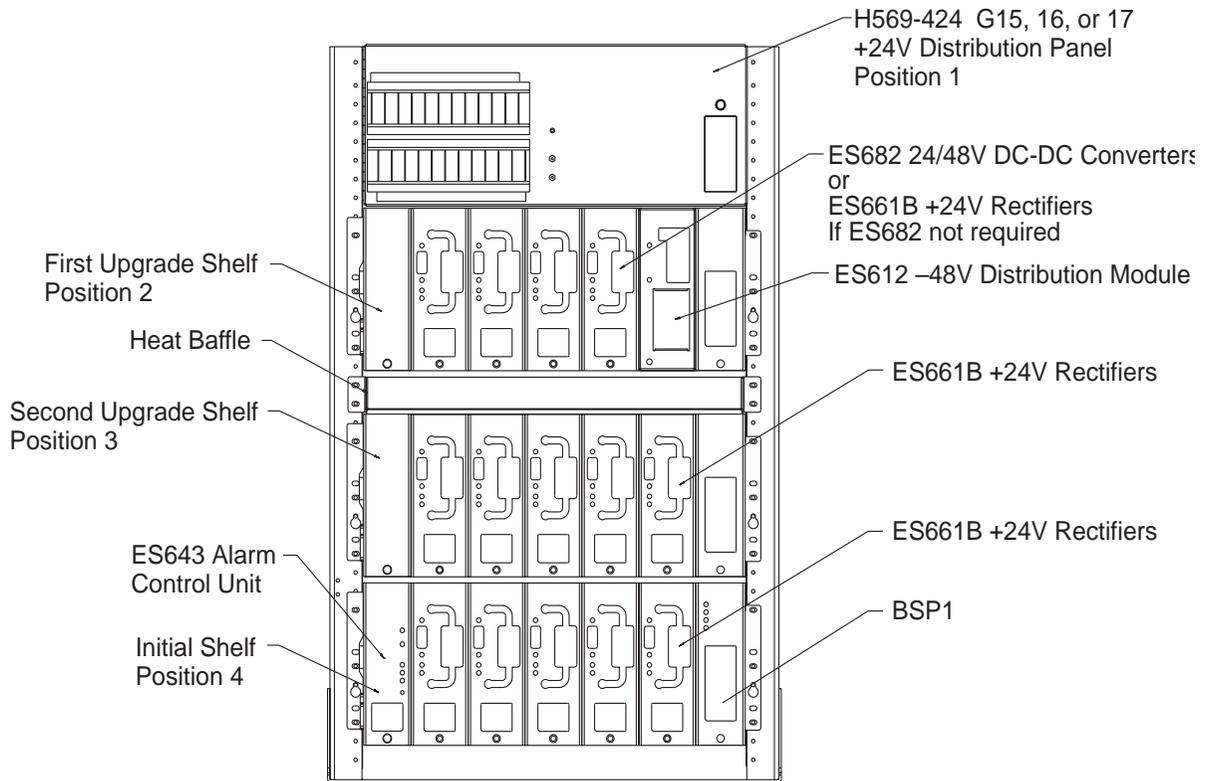


Figure 4-4: CPS Module Positions

## ***Installation and Turn Up Sequence, continued***

### ***CPS Modules***

Table 4-B lists the various CPS modules and their associated apparatus codes and comcodes.

**Table 4-B: CPS Modules**

<b>Unit</b>	<b>Apparatus Code</b>	<b>Comcode</b>
24V Rectifier	ES661B	107675373
24/48V DC/DC Converter	ES682	107306045
48V Plug-in Distribution Module	ES612	107826760
Alarm Control Unit (ACU)	ES643*	107318941
LVD Circuit Pack	BSP1**	107322976
ACU Slot Cover	N/A	847345576
*The ES643 is installed when Group Z1 is ordered.		
**The BSP1 circuit pack is factory-installed on all initial CPS shelves.		

There are 3 types of modules which may be plugged into the CPS shelves: the ES661B (+24V Rectifier), the ES682 (24V/48V Converter), and the ES612 (48V Distribution Module). When 48V power is not required, the rectifiers may be plugged into any of the three shelves. If 48V power is required, the ES682 Converters and ES612 Distribution Unit should be placed in the top shelf as shown in Figure 4-4. The placement of the ES682 and ES612 in the top shelf is required to accommodate dressing of the wires out of the top of the ES612 unit (provisions have been made in the Group 17 Distribution Panel for this purpose).

## ***Installation and Turn Up Sequence, continued***

### ***Installing Modules***

If rectifiers are installed in the initial and first upgrade shelf and a 48V upgrade is required, the second upgrade shelf may be mounted, and the rectifiers moved one at a time to the middle shelf. The 48V units may now be installed in the top shelf. Install the modules using the following procedure:

1. Ensure that the proper modules have been ordered and received.
2. Disconnect the power to the shelves by turning the ac service circuit breakers Off.
3. The On/Standby switch on each rectifier/converter must be in the Standby position.
4. Install each module by placing it on the appropriate power shelf and carefully sliding it toward the backplane until its mounting screw prevents any further backward motion. Figure 4-4 shows the positions of the rectifiers, converters, and 48V distribution module. Do not seat the power modules until testing of the installation is complete.

### ***Low Voltage Disconnect Board (BSP1)***

The optional LVD board (BSP1) is shipped installed in the initial CPS shelf when Group Z1 is ordered. The low voltage disconnect threshold voltage is set in the factory to 21.25V. On SW201, the following switch settings support a 21.25V threshold: DIP switches 1 and 2 in the on position and switches 3 and 4 in the Off position. Verify the LVD is set at 21.25V unless otherwise specified in the job specification.

Refer to “*Low Voltage Disconnect*” in Section 5 for more information.

## ***Battery Installation***

### ***Introduction***

Read the following safety precautions carefully before attempting to unpack and install the battery. Storage type batteries differ from other sources of power in that they are delivered to the points of installation as live units.

### ***Safety Precautions***

Fully brief anyone who is permitted access to battery areas on the hazards of handling lead-acid batteries. Make it clear to anyone handling, unpacking, or installing lead-acid batteries that they contain electrolyte (sulfuric acid and water). Everyone must wear protective equipment such as rubber gloves, rubber aprons, full face mask, and splash-proof goggles when performing any activity involving handling of batteries or cells containing electrolyte.

A storage battery gives no indication by its appearance of the potential energy stored in it. All lead-acid storage cells/batteries have enormous short circuit capability which can result in serious burns. Use extreme care to avoid shorting out cell and/or battery terminals. Shorting a cell or battery with a non insulated tool can vaporize or throw the tool.

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. NEVER tamper with or block the vent caps of the 12IR125 battery modules. A damaged gas vent cap could become clogged, resulting in an explosion due to internal pressure may result. Such an explosion could short circuit other battery modules and result in a fire. ALWAYS place batteries in a well-ventilated area. NEVER place battery modules in a sealed environment.

In case of electrolyte contact with the skin, remove the electrolyte **immediately** by flushing the affected area with large amounts of plain tap water. In case of electrolyte in the eye, pour water into the inner corner of the eye and allow at least one quart of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician **immediately**.

## ***Battery Installation, continued***

### ***Wiring Options***

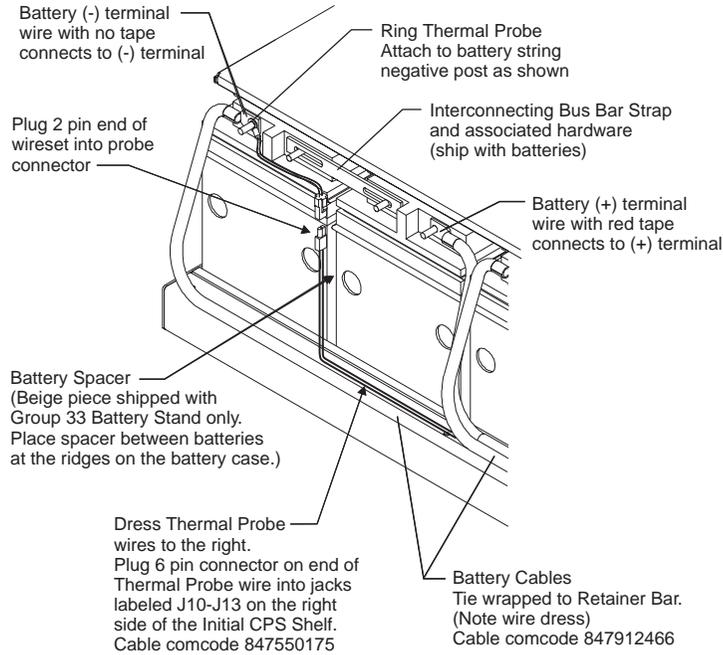
There are currently two options for battery wiring for the H569-424 Plant. Option one provides a set of cables for each battery string (no battery disconnect). Option two provides one battery disconnect per two strings (one shelf) of batteries. With either option, battery cables are factory installed on the frame for the number of battery strings in the initial order (up to a maximum of 4 strings). The cables are tie wrapped to the battery retainer bar, doubled over and tie wrapped to the bar again to prevent the battery lugs from scratching the frame during shipment. Heat shrink tubing is placed over the lugs on the wires to prevent shorting when installing the batteries. The heat shrink covering the lug should be removed as each battery string is installed, i.e, lugs not connected at any stage during the installation should remain covered with the heat shrink tubing until installed. It is necessary to cut the tie wraps which are used to double the cable over. The retainer bar should be removed with the cables still tie wrapped to it and the batteries slid into place. The bar is replaced and the cables are connected to the batteries.

Two batteries comprise a string. The wire without the red tape is connected to the (-) terminal of the battery on the left hand side of the string. The interconnecting busbar, which ships with the batteries, connects the (+) terminal of the left battery to the (-) terminal of the right battery. The wire with the red tape is connected to the (+) terminal of the battery on the right hand side of the string. Refer to Figures 4-5 and 4-6.

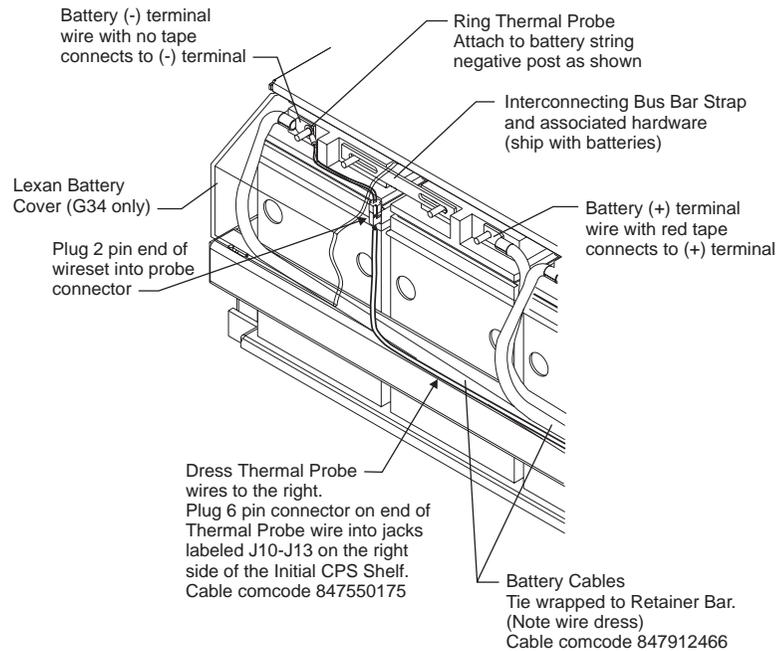
### **Warning**

<p>As soon as the battery connections are made, the lugs on the same shelf are energized regardless of whether or not the shelf has battery disconnects. Lugs on other shelves will be energized if there are no battery disconnects or if the disconnects are not open.</p>
--

## Battery Installation, continued



**Figure 4-5: Battery Wiring (G33 Stand, Zones 2 and 3)**



**Figure 4-6: Battery Wiring (G34 Stand, Zone 4)**

## ***Battery Installation, continued***

### ***Initial Battery Installation (Plant Not Active)***

Installation and charging of the 12IR125 Batteries is covered in the battery product manual, select code, 157-622-025. Refer to Figure 4-5 (Group 33 battery stand) and Figure 4-6 (Group 34 battery stand) for wiring of the 12IR125 Batteries.

#### **Warning**

- Use insulated tools when working with batteries and around hot bus bars.
- Never place metal objects on top of a battery.
- Remove all metal jewelry such as rings and watches when working on or near batteries.
- Avoid creating sparks, including those from static electricity, or the use of an open flame near batteries since the gas generated by batteries is highly explosive.
- Before performing each work operation, firmly touch a ground to discharge the static electricity from your body.

1. Remove the retaining bar on shelf which will be populated with the new battery string.
2. Remove the retaining bar on the next highest shelf to facilitate battery installation (Group 33 Battery Stand only).
3. Check the date code on the batteries and if acceptable load batteries into shelf. Do NOT connect intercell connectors at this time.
4. For Group 33 battery stands, if the shelf where the string is to be installed will only contain one string, then the battery brace for the middle of the shelf should be installed now.
5. Install spacers between batteries (Group 33 battery stands only). Refer to Figure 4-5.
6. Reinstall retaining bar on shelf containing the new batteries.
7. If the plant is equipped with battery disconnects, open the disconnect switches before proceeding.

## ***Battery Installation, continued***

8. Cut the cable ties holding the lugged ends of the battery cables to the retaining bar. Cut and remove the heat shrink tubing which has the label "Remove for 24V System Only" to allow use of the inside pair of battery cables. See Figure 4-7 for location of tubing. Apply NO-OX-ID to all cable connecting hardware and connect all equipped cables to their respective battery strings. Connect Temperature Compensation probes at the same time. The probe should be connected to the most negative battery post in the string. See Figures 4-5 and 4-6. Note: The longer set of cables is used to connect the battery string on the left side of the frame and the shorter set the string on the right.

Note: The proper sequence for termination of the cable thermal probe combination is:

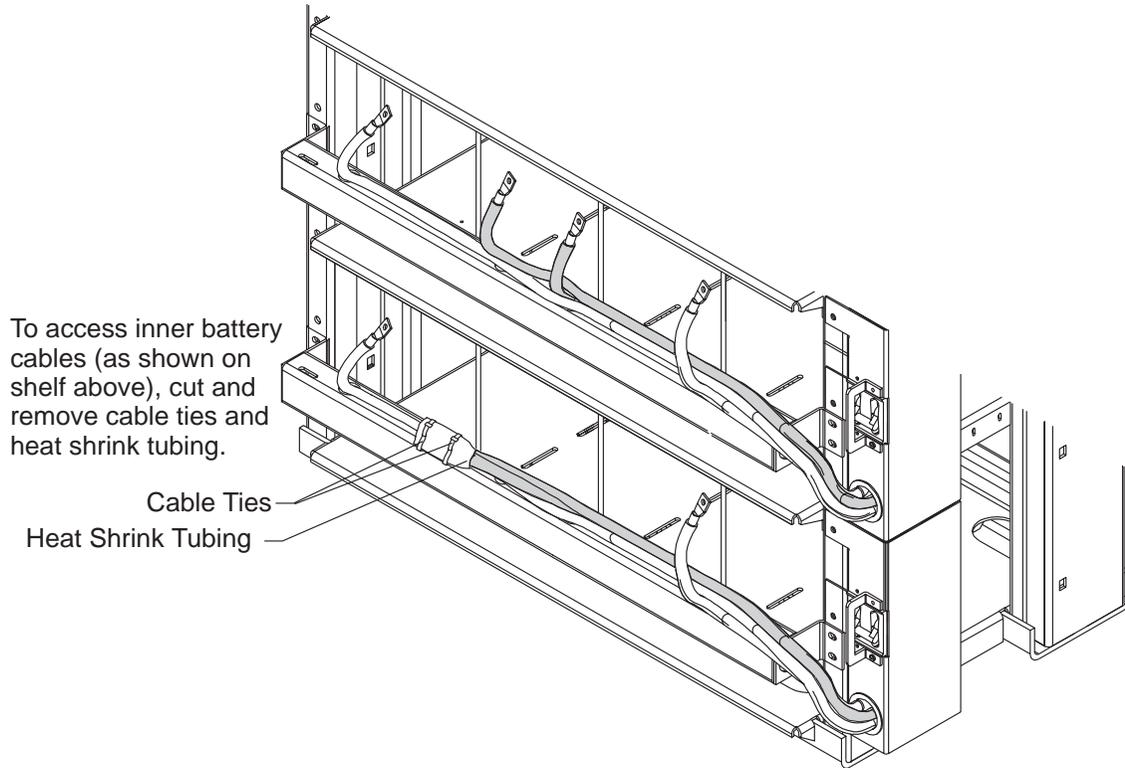
- Battery Power Cable on (-) Post
  - Temperature Probe Connector
  - Flat Washer
  - Lock Washer
  - Nut
9. If not already done at the factory, install Battery Temperature Compensation Probe cables in the appropriate plug of the INITIAL shelf (J10-J13). Dress the Temperature Probe cables along the same path as the battery cables and cable tie into place. Refer to Figures 4-5 through 4-8 for proper cable routing.
  10. If the plant is equipped with battery disconnects and an open string alarm is desired, install wireset (847582871) in accordance with T83280-30, Sheet D2, Figure HA/H4. Depending on the configuration, wireset 847528871 may be pre-installed by the factory. Battery disconnect alarms plug into the LVD circuit pack (J10-J13) and thermal probe wireset will plug into the pigtail connector.
  11. If a remote power off switch is to be installed, refer to T83280-30, Sheet D2, Figure HA and T83119-30, Sheet D4, Figure HC for connecting points.
  12. Apply NO-OX-ID to the intercell connectors and connect them to the batteries.

## ***Battery Installation, continued***

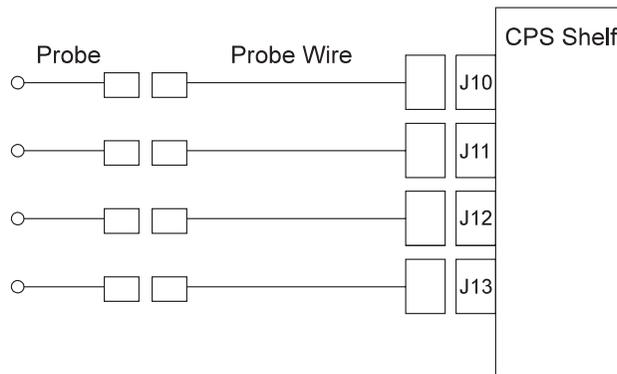
Note: Distribution panel bus bars will now have battery potential applied to them unless the plant is equipped with battery disconnects and the battery disconnects are open.

13. Torque all battery and intercell connections to 60 lb-in.
14. Repeat steps 1-10 for each shelf of batteries to be installed.
15. Install the protective cover over the battery terminals.
16. Reinstall the retaining bar on the shelf above (Group 33 Battery Stand only).
17. Install any remaining protective covers for unequipped shelves.
18. Close battery disconnects if the plant is equipped with them. Bus bars in the distribution panel will have battery potential applied after the disconnect switches are closed.

## Battery Installation, continued



**Figure 4-7: Accessing Battery Cables**



### Thermal Probe Wiring

Note: The Temperature Probe Wiring must be connected to the Initial Shelf only.

**Figure 4-8: Temperature Probe Connection to the Initial CPS Shelf**

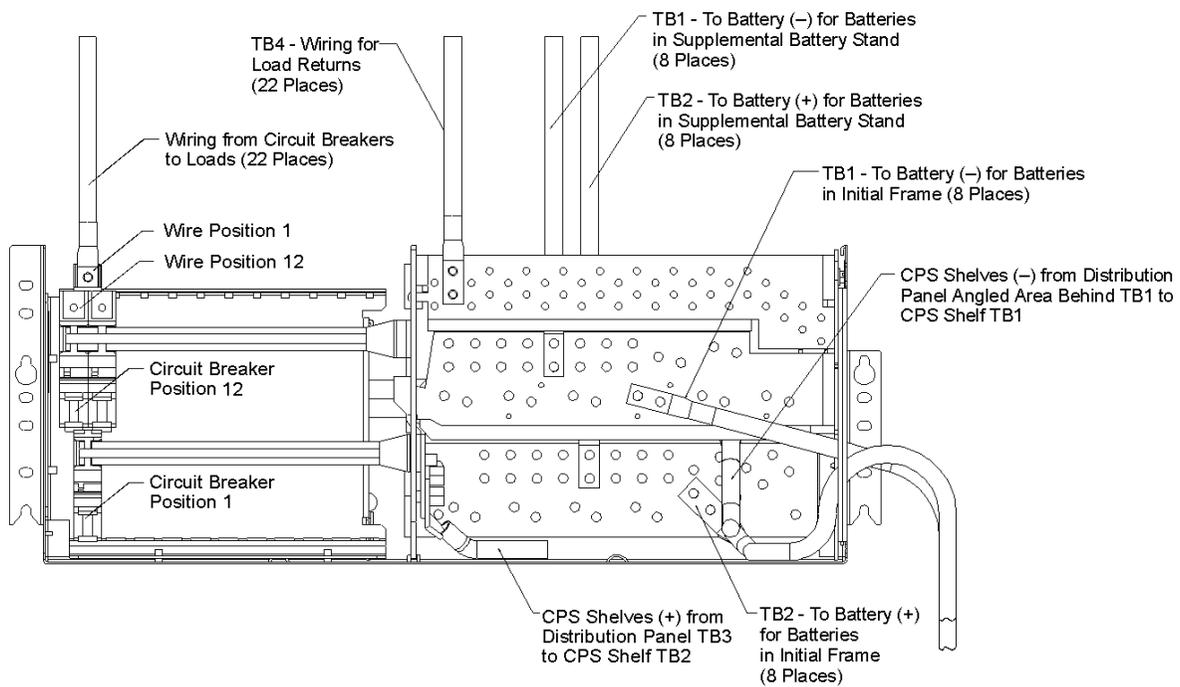
## DC Distribution Wiring

### Overview

The Group 17 DC Distribution panel is shown in Figure 4-9.

Connect the batteries from the initial frame, the output from the CPS shelves, and the output wiring as shown in the diagram.

Note: Complete wiring to circuit breaker positions 1 through 11 before positions 12 through 22.



**Figure 4- 9: DC Distribution Panel**

## Alarm Wiring

### Overview

When Group Z1 is ordered, a fifty foot, 24 AWG office alarm cable is shipped wrapped to the top battery shelf of the frame. During installation, the cable must be removed from the top battery shelf and plugged into J6 on the initial CPS shelf. The other end is cut and should be attached to the load equipment. Table 4-C shows available alarms, their pin numbers and their color code.

**Table 4-C: Office Alarm Cable Pin Assignments and Color Coding (J6, Comcode 847803012)**

Pin Number	Office Alarm	Wire Color
1	PMJ_NO	*
2	PMJ_C	BL-W
3	PMJ_NC	W-BL
4	PMN_NO	*
5	PMN_C	O-W
6	PMN_NC	W-O
7	BD_NO	*
8	BD_C	G-W
9	BD_NC	W-G
10	MJF_NO	*
11	MFJ_C	BR-W
12	MJF_NC	W-BR
13		*
14	2ACF_NO	*
15	2ACF_C	G-Y
16	2ACF_NC	Y-G
17		*
18	EARTH_GND	*
19	AUX_PMJ	*
20	AUX_PMN	*
21	BATT	*
22	ACF_NO	*
23	ACF_C	S-W
24	ACF_NC	W-S
25	R_VV	*
26	R_VI	*
27	R_RTN	*
28	R_O/S_IN	*
29	PBT	*
30	O/S_RTN	*
31		*
32		*
33		*
34		*
35		*
36	EARTH_GND	BL-Y
* No wire is attached to the connector pin		

## ***Initial Start-up and Test***

### ***Preparation***

- Verify that all ac service circuit breakers are Off.
- Verify that the battery disconnects on the right side of the battery shelf are disconnected (if equipped).
- Verify that the circuit breakers in the distribution panel are Off.
- Verify that the On/Standby switch is in the Standby position on all rectifiers.

### ***Procedure***

1. Turn the ac service circuit breakers On.
2. Seat each rectifier using the 3/16-inch Allen wrench, turning the mounting screw clockwise. Verify that the fan operates on the rectifier.  
  
Note: In order to verify fan operation, it may be necessary to have only one rectifier seated at a time.
3. After all the rectifiers are seated, verify that the yellow Standby LED lights on all rectifiers.
4. Turn one rectifier On. As the rectifier is turned On, verify that the LVD Fail LED lights on the right side of the shelf (BSP1). Verify that the LVD contactor closes and the alarm LEDs extinguish. (You'll hear it close.)
5. Turn all remaining rectifiers On using the On/Standby switches. Verify that the yellow Standby LEDs extinguish and the green On LED lights on all power units.
6. Turn the battery disconnect switch On, if so equipped.
7. Verify that the green Normal LED on the ACU lights and all alarm LEDs extinguish after all rectifier switches are in the On position.
8. Disconnect the temperature probe cables (P10/P13) at the connector plug on the right side of the CPS shelf before adjusting the plant voltage.

### **Warning**

<p>Do not attempt to adjust the output voltage with the temperature probes connected. Output voltage could exceed recommended limits during low temperature periods.</p>
--

## ***Initial Start-up and Test, continued***

9. Plug a digital multimeter (DMM) into the test jacks on the ACU.
10. Verify that the plant voltage is 27.24 using the Vadj potentiometer located on the ACU.
11. Reconnect the temperature probe cables (P10/P13) on the BSP1 output distribution module. (It is acceptable for the “Temp Comp” LED to be active as long as the PMJ is not also active). Note: The plant voltage will change when P10-P13 are attached and Temperature Compensation is active.

Note: An active Temperature Compensation LED is not an alarm indication. It is only an indication that Temperature Compensation is actively lowering the plant voltage due to the battery temperature being above 25° C. Never adjust the plant voltage with Temperature Compensation active. Temperature Compensation may be disabled by disconnecting the Temperature Compensation probe cable from J10-J13 of the BSP1 board.

12. Simulate a rectifier alarm by placing one rectifier in standby. Verify that the PMN LED lights on the ACU. Clear this alarm by turning the rectifier on.
13. Place two rectifiers in standby. Verify that the PMN and the PMJ LEDs light on the ACU. Clear these alarms by turning the rectifiers On.

### Notes:

The standby mode and power unit alarms both use the same communication paths to the ACU; therefore, they test the same system and power unit interfaces.

You must perform steps 11 and 12 for all rectifier/converter shelves installed.

## ***Initial Start-up and Test, continued***

### ***Low Voltage Disconnect (LVD) Test***

1. Simulate a failed low voltage disconnect contactor as follows: (See Figure 4-2 for Contactor location).
  - a. Remove one Quick-Connect® connector from the low voltage disconnect contactor coil.
  - b. Verify that the LVD Open LED lights on the output module and the PMJ LED lights on the ACU.
  - c. Clear these alarms by replacing the Quick-Connect® connector.
2. Test the temperature management feature using the following procedure:
  - a. Locate the exposed pins on the rear of a temperature probe. Short these pins. Verify that the "Probe Fail" LED lights on the BSP1 distribution unit and the PMN LED lights on the ACU. Remove the short. Note: When the pins on the temperature probe are shorted, the plant voltage may decrease.
  - b. Unplug the cable from the temperature probe. Verify that the "Probe Fail" LED lights on the BSP1 distribution unit and the PMN LED lights on the ACU. Note: The Temperature Compensation LED may stay illuminated due to ambient temperature. This is a normal condition.

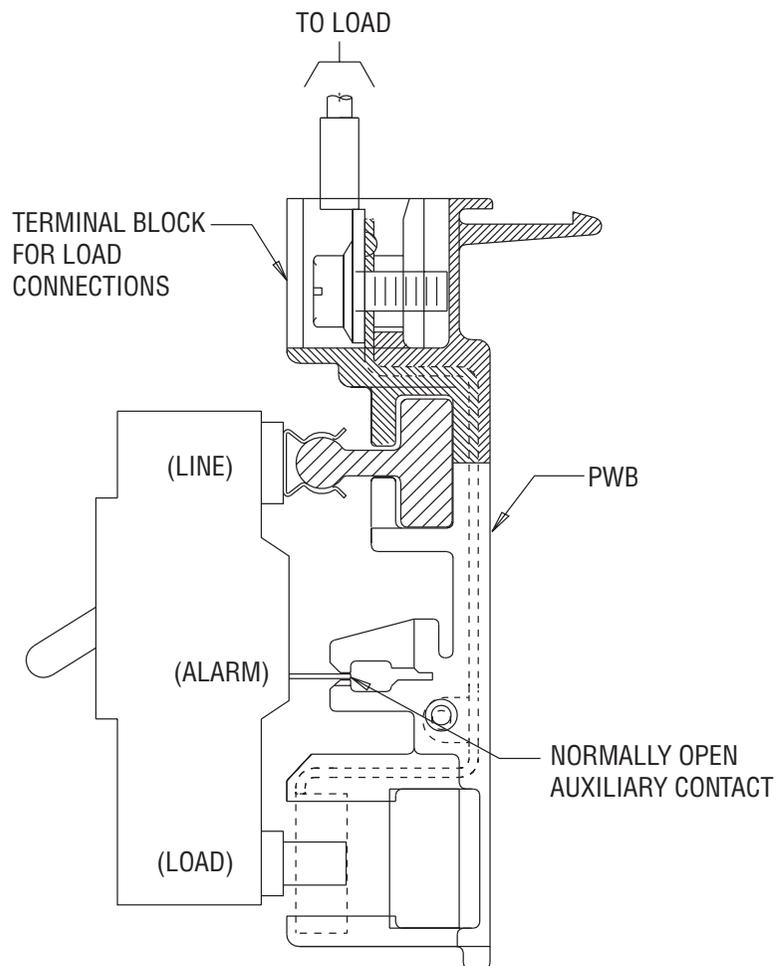
## *Initial Start-up and Test, continued*

### *Fuse Alarm Test*

The plug-in circuit breakers are three terminal devices: a line terminal, a load terminal, and an alarm terminal. The alarm terminal is a normally open contact that provides a closure to the line terminal when the circuit breaker is tripped. Figure 4-10 shows a circuit breaker and Figure 4-2 shows the breaker mounted in the distribution shelf.

To verify a fuse alarm, make a closure (jumper) between the line side of the circuit breaker (the top of the circuit breaker) and the alarm strip (the center of the circuit breaker).

This closure should cause a Power Major alarm on the ACU and send a major fuse alarm out on the office alarm cable on the left side of the CPS shelf.



**Figure 4-10: Plug-in Circuit Breaker**



## 5 *Alarms, Controls, and Displays*

### *Displays*

#### *Voltage Adjust*

A potentiometer (V Adj) is provided on the ES643 ACU faceplate to allow the customer to adjust the rectifier output voltage. If the ES643 fails, loses power, or is removed, the plant output voltage reverts to its preset voltage (approximately 26 volts dc).

#### **Warning:**

Do not attempt to adjust the output voltage with the temperature probes connected. Output voltage could exceed recommended limits during low temperature periods.
---

#### *Output Voltage Adjust*

A plant voltage control originating in the ACU which sets the rectifier output voltage to the desired value within the rectifier operating voltage range.

#### *Normal*

This green LED on the control unit lights while the plant is operating normally and is able to furnish power to the load. While in this operational mode, the rectifiers can be switched to the Standby mode by a control signal originated by the customer and routed to the power units.

## ***Displays, continued***

### ***Power Major Alarm***

This red LED (PMJ) on the control unit lights to signify one or more of the following conditions:

- Two or more rectifiers fail
- The LVD fails (contactor open)
- Excessive battery temperature
- Battery on Discharge alarm
- Converter fail
- Output distribution circuit breaker has operated
- Battery string open (disconnect switch open)

### ***Power Minor Alarm***

A yellow LED (PMN) on the control unit lights to signify one or more of the following conditions:

- one rectifier or one converter failure
- a temperature probe failure
- an LVD circuit failure
- one ac failure (ACF) alarm

### ***AC Fail***

An indicator found in CPS Plants, this yellow LED lights when the ac service voltage to a rectifier falls below the normal input operating voltage range. Battery voltage must be present for the LED to light.

### ***Major Fuse Alarm (MJF)***

This red MJF LED lights to signify that an output distribution circuit breaker has operated due to excessive current. A circuit breaker in the trip position results in an alarm condition.

### ***BD***

Whenever the plant voltage drops below this preset threshold, the ACU issues BD and PMJ alarms; and the corresponding red PMJ LEDs lights.

### ***On***

This green LED lights while the rectifiers or converters are operating normally and are able to furnish power to the load. While in this operational mode, the rectifiers can be switched to the Standby mode under local control or via a control signal originated remotely.

## ***Displays, continued***

### ***Power On/Standby Switch***

This two-position switch determines the operational status of the rectifier or converter.

### ***Standby***

This yellow LED lights while rectifiers or converters are in the Standby mode. In this mode, the power unit control and alarm circuits are powered; however, the power circuits are inhibited to prevent these units from producing output power. To switch the power units from Standby to On, local control signals must be switched to the power On state.

### ***Alarm***

This red LED lights to indicate that a rectifier or converter unit has shut down due to an output under voltage condition, a thermal alarm, or an operated internal fuse.

### ***Thermal Alarm***

This red LED lights when the rectifier shuts down due to inadequate air flow indicating possible intake air blockage, fan failure or inlet air temperature above 65 degrees Celsius.

### ***Front Panel Test Jacks***

Test points are provided on the front panel so that the plant voltage may be checked with an external meter. The test points are current-limited to protect against accidental short-circuits.

### ***Voltage Test Jacks***

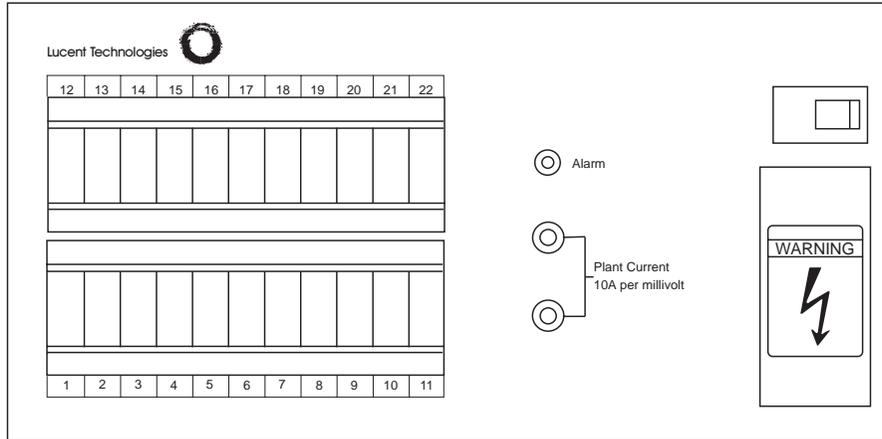
Test jacks are provided to measure the plant primary output voltage in CPS Plants.

## Displays, continued

### **Plant Current Test Jacks**

The plant current may be measured on the Group 17 Distribution Panel (see Figure 5-1) using a multimeter capable of reading millivolts. Place the multimeter leads in the test jacks and measure the millivolt reading. Multiply the millivolt reading by 10 to obtain the plant current.

Example: 10 millivolts across the jacks X 10 = 100 Amps



**Figure 5-1: Plant Current Test Jacks**

## ***Alarm Control Unit***

### ***Features***

Table 5-A summarizes the ES643 features for rectifiers and converters.

**Table 5-A: ES643 Features**

<b>Feature</b>	<b>Rectifier</b>	<b>Converter</b>
Test point (volts)	Yes	No
Plant voltage adjust	Yes	No
PMJ LED	Yes	Yes
PMN	Yes	Yes
Plant normal LED	Yes	Yes
Remote/On Standby	Yes	Yes
PMJ office alarm	Yes	Yes
PMN office alarm	Yes	Yes
Auxiliary PMJ Alarm	Yes	Yes
Auxiliary PMN alarm	Yes	Yes
Battery (AUX alarm)	Yes	Yes
ACF office alarm	Yes	No
BD office alarm	Yes	No

## Alarms

### **Battery on Discharge (BD)**

In the event that AC power is lost, the batteries provide power for the load. While the batteries are providing the plant's power, the plant voltage will decrease below the float voltage. The ES643 (ACU) monitors the plant voltage and features a BD alarm. A DIP switch on the ACU controls the set point for the BD threshold. Whenever the plant voltage drops below this preset threshold, the ACU issues BD and PMJ alarms; and the corresponding red PMJ LEDs lights.

### **Voltage Threshold for the BD Alarm**

The voltage threshold for the BD alarm is selected using SW440 on the main circuit board of the ACU. The setpoint is typically 0.5 volt below the plant float voltage for nominal 24V plants **without** Battery Management. The BD setting is typically less than 2 volts below the plant float voltage if Battery Management is used. This lower threshold is required to prevent a BD alarm from occurring as the plant float voltage is lowered while the battery temperature exceeds 25° C.

**Table 5-B: SW440 BD Settings**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>Voltage</b>
C	C	C	C	C	C	23.0
O	C	C	C	C	C	23.5
C	O	C	C	C	C	24.0
O	O	C	C	C	C	24.5
C	C	O	C	C	C	25.0*
O	C	O	C	C	C	25.5
C	O	O	C	C	C	26.0
O	O	O	C	C	C	26.5
C	C	C	O	C	C	27.0
O	C	C	O	C	C	27.5
C	O	C	O	C	C	28.0
O	O	C	O	C	C	28.5
C	C	O	O	C	C	29.0
O	C	O	O	C	C	29.5
C	O	O	O	C	C	30.0
* Factory default setting						

**Notes**

The Battery Discharge Alarm is factory set at 25VDC when Group Z1 is ordered. It is not recommended this setting be changed.

Battery discharge alarm voltage settings exceeding 26.5 VDC are not recommended for use with lead-acid batteries

## ***Alarms, continued***

### ***Low Voltage Disconnect***

DIP switches in the BSP1 circuit pack permit the user to set the plant voltage at which the plant load is disconnected from the battery. The disconnect threshold may be set for either 21.25 volts or 20.25 volts. The 20.25-volt threshold may be used when the drop between the plant and the load is minimal. For the H569-424 Group Z1, the factory default setting is 21.25 volts.

**Table 5-C: SW201 LVD Settings**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Voltage</b>
On	On	Off	Off	21.25*
Off	Off	Off	Off	20.25
* Factory default setting.				

### ***Rectifier Alarms***

Whenever the ACU receives a single rectifier alarm, it issues a Power Minor (PMN) alarm. A yellow LED lights on the ACU face plate. If the ACU receives two or more rectifier alarms, it will issue both a PMN and a Power Major (PMJ) alarm. Both the yellow PMN LED and the red PMJ LED on the ACU faceplate will also light.

Since a loss of a single rectifier may not necessarily affect the plant voltage, this condition is treated as a minor alarm. However, if two or more rectifiers have failed or are in standby (even if they are not required to power the load), the ACU issues a PMJ.

### ***AC Fail Alarm***

The AC Fail Alarm indicates that ac input power to one or more rectifiers is missing or has dropped below the minimum ac voltage for the operating range being used. This alarm results in an isolated transfer contact for the office alarm system. An ACF alarm also results in a PMN alarm; thus the yellow PMN LED will light.

### ***Two AC Fail Alarm***

If the ac to two or more rectifiers fails, the Two AC Fail alarm is generated and can be used to signal a generator to begin its start sequence.

### ***Major Fuse Alarm***

The ES643 monitors the distribution for blown fuses and/or tripped circuit breakers. A blown fuses indicates that some part of the customer's equipment has lost power; therefore, a Power Major (PMJ) alarm will be issued in addition to the Major Fuse (MJF) alarm. The red PMJ on the ES643 face plate will light.

## *Alarms, continued*

### *Battery on Discharge Alarm (BD)*

This alarm occurs when the rectifier plant voltage is below a pre-set threshold. It typically occurs when the ac service voltage to the plant is low or missing or there is an insufficient number of rectifiers to power the load and the load is being powered by the batteries.

### *Alarm Return (AR)*

A signal path between the ACU and the rectifiers that provides a common return path.

### *Rectifier Alarm*

A signal to the ACU indicating low rectifier output voltage resulting from a rectifier failure or excess load.

### *Office Alarms*

The office alarm and control signals listed below are available to facilitate the monitoring and control of the CPS plant.

- **Signal Interface:** A signal path interface between the Alarm Control Unit and the Office Alarm Interface which provides customer access to the office alarm and control tie-points on J6.
- **Battery Major Alarm:** A signal to the ACU indicating that a battery module temperature is above 65°C.
- **Battery Minor Alarm:** A signal to the ACU indicating that temperature compensation is activated, a temperature probe has failed, or the LVD circuit has failed but the LVD contactor is closed.
- **Temperature Compensation:** A signal to the ACU indicating that a battery module temperature has exceeded approximately 25°C.

## ***Alarm Processing***

### ***Overview***

Alarm processing, plant On/Standby control and plant voltage adjustments are administered by the ES643, Alarm Control Unit (ACU) in the CPS 24V plant. One ACU supports a one-, or two-, or three-shelf plant.

The ACU processes alarm conditions and presents them to the user as front panel LED indicators and Form-C relay contact closures. The ACU sorts and groups alarm conditions occurring in the CPS plant into two categories based on their impact on plant functions.

Where feasible, LEDs, indicators, and relay contact closures provide supplementary information to indicate which specific alarm condition resulted in the PMN or PMJ alarm.

### ***Power Major Alarms***

Conditions that impact service and require immediate attention are classified as major alarms and designated as Power Major (PMJ) alarms. Red LEDs signify major alarms.

### ***Power Minor Alarms***

Conditions requiring service, but having no immediate impact on the plant output that can wait for service for up to 24 hours are classified as minor alarms and designated as Power Minor (PMN) alarms. Yellow LEDs signify minor alarms.

## Alarm Processing, continued

### Plant Alarms and Indications

The following table summarizes plant alarms and alarm indications (i.e., contact closures and/or LEDs).

**Table 5-D: Plant Alarms and Alarm Indications**

Alarm Condition	*Office Alarm (Contact Closure)	Power Unit LED	*ES643 LED	BSP1 LED	Distribution LED
Rectifier Standby (1)	PMN	Stby	PMN		
Rectifier Standby (2)	PMN PMJ	Stby	PMN PMJ		
Rectifier Alarm (1)	PMN	Alarm	PMN		
Rectifier Alarm (2)	PMN PMJ	Alarm	PMJ		
Converter Standby (1)	PMN	Stby	PMN		
Converter Standby (2)	PMN PMJ	Stby	PMN PMJ		
Converter Alarm (1)	PMN	Alarm	PMN		
Converter Alarm (2)	PMN PMJ	Alarm	PMJ		
AC Fail (1)	PMN ACF		PMN		
AC Fail (2)	PMJ ACF 2ACF		PMJ		
Excess Battery Temp	PMJ		PMJ	Temp Comp	
Battery on Discharge	PMJ BD		PMJ		
LVD Open	PMJ		PMJ	LVD Open	
Probe Fail	PMN		PMN	Probe Fail	
Temp Comp				Temp Comp	
LVD Fail	PMN		PMN	LVD Fail	
LVD Open	PMJ		PMJ		
Primary Circuit Breaker Trip	PMJ PMN		PMJ		Group 15,16 or 17, Red
Secondary Circuit Breaker Trip	PMJ PMN		PMJ PMN		ES612 Red
Battery String Open	PMN		PMN		
*During normal plant operation, it is expected that cause certain conditions which a major alarm to be issued will also cause a minor alarm.					

## ***Office Alarm Contacts***

A set of Form-C contacts is brought out on J6 for each of the following plant alarms:

- Power Major (PMJ)
- Power Minor (PMN)
- Battery on Discharge (BD)
- AC Fail (ACF)
- Major Fuse Alarm (MJF)

These are Form-C or transfer type contacts which allow an installer to connect the ACU to an office alarm system. Each set of isolated contacts consists of a combination of normally open (NO) and normally closed (NC) contacts with one side of each common (C). When an alarm condition exists, a closure exists between the NC and C poles and an open exists between the NO and C poles. If the ACU is powered down, the alarm relays are de-energized and all NC to C closures are active.

Table 5-E gives the office alarm pin assignments on J6.

## Office Alarm Contacts, continued

**Table 5-E: Office Alarm Pin Assignments (J6)  
Comcode 847803012**

Pin Number	Office Alarm
1	PMJ_NO
2	PMJ_C
3	PMJ_NC
4	PMN_NO
5	PMN_C
6	PMN_NC
7	BD_NO
8	BD_C
9	BD_NC
10	MJF_NO
11	MFJ_C
12	MJF_NC
13	
14	2ACF_NO
15	2ACF_C
16	2ACF_NC
17	
18	EARTH_GND
19	AUX_PMJ
20	AUX_PMN
21	BATT
22	ACF_NO
23	ACF_C
24	ACF_NC
25	R_VV
26	R_VI
27	R_RTN
28	R_O/S_IN
29	PBT
30	O/S_RTN
31	
32	
33	
34	
35	
36	EARTH_GND

## **6**                      ***Maintenance***

### ***Overview***

#### ***In This Section***

This section provides field maintenance information and procedures for the power modules. Before performing the maintenance procedures, review the safety information in Section 3.

#### **Warning**

The modules intended for use in the CPS shelf are not suitable as disconnect means and the spacings of the shelf backplane do not provide adequate spacing to act as a disconnect means.
--

#### ***Safety***

Note: Before working on any output circuit, turn Off ac service circuit breakers to the rectifier shelf and turn Off circuit breakers on the cabinet output. Disconnect batteries.

#### **Warning**

AC input voltages are provided to the CPS via multiple input cables. Ensure that the circuit breaker for each ac input is disconnected while installing or servicing this equipment.
--

## ***Power Modules***

### ***Introduction***

With the exception of a fan or Low Voltage Disconnect Contactor failure, the power units are repaired by replacement.

### ***Fan Maintenance***

The expected life of the power unit fans at 25 degrees Celsius (77 degrees Fahrenheit) is seven years. The fans in CPS power modules may be replaced in the field without opening the power unit. When one or both fans fail, the power unit shuts down and issues a power unit alarm and a thermal alarm.

Two approaches can be taken to fan maintenance. The first approach is to replace the fan cradle assembly on a routine basis every five years; this ensures that the fans do not fail in the field under normal operating conditions. This approach is appropriate when there are no remote alarm facilities at the site. The second approach, assuming one has remote alarm capability, is to wait until the fans fail. The power unit will safely shutdown and issue both a fail alarm and a thermal alarm. The fan cradle assembly can then be replaced. Since it is likely that all the power units in that installation are of roughly the same age, all power unit fans at that site should be replaced at that time. The approach used depends on the convenience of the site as well as the monitoring of alarms used at the site.

### ***Fan Replacement***

1. Using the Allen wrench provided, remove the power unit from the system.
2. Remove the screw holding fan cradle assembly onto the bottom of chassis.
3. Separate fan cradle assembly from the chassis.
4. Unplug the connectors on the old fans from the power unit.
5. Plug in fan connectors on the new fan cradle.
6. Reattach fan cradle assembly to chassis bottom panel using one screw.
7. Replace and restore ac service according to the procedures outlined in Section 4.

## ***H569-424 Group 17 Low Voltage Disconnect Contactor***

### ***Introduction***

Note: The best possible situation for replacing the low voltage disconnect contactor is with the plant completely de-energized, no ac to the rectifiers and all battery strings open. If this is not possible then all safety precautions in this procedure must be followed completely.

Read the entire procedure before proceeding with any work.

### ***Replacement***

1. The first step is to determine if the OPEN LVD alarm is factual. Open the Distribution panel door and visually inspect the Low Voltage Contactor to see if the contacts are open. If the contacts are open there will be a clear space between the contacts of the contactor and the bus bar of the contactor.
2. If the contacts are open then visually inspect the wiring harness of the Low Voltage Disconnect contactor. There are four wires connected to the microswitch on the front of the contactor and two wires connected to the solenoid of the contactor. Wiggle the wiring harness and see if there may be a bad contact causing the alarm. Pay particular attention to the RED and Black wires connected to the solenoid, they supply the voltage to the coil of the contactor to pull it in when it is initially powered up.
3. If the contacts of the Low Voltage Disconnect are open then there is also the possibility that the BSP1 circuit pack may be defective. Procure another BSP1 circuit pack from your spares.
4. Remove the cover on the right hand side of the initial rectifier shelf and check the DIP switch setting (SW201). It should be set for a default setting of 21.25 Volts (Switch settings which correspond to a 21.25 Volt setting are: Switches 1 and 2 closed, switches 3 and 4 open)
5. Set Switch 201 on the new BSP1 circuit pack to the same settings as the original BSP1 circuit pack.
6. Slide the new BSP1 circuit pack into the channel of the shelf and engage it into the backplane.
7. If the contactor closes and the alarm expires then the problem was with the BSP1 circuit pack. Return the defective BSP1 circuit pack for repair.

## ***H569-424 Group 17 Low Voltage Disconnect Contactor, continued***

8. If the contactor does not close and the alarm expire, then the LVD contactor is defective.

NOTE: With the LVD contactor open battery reserve is not available to the plant. To replace the contactor remove as much of the shorting potential as possible.

1. Open all battery disconnects or if there are no battery disconnects then remove the intercell connectors of all battery strings in the plant.
2. Disengage the BSP1 circuit pack from the right side of the initial rectifier shelf.
3. If the plant can not be taken off-line (AC input Off) then it will be necessary to insulate the area inside the distribution around the bus bars to prevent any possibility of producing a short circuit condition between hot/live bus bars and frame ground.
4. The LVD contactor can be removed through the access area around the bus bars and out the front of the plant.
5. Use the smallest tools possible to allow more room for working inside the distribution panel. (1/4" drive ratchet and deep sockets will work well). Make sure that the tools are well insulated!
6. Locate the wiring harness of the LVD contactor situated behind the solenoid portion of the contactor and remove any cable ties which may hinder the removal of the contactor.
7. Make note of the wire colors of the wiring harness and where they are connected to the LVD for replacement on the new contactor.
8. Remove the four wires connected to the microswitch located on the bus bar side of the contactor.
9. Remove the four nuts, lockwashers, and flat washers which mount the contactor between TB2 and TB3 bus bars. Be careful not to drop any hardware into the rectifier shelf(s) below the distribution panel.

## ***H569-424 Group 17 Low Voltage Disconnect Contactor, continued***

10. Pull the contactor out and into the bus bar area of the distribution panel and out the front of the plant.
11. Note the locations of the RED and Black leads of the wiring harness on the solenoid housing and then remove them.
12. Place the new contactor in position and replace the RED and Black leads onto their appropriate terminals.
13. Slide the contactor back into position between TB2 and TB3 making sure that the RED and Black leads are fed back into the cavity behind the contactor.
14. Secure the contactor in place with the flat washers, lockwashers, and nuts removed from the original contactor.
15. Replace the four wires back into their respective positions on the microswitch.
16. Remove all tools and insulating material from the distribution panel.
17. Close all battery string disconnects or replace all intercell connectors for all battery strings.
18. Engage the BSP1 circuit pack. The contactor should close and the LVD OPEN alarm should be retired.
19. Replace all covers and close the distribution panel door.



# **7**                    ***Troubleshooting***

## ***Preparation***

### ***Safety***

Review all safety instructions and warnings before troubleshooting the CPS.

#### **Warning**

The modules intended for use in the CPS shelf are not suitable as disconnect means and the spacings of the shelf backplane do not provide adequate spacing to act as a disconnect means.
--

Before working on any output circuit, turn Off ac service circuit breakers to the rectifier shelf and turn Off circuit breakers on the cabinet output. Disconnect batteries and the generator output circuit breaker.

#### **Warning**

AC input voltages are provided to the CPS via multiple input cables. Ensure that the circuit protector for each ac input is disconnected while installing or servicing this equipment.
--

## Rectifier

### Checklist

Before beginning to troubleshoot the ES661B rectifier, check the following:

- Is there an ac failure?
- Is the ac source connected?
- Is the input circuit breaker on?
- Are any LEDs lit?
- Is the rectifier properly installed in the shelf?
- Are all the rectifiers or only one not working properly?

### Indications, Causes, and Corrective Actions

The following chart lists indications, possible cause, and the corrective action(s) to take when a rectifier does not deliver power. Match specific site conditions to those in the “indication” column and complete the corresponding corrective action.

**Table 7-A: Rectifier Trouble Conditions**

<b>Indication(s)</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
No LED is lit.	AC source not connected.	Check ac source.
No LED is lit.	Circuit breaker is not on-line.	Turn the input circuit breaker On.
No LED is lit.	Rectifier may not be fully seated in shelf.	Insert rectifier in shelf.
Alarm and Thermal Alarm LEDs are lit.	Fan obstruction.	1. Check for fan obstruction. 2. Remove obstruction. 3. Restart rectifier.
Thermal Alarm LED is lit. There is no fan obstruction.	Fans defective.	1. Remove rectifier from shelf. 2. Replace fans. 3. Reinstall rectifier.
Alarm LED is lit and Thermal Alarm LED is not.	Load may be greater than capacity.	Decrease load or add rectifiers.

**Table 7-A: Rectifier Trouble Conditions**

Indication(s)	Possible Cause	Corrective Action
Thermal Alarm LED is not lit.  Load is not greater than capacity.	Rectifier may need to be reset.	1. Turn the On/Standby switch to the Standby position and then On again. Rectifier restarts. 2. Check plant voltage and adjust as required. If rectifier does not restart, replace it.
Standby LED is not lit.  Green (normal) LED is not lit.	Rectifier defective.	Replace rectifier.
Standby LED is not lit. Green (normal) LED is lit.	Circuit breakers not operated.	Operate circuit breaker.
Standby LED is not lit. Green (normal) LED is lit. Circuit breaker is On.	Defective rectifier	Replace rectifier.
Standby LED is lit.	Power switch may be in the Standby position.	Turn power switch On.
Standby LED is lit. Power switch is in the On position.	Control unit may have shut down rectifier using remote On/Standby control.	1. Remove control unit. Rectifier restarts. Verify that it continues to operate after one minute. 2. Check rectifier for proper On/Standby control. If rectifier does not continue to operate after one minute, check for excessive load.
Standby LED is lit. Power switch is On. Control unit has been removed.	Defective rectifier.	If rectifier does not restart after the control unit is removed, replace the rectifier.

## Plant

**Table 7-B: Plant Trouble Conditions**

<b>Indication(s)</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
FA LED on Group 17 panel and PMJ on ES643	Blown distribution fuse or operated circuit breaker (Group 17 or ES612 module)	Investigate the distribution circuit and replace fuse or reset circuit breaker.
PMJ on ES643. No other alarms present.	Battery string is open.	Close Battery Disconnect Switch.
Temperature Compensation	Temperature Compensation is active. Battery temperature is greater than 25°C	None. This is a normal condition unless PMJ is also active.
No LED is lit.	Rectifier may not be fully seated in shelf.	Insert rectifier in shelf.
Alarm and Thermal Alarm LEDs are lit.	Fan obstruction.	<ol style="list-style-type: none"> <li>1. Check for fan obstruction.</li> <li>2. Remove obstruction.</li> <li>3. Restart rectifier.</li> </ol>
Thermal Alarm LED is lit. There is no fan obstruction.	Fans defective.	<ol style="list-style-type: none"> <li>1. Remove rectifier from shelf.</li> <li>2. Replace fans.</li> <li>3. Reinstall rectifier.</li> </ol>
Alarm LED is lit and Thermal Alarm LED is not.	Load may be greater than capacity.	Decrease load or add rectifiers.
Thermal Alarm LED is not lit.  Load is not greater than capacity.	Rectifier may need to be reset.	<ol style="list-style-type: none"> <li>1. Turn the On/Standby switch to the Standby position and then On again. Rectifier restarts.</li> <li>2. Check plant voltage and adjust as required. If rectifier does not restart, replace it.</li> </ol>
Standby LED is not lit. Green (normal) LED is not lit.	Rectifier defective.	Replace rectifier.

**Table 7-B: Plant Trouble Conditions**

Indication(s)	Possible Cause	Corrective Action
Standby LED is not lit. Green (normal) LED is lit.	Circuit breakers not operated.	Operate circuit breaker.
Standby LED is not lit. Green (normal) LED is lit. Circuit breaker is On.	Defective rectifier	Replace rectifier.
Standby LED is lit.	Power switch may be in the Standby position.	Turn power switch On.
Standby LED is lit. Power switch is in the On position.	Control unit may have shut down rectifier using remote On/Standby control.	<ol style="list-style-type: none"> <li>1. Remove control unit. Rectifier restarts. Verify that it continues to operate after one minute.</li> <li>2. Check rectifier for proper On/Standby control. If rectifier does not continue to operate after one minute, check for excessive load.</li> </ol>
Standby LED is lit. Power switch is On. Control unit has been removed.	Defective rectifier.	If rectifier does not restart after the control unit is removed, replace the rectifier.
<p>Note: If none of these corrective actions remedies the problem, refer to Section 1, “<i>Technical Support</i>” for assistance information.</p>		



## **8**                      *Spare Parts*

With the exception of a fan failure, the power units are repaired by replacement; therefore, each service area needs one set of spares.

Table 8-A contains recommended spare parts for the 24-volt CPS plant. One each is recommended for each service area.

**Table 8-A: Recommended Spares**

<b>Unit</b>	<b>Apparatus Code</b>	<b>Comcode</b>
24V Rectifier	ES661B	107675373
24/48 Converter	ES682	107306045
Alarm Control Unit	ES643	107318941
LVD Circuit Pack	BSP1	107332976
DC Fan Cradle Assy.	N/A	847244100



## **9**                      ***Additions/Changes to the System***

### ***Preparation***

#### ***Introduction***

This section outlines the sequence for adding or replacing major components to the H569-424 +24V battery plant equipped with a Group 17 distribution panel.

#### ***Tools***

- Normal electrician tools including insulated socket wrenches
- Digital meter with an accuracy of  $\pm 0.05\%$  (Fluke 87 or equivalent)
- Small screw driver
- ESD strap
- Heat shrink gun
- Protective canvas
- Insulating rubber mat
- Torque wrenches (Refer to Table 9-A)
- Compression tooling for installation of various compression lugs

#### **Warning**

Due to the possibility of working on energized circuits during these procedures, all tools and test equipment must be insulated in an approved manner.
--

#### ***Safety***

Please review and observe all safety precautions and warnings. All elements of the H569-424 power system present hazardous voltage and hazardous energy levels.

Please follow all safety labels and warnings on the products and in this manual.

## Preparation, continued

### **Torque Requirements for Electrical Connections**

Table 9-A identifies the torque requirements to be followed when making power connections throughout these procedures:

**Table 9-A: Minimum Torque for All Electrical Connections**

Screw Size	Torque - lb-in or (lb-ft)					
	Wire Connections		Head Tightened		Nut Tightened	
	Slotted Machine	Hex or Socket Cap	Slotted Machine	Hex or Socket Cap	Slotted Machine	Hex or Socket Cap
8-32	15	15	19	19	19	23
10-24	21	21	27	27	27	33
1/4-20	50	50	65	65	65	80
5/16-18	-	100	-	135	135	165
3/8-16	-	180	-	240	240	290
7/16-14	-	280	-	385	385	465
1/2-13	-	500	-	585	585	710
5/8-11	-	(71)	-	(97)	(97)	(118)
3/4-10	-	(125)	-	(172)	(172)	(209)

## ***Adding Rectifiers/Converters to a Working Plant***

### ***Introduction***

Power modules may be added with input power applied. However, the On/Standby switch on the unit should be in the Standby position.

### **Warning**

Only qualified personnel should install and service the CPS shelf and plug-in modules. Hazardous energy and voltages are present in the unit and on the interface cables and will shock or cause serious injury or death if safety precautions are ignored. Follow all safety warnings and practices when servicing this equipment.

Avoid creating sparks, including those from static electricity, or the use of an open flame near batteries since the gas generated by batteries is highly explosive. Before performing each work operation, firmly touch a ground to discharge the static electricity from your body.

The use of insulated tools is mandatory when working with batteries and around energized bus bars. Never place metal objects on top of a battery. Remove all metal jewelry such as rings and watches when working on or near batteries.

### ***Procedure***

To install a module in a working plant:

1. Ensure that the On/Standby switch on the module is in the Standby position.
2. Place the module on the shelf and slide it toward the backplane until the mounting screws prevent any further backward motion.
3. Using a 3/16 Allen head wrench, seat the module by turning the mounting screw clockwise.
4. Turn the module On.

## Adding Upgrade Shelf Kits

### Introduction

- To prevent objects from falling into operating units, cover existing shelves while installing a new shelf in the CPS 4024.
- *If two shelves are already installed*, the first upgrade kit is not required.
- *If installing the first upgrade shelf*, the shelf must be mounted with a minimum amount of clearance between the Distribution Panel and the top of the shelf.
- *If installing the second upgrade shelf*, a Heat Baffle must be installed between the first upgrade shelf and the second upgrade shelf.
- Install shelves beneath the Distribution Panel. Refer to Figure 9-1.

### Caution

Shelves will be added to a plant that is powering an active load. Observe all safety precautions.

### Procedure

1. Unpack Upgrade Shelf Kit and inventory parts to insure that all necessary items are present (see Table 2-0).
2. Place CPS Shelf in position on the frame and secure with mounting screws provided in kit. Refer to Figure 9-1 for mounting positions.

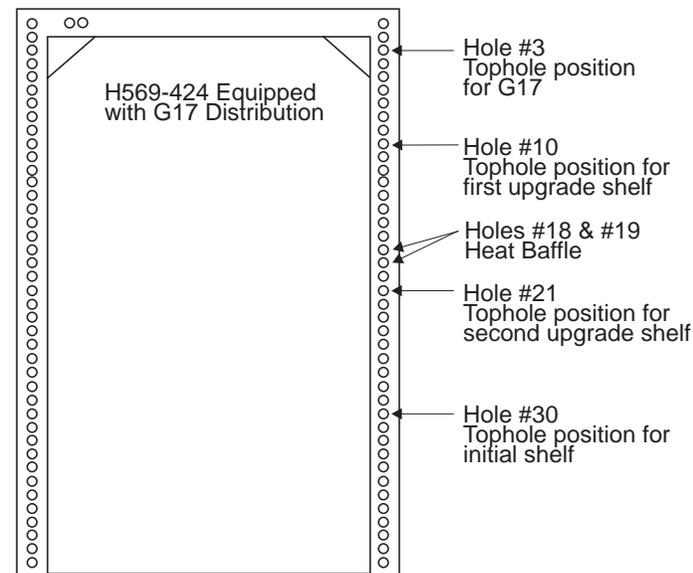
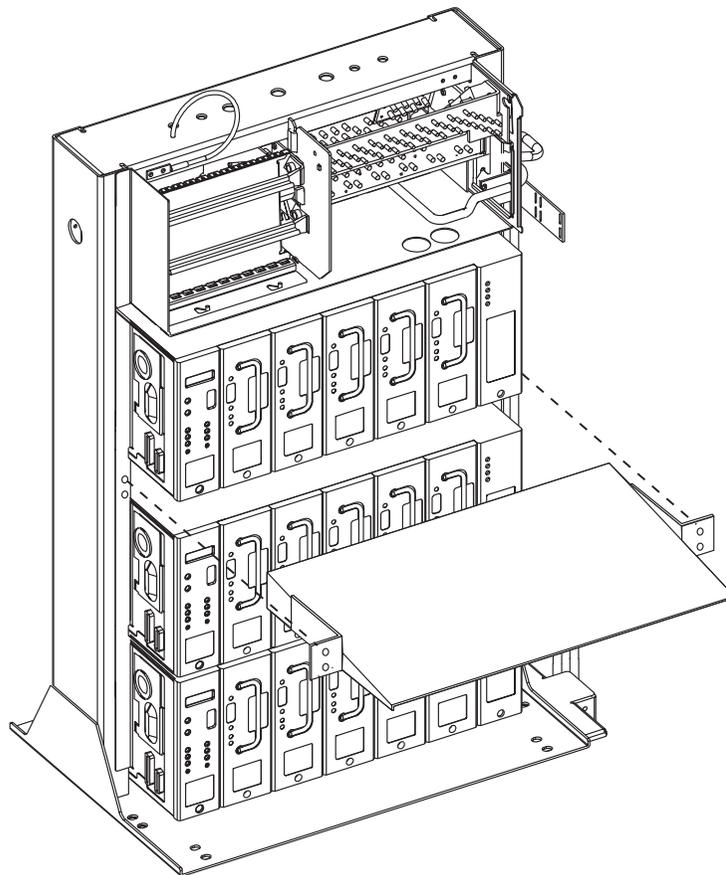


Figure 9-1: H569-424 Framework

## ***Adding Upgrade Shelf Kits, continued***

3. Install the baffle:
  - a. Remove the cable bracket from the frame.
  - b. Place baffle in position. Refer to Figure 9-2 for baffle location. The front of the baffle should be nearly flush with the shelf below it and should slope upward toward the rear of the unit to cause the heat to rise upward toward the rear of the H569-424.
  - c. Re-install the cable bracket on top of the heat baffle.



***Figure 9-2: Baffle Location***

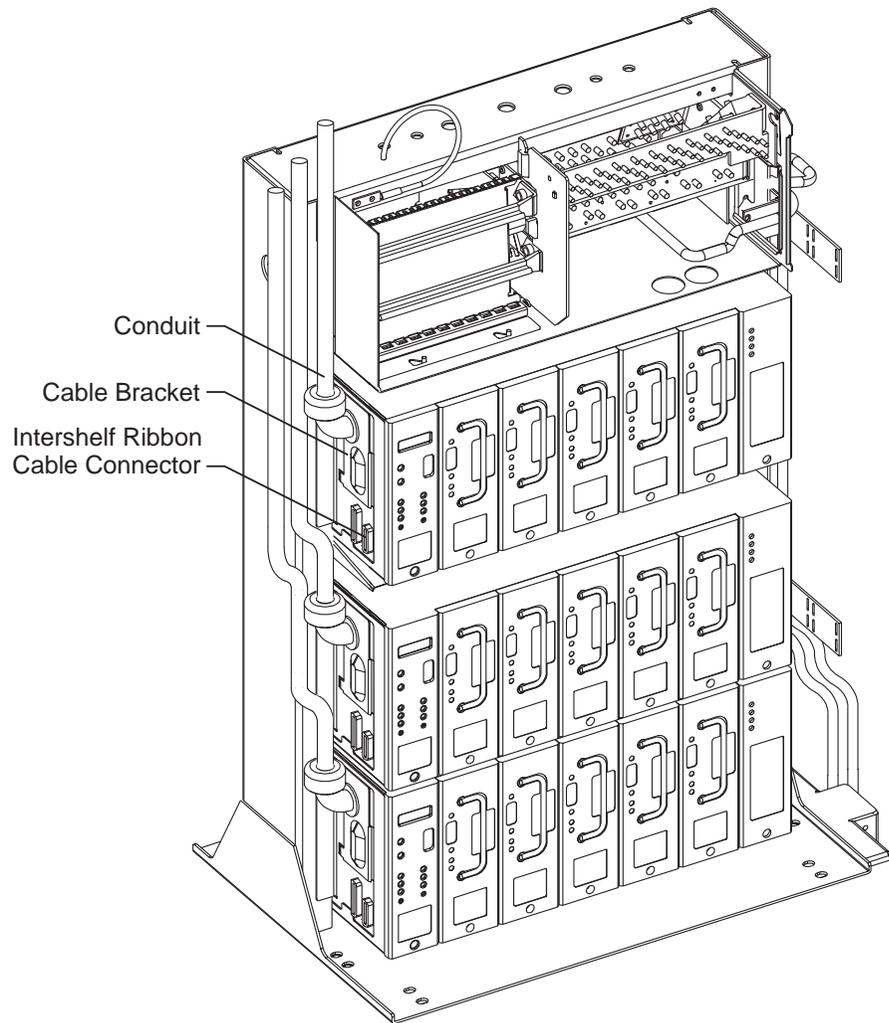
## ***Adding Upgrade Shelf Kits, continued***

4. Check the wiring grommets in the Distribution Panel and insure that they are inserted into the Distribution Panel from the bottom up. These grommets are located in the bottom of the Distribution Panel directly over slot five (5) of the CPS shelf and are used for routing cabling into and out of any ES612 plug in distribution module plugged in to slot five (5) of the CPS shelf. If the grommets are inserted from the top of the distribution panel there will not be enough clearance to insert modules into slots four (4) and five (5) of the CPS shelf.
5. After the shelf is mounted to the frame, proceed to the left side of the shelf and remove the cover(s) over the ac input connections.
6. Insure that the ac breakers that will be used to feed the shelf are Off.
7. Secure the wiring to the input of the shelf and replace the covers.

## ***Adding Upgrade Shelf Kits, continued***

8. Secure the conduit or flexible conduit to the cable bracket on the left side of the frame. See Figure 9-3.

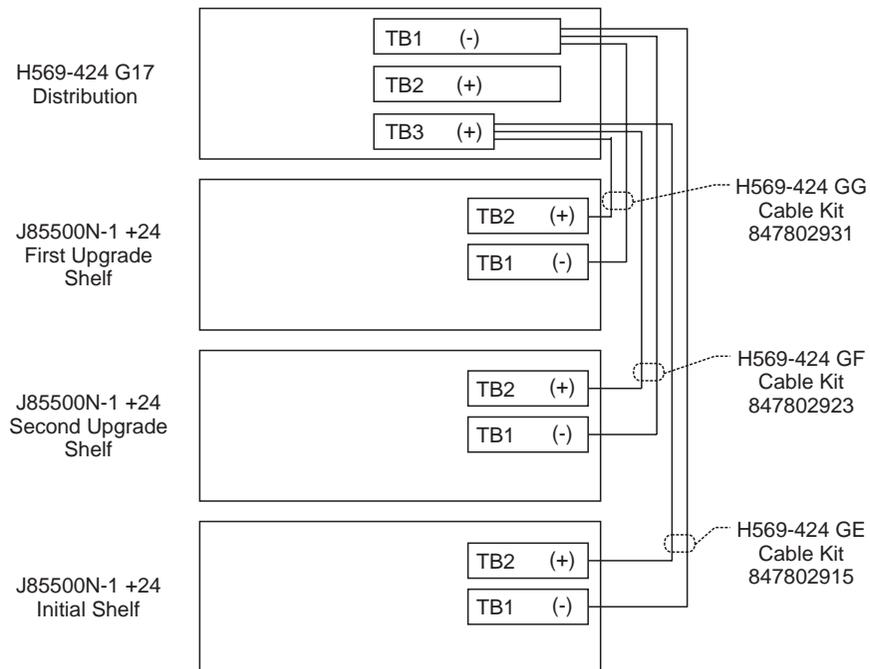
Note: Do not allow the conduit to impede access to connectors.



***Figure 9-3: Securing Conduit to Left Side of Frame***

## Adding Upgrade Shelf Kits, continued

9. Remove the cover on the right side of the CPS shelf to expose the primary output bus bars.
10. Open the Distribution Panel door and insulate the work area around and below the bus bars.
11. Using the cables supplied with the kit, connect the output bus bars of the shelf to the bus bars of the Distribution Panel. Refer to Figure 9-4.

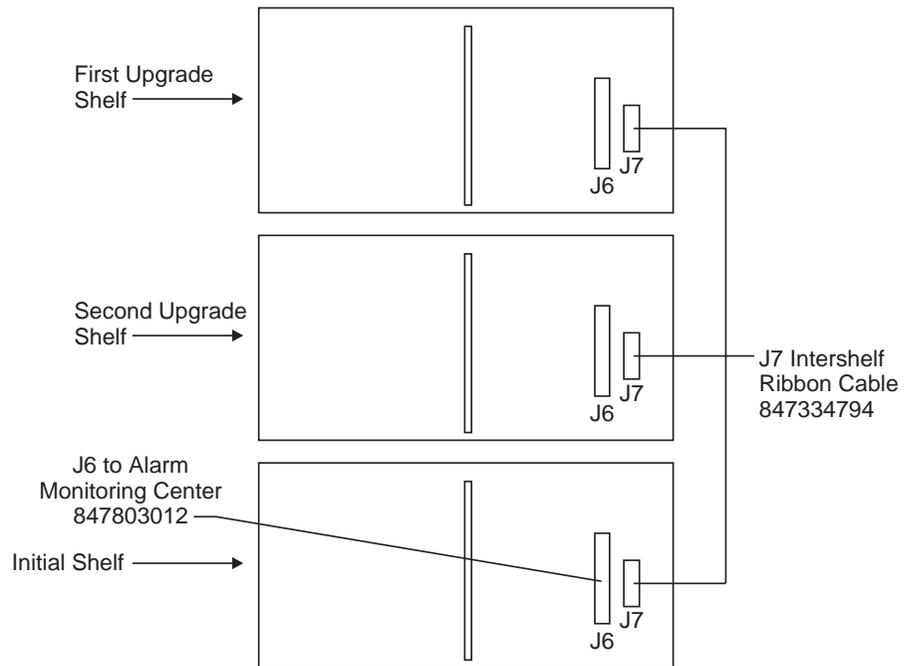


**Figure 9-4: Supplemental Shelf Cabling (Front View)**

12. The cable from TB1 (-) of the CPS shelf should be mounted to the rear portion of TB1 (-) in the Distribution Panel.
13. Connect cable from TB2 (+) of the CPS shelf to TB3 (+) of the Distribution Panel.
14. Replace the cover on the right side of the CPS shelf.

## Adding Upgrade Shelf Kits, continued

15. Connect ribbon cable supplied with the kit to J7 on the upgrade shelf and J7 of the initial shelf. Refer to Figure 9-5.



**Figure 9-5: Upgrade Shelf Cabling (Left Side View)**

16. Mount the cable tie bracket using the rack screw supplied with the kit and tie wrap the middle connector to the bracket.
17. Turn On ac service to newly installed shelf.
18. Insert required rectifiers/converters into shelf. Make sure that the switch on each rectifier/converter is in the Standby position and slide the rectifier/converter to the rear of the CPS shelf. Using the allen wrench supplied with the shelf, secure the rectifier/converter to the shelf with the mounting screw located on the bottom of the front panel of each rectifier/converter.
19. As the rectifier/converter connects to the ac socket on the shelf the yellow Standby LED will illuminate. For rectifiers, the fans will start running at this time.

## Adding Upgrade Shelf Kits, continued

20. If the first upgrade shelf is to be used with converters and an ES612 distribution module is to be used to distribute the secondary voltage then plug the ES612 module into slot five of the shelf. While the converters are in Standby the green LED on the ES612 will be Off. Refer to Figure 9-6.

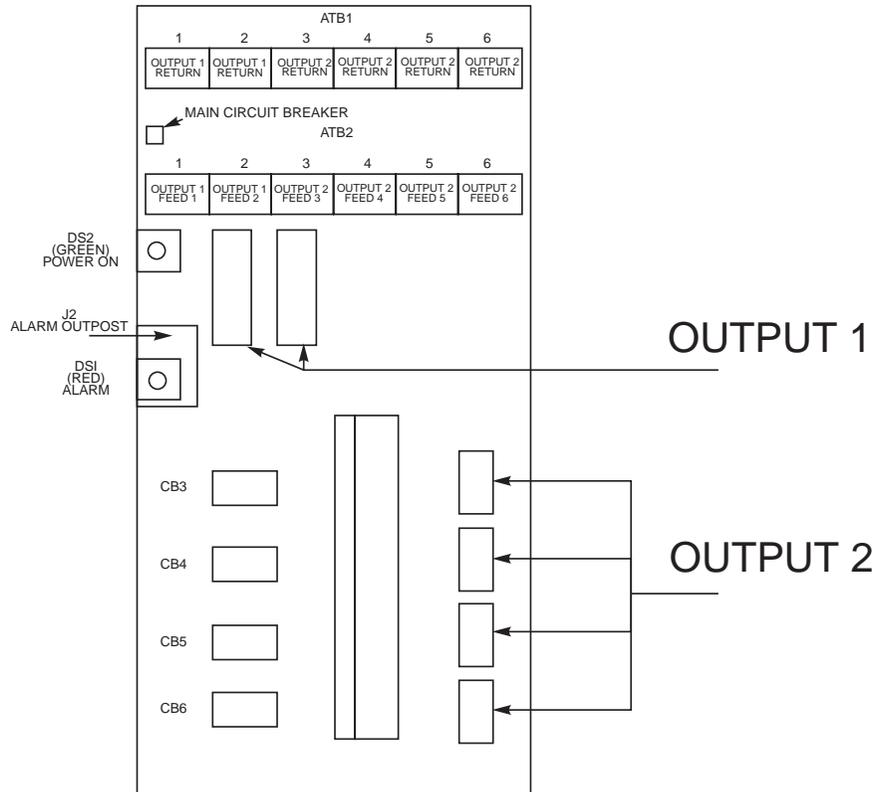
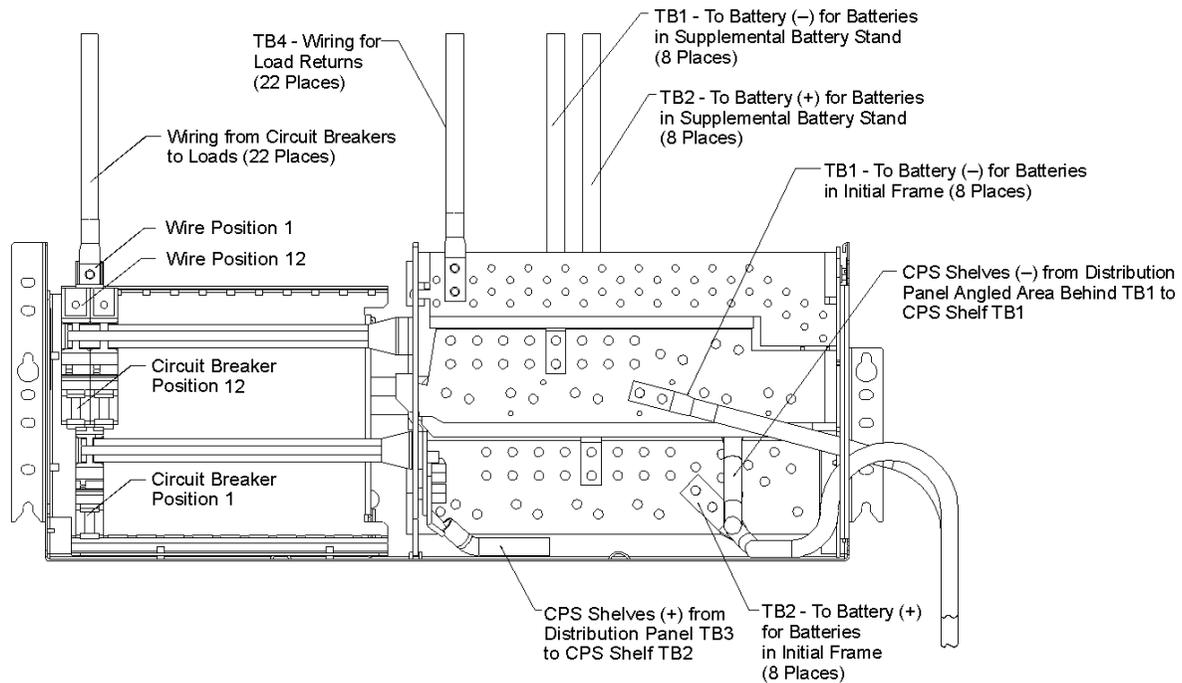


Figure 9-6: ES612 Cabling

## Adding Upgrade Shelf Kits, continued

21. Remove the cover of the ES612 Distribution Panel.
22. With the converters Off, cabling may be routed and connected to the ES612 distribution module through the primary distribution panel via the grommets in the bottom of the primary distribution panel into the ES612 module. 10 - 12 AWG, 105° C wiring equipped with T&B C220 or equivalent lug is recommended for these connections. The ES612 module should have a reference ground lead (12 AWG with T&B C220 or equivalent lug) run from its return terminal strip to the discharge return bus bar of the primary distribution panel (TB4 on the Group 17 panel). Refer to Figure 9-7.

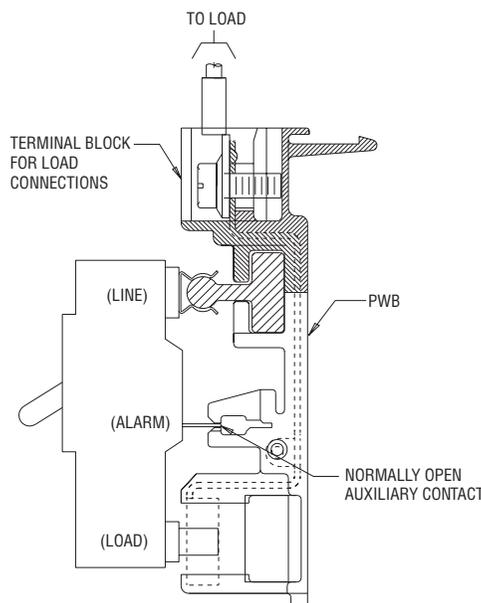


**Figure 9-7: DC Distribution Panel**

23. Route load leads and return leads out of the ES612 distribution up through the grommets of the primary distribution panel and out the top of the frame to their appropriate loads.
24. Refer to the *CPS 4024 Frame Mount for Wireless Applications* product manual for available circuit breakers. The ES612 can accommodate circuit breakers up to 25 amperes.

## Adding Upgrade Shelf Kits, continued

25. Ensure that the breakers are in the Off position and then plug them into the desired positions of the ES612 distribution panel.
26. Place On/Standby switch on the converters to On. The green LED on the ES612 distribution should now be illuminated.
27. A fuse alarm test should now be performed as follows: The plug-in circuit breakers are three terminal devices: a line terminal, a load terminal, and an alarm terminal. The alarm terminal is a normally open contact that provides a closure to the line terminal when the circuit breaker is tripped. Figure 9-8 shows a circuit breaker. To verify a fuse alarm, a closure (jumper) is made between the line side of the circuit breaker (the top of the circuit breaker) and the alarm strip (the center of the circuit breaker). Providing this closure should cause a major fuse alarm on the power shelf and an alarm on the distribution panel.



**Figure 9-8: Plug-in Circuit Breaker**

28. To power -48V loads, turn On breakers or insert fuses.
29. Replace cover on the ES612 Distribution Panel.

## Adding Battery Strings to Plants Without Battery Disconnect

### Procedure

1. Unpack the Battery Upgrade Kit and inventory parts to insure that all necessary items are present (see Table 2-P for Group 33 Battery Stands and Table 2-Q for Group 34 Battery Stands). Remove the retaining bar on shelf which will be populated with the new battery string and retaining bar on the shelf above (Group 33 only).
2. If the shelf where the new string is to be added will only contain one string, then the battery brace for the middle of the shelf should be installed now (Group 33 Battery Stand Only). Refer to Figure 9-9A.

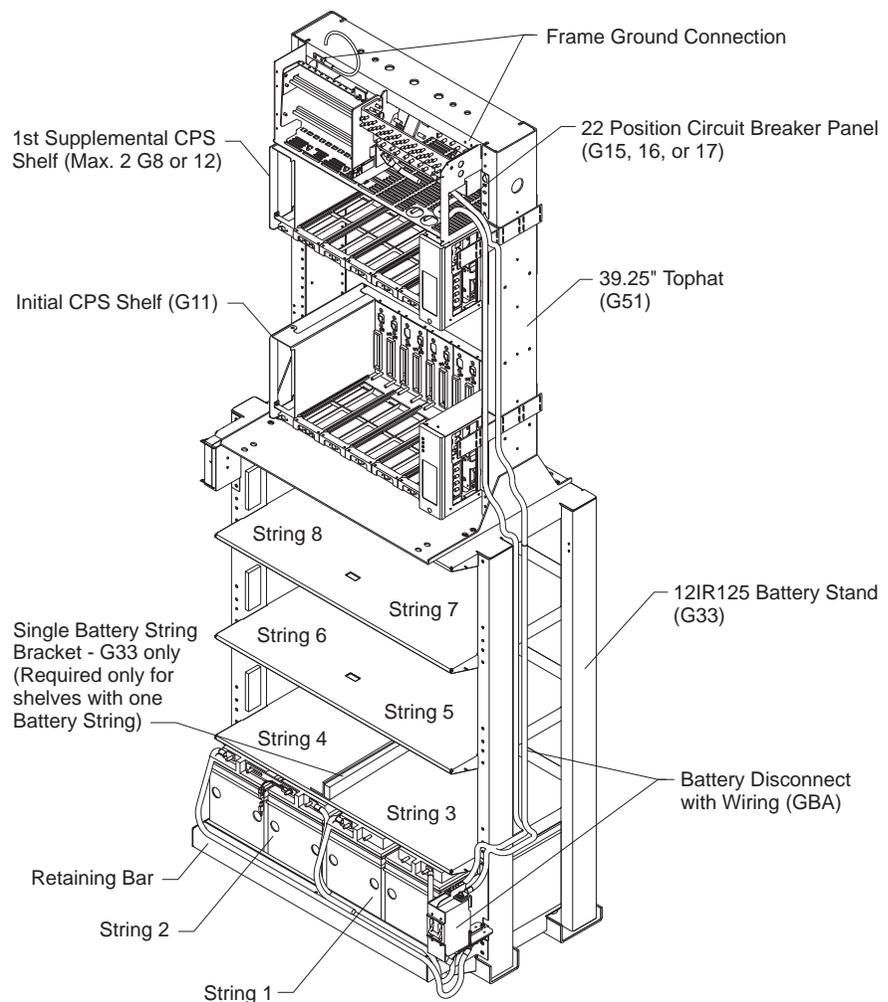
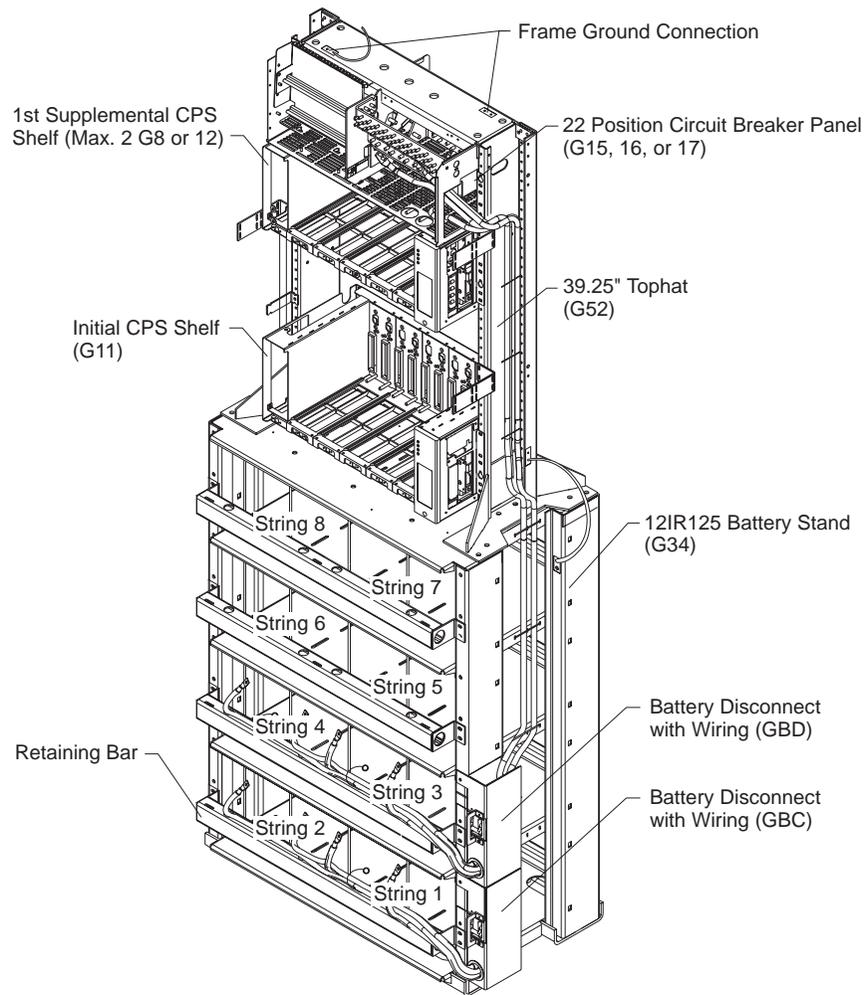


Figure 9-9A: H569-424 Plant for Zone 2 and 3

## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***

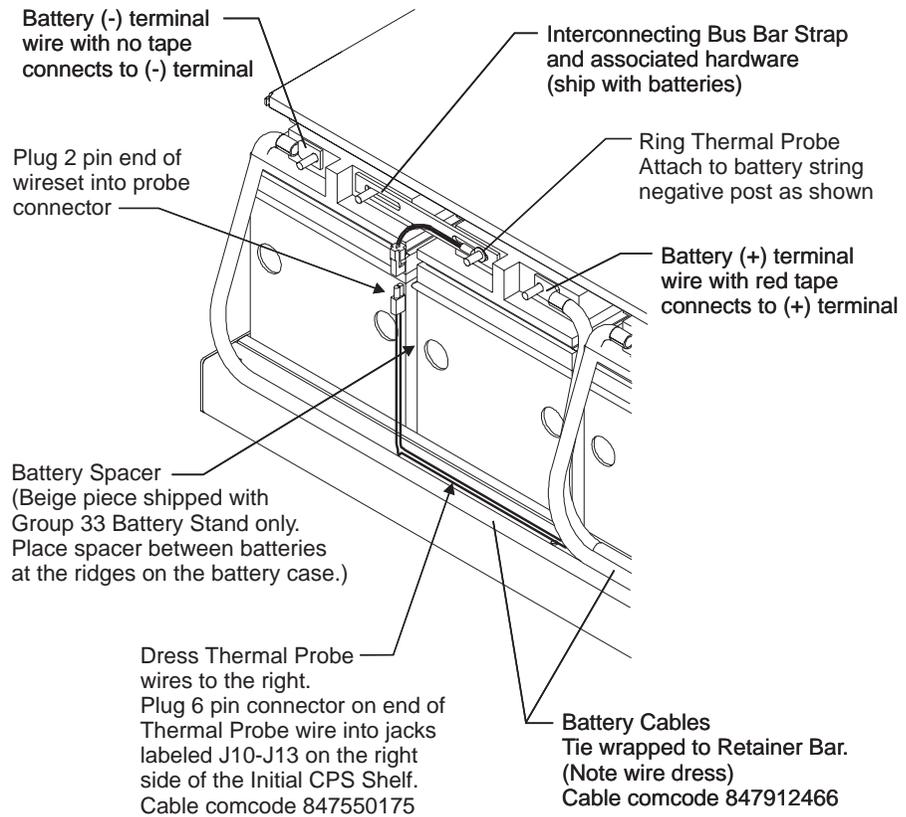
3. Check the date codes on the batteries and if acceptable load batteries into shelf. (Do NOT connect intercell connectors at this time). Refer to Figures 9-9A and 9-9B for battery string location and numbering.



***Figure 9-9B: H569-424 Plant for Zone 4***

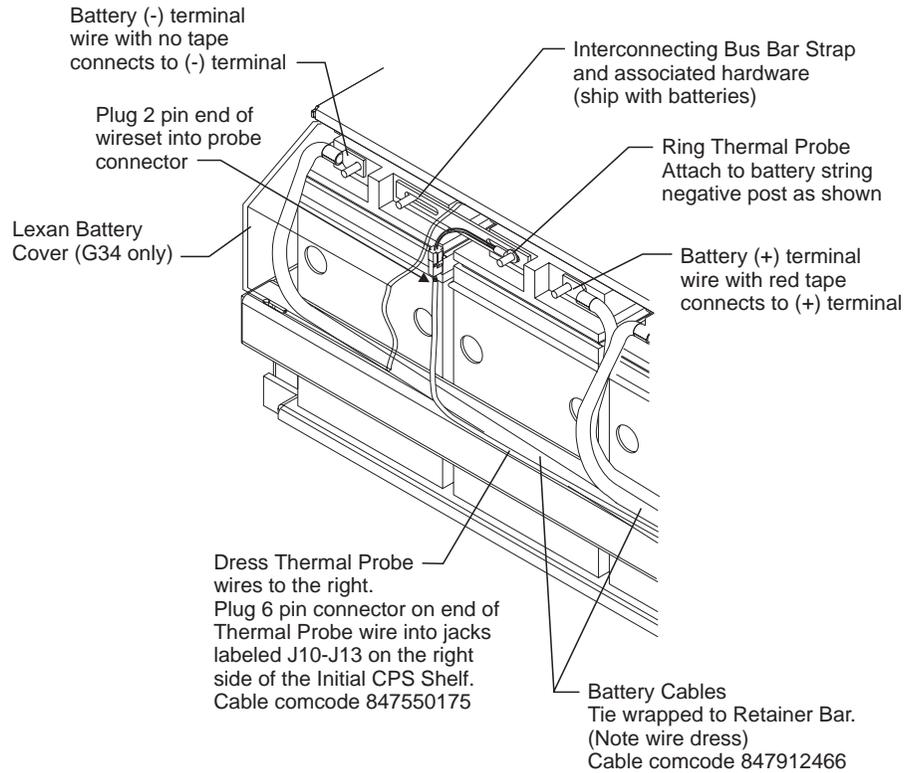
## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***

4. Install spacers in between batteries (Group 33 battery stand only). Refer to Figure 9-10A.



***Figure 9-10A: Battery Wiring (Zones 2 and 3)***

## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***



***Figure 9-10B: Battery Wiring (Zone 4)***

## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***

5. Reinstall retaining bar on shelf containing the new batteries.
6. Install the cable from the batteries to the distribution bus bar.
  - a. Install cable from batteries to distribution bus bars. Start from battery terminals and measure cables to fit.
  - b. Cut cables and crimp connecting lugs onto cables.
  - c. Apply NO-OX-ID to all battery connection hardware and secure the cables to the battery terminals.
  - d. Insulate the work area around and in the distribution panel and then connect the battery cables to the bus bars in the distribution panel.
  - e. Install the Temperature Compensation cables from the INITIAL shelf (J10-J13) to the battery string. Note: The Temperature Compensation feature will not function if the Temperature Compensation probes are connected to a shelf other than the initial shelf.
  - f. Dress and cable tie all cables into place.
  - g. Using a digital multimeter, measure the open string voltage of the batteries between the positive and negative leads of the batteries where the intercell connectors are to be placed. The meter should measure the difference between the plant Float voltage and the battery string voltage. Adjust the plant voltage using the voltage adjust potentiometer on the Alarm Control Unit located on the initial shelf down until the voltage measured on the meter is as close to zero as possible.
7. With the plant voltage reduced to approximately battery string voltage apply NO-OX to the intercell connectors and connect them to the batteries; connect temperature compensation probes at the same time. The proper sequence for termination of the intercell connectors is:
  - Intercell connector
  - Temperature probe connector (negative terminal)
  - Flat washer
  - Lock washer
  - Nut

## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***

8. Check the Temperature Compensation LED on right side of initial shelf. If the LED is not lit, then the plant voltage may be readjusted to the desired float voltage. If the LED is lit, disconnect the temperature compensation cable at the plug located on the LVD board and then readjust plant float voltage to the desired float voltage. Reconnect the Temperature Compensation plug.

**Note:**

An active Temperature Compensation LED is not an alarm indication. It is only an indication that Temperature Compensation is actively lowering the plant voltage due to the battery temperature being above 25° C. Never adjust the plant voltage with Temperature Compensation active. Temperature Compensation may be disabled by disconnecting the Temperature Compensation probe cable from J10-J13 on the right hand side of the CPS shelf

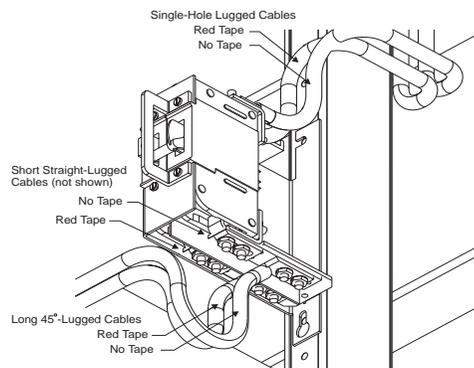
9. Torque all battery and intercell connections to 60 lb-in.
10. Install the protective cover over the battery terminals.
11. Reinstall the retaining bus bar on the shelf above (Group 33 only).

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 33 Battery Stand***

### ***Procedure***

**Caution: Use insulated tools when working with batteries and around energized bus bars.**

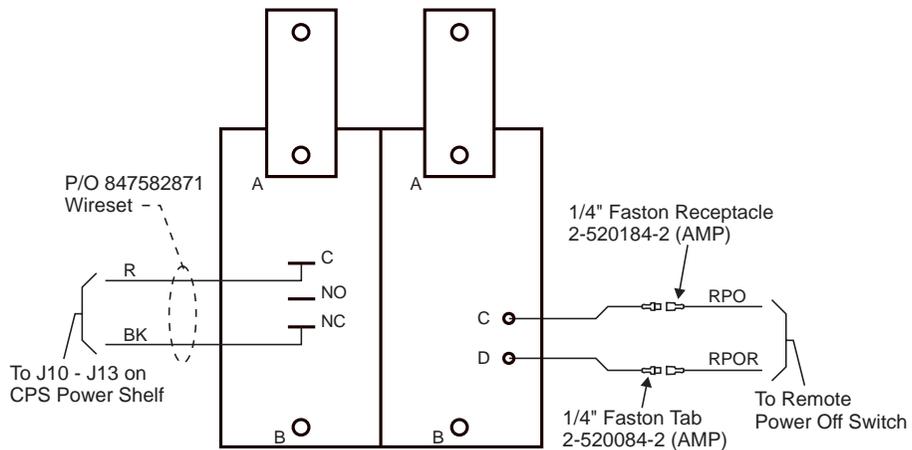
1. Unpack the Battery Upgrade Kit and inventory parts to insure that all necessary items are present (see Table 2-P).
2. Remove Lexan cover on the disconnect switch.
3. Make connections from battery strings to disconnect switch and from disconnect switch to Distribution Panel. Reference H569-424, Sheet B8 for connecting points.
4. Ensure that the disconnect switch is OPEN.
5. The wire set for connecting the disconnect switch will have three sets of cables. The cables with the lugs already crimped onto them will be used to connect the battery strings to the bottom side of the disconnect switch.
6. There will be two sets (one for each battery string). Each set will have a cable marked with RED TAPE and a cable with NO tape. The shortest set of cables will connect to battery string nearest to the disconnect switch. Connect the shortest cable marked with the RED TAPE (double hole lug end) to the first set of terminals on the inside of the disconnect switch. Connect the shortest cable with no tape (double hole lug end) to the first set of terminals on the outside of the disconnect switch. Refer to Figure 9-11.



***Figure 9-11: Battery Disconnect Switch with Group 33 Battery Stand***

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 33 Battery Stand, continued***

7. Connect the longest cable marked with RED TAPE (double hole 45 degree lug) to the second set (back) of terminals on the inside of the disconnect switch. Connect the longest cable with no tape (double hole 45 degree lug) to the second set (back) of terminals on the outside of the disconnect switch.
8. If an open string alarm is required, then connect wireset 847582871 to the back of the disconnect switch. Refer to Figure 9-12.



***Figure 9-12: Battery Disconnect Switch***

9. If disconnect switch is to be connected to a Remote Power Off switch connect the leads for the Remote Off switch to the back of the battery disconnect switch. (Remote Off leads have Faston receptacles crimped on them). Refer to Figure 9-12.
10. Mount the disconnect switch to the battery stand. The switch should be mounted on the right hand side as viewed from the front.

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 33 Battery Stand, continued***

11. Using the remaining cable set (single hole connector on one end only), connect the cable marked with the RED TAPE to the terminal on the top inside of the disconnect switch. Route the cable along the approximate path that it will be tied to and up to the Distribution Panel. Measure the cable to fit onto TB2 at the next available set of studs. Mark or hold the cable at the desired length and pull out of the Distribution Panel. Cut and strip the cable. Crimp the double hole lug (45 deg.) supplied with the kit onto the cable and apply shrink wrap to cover the shiner.

**Caution: The work area inside the distribution panel should be insulated. Use insulated tools while working inside the distribution panel.**

12. Route the cable back into the Distribution Panel and connect it to TB2.
13. Connect the cable that is not marked onto the outside terminal of the disconnect switch. Route it along the approximate path that it will be tied to and up to the Distribution Panel. Measure the cable to fit onto TB1 at the next available set of studs. Mark or hold the cable at the desired length and pull it out of the Distribution Panel. Cut and strip the cable. Crimp the double hole lug (straight) supplied with the kit onto the cable and apply heat shrink to cover the shiner.
14. Route the cable back into the Distribution Panel and connect it to TB1.
15. Dress and cable tie all cables from disconnect switch to the Distribution Panel into their proper place.
16. Remove the retaining bar on shelf which will be populated with the new battery string.
17. If the shelf where the new string is to be added will only contain one string, then the battery brace for the middle of the shelf should be installed now. Refer to Figure 9-9A.
18. Remove the retaining bar on the next higher shelf to facilitate battery installation.

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 33 Battery Stand, continued***

19. Check the date codes on the batteries; if acceptable, load batteries into shelf. (Do NOT connect intercell connectors at this time). Refer to Figure 9-9A for battery string location and numbering.
20. Install spacers in between batteries. Refer to Figure 9-10A.
21. Reinstall retaining bar on shelf containing the new batteries.
22. Cut cables and crimp connecting lugs onto cables.
23. Apply NO-OX-ID to all battery connection hardware and secure the cables to the battery terminals.
24. Install the Temperature Compensation cables from the INITIAL shelf (J10-J13) to the battery string. Note: The Temperature Compensation feature will not function if the Temperature Compensation probes are connected to a shelf other than the initial shelf.
25. Dress and cable tie all cables into place.
26. With the plant voltage reduced to approximately battery string voltage apply NO-OX to the intercell connectors and connect them to the batteries; connect temperature compensation probes at the same time. The proper sequence for termination of the intercell connectors is:
  - Intercell connector
  - Temperature probe connector (negative terminal)
  - Flat washer
  - Lock washer
  - Nut
27. Reconnect the Temperature Compensation plug .
28. Torque all battery and intercell connections to 60 lb-in.
29. Install the protective cover over the battery terminals.
30. Reinstall the retaining bus bar on the shelf above.

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 33 Battery Stand, continued***

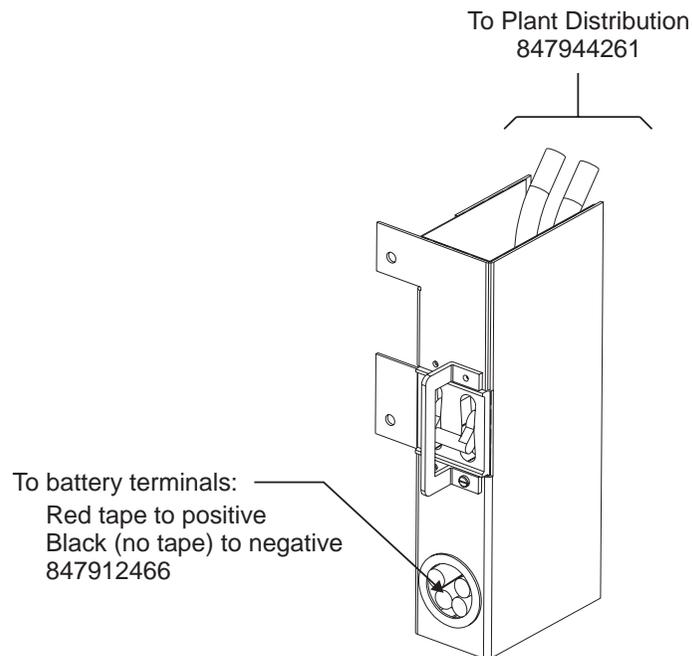
31. Reinstall the Lexan cover onto the battery disconnect switch.
32. Close the battery disconnect switch.

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 34 Battery Stand***

### ***Procedure***

**Caution:** Use insulated tools when working with batteries and around energized bus bars.

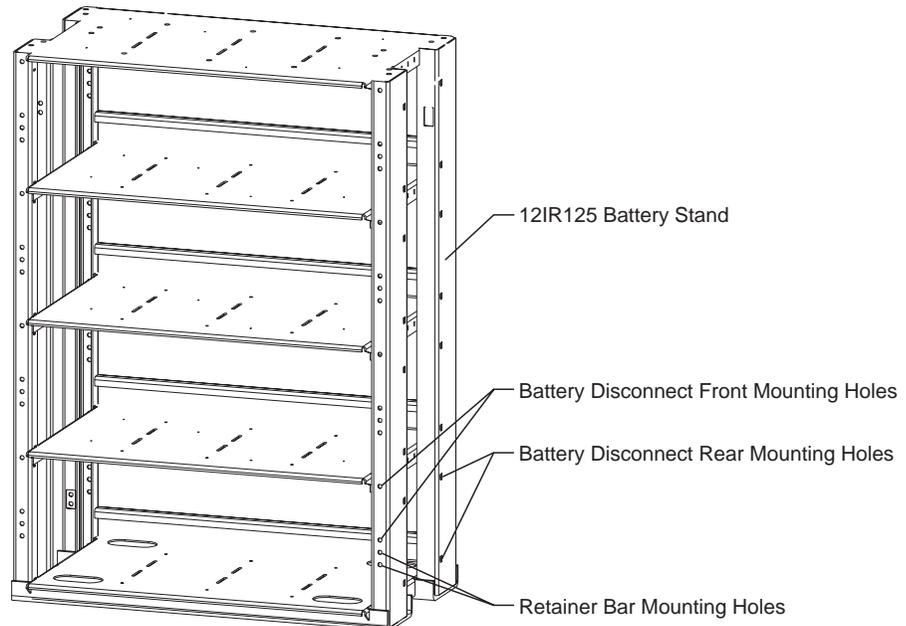
1. Unpack the Battery Upgrade Kit (ED83123-30 G14) and inventory parts to insure that all necessary items are present (see Table 2-Q).
2. Make connections from battery strings to disconnect switch and from disconnect switch to Distribution Panel. Reference H569-424, Sheet B8 for connecting points.
3. Ensure that the disconnect switch is OPEN.
4. The wire set for connecting the disconnect switch will have three sets of cables.
5. There will be two sets (one for each battery string). Each set will have a cable marked with RED TAPE and a cable with NO tape. The shortest set of cables will connect to battery string nearest to the disconnect switch.



***Figure 9-13: Battery Disconnect Switch with Group 34 Battery Stand***

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 34 Battery Stand, continued***

6. If an open string alarm is required, then connect wireset 847582871 to the back of the disconnect switch. Refer to Figure 9-12.
7. If disconnect switch is to be connected to a Remote Power Off switch connect the leads for the Remote Off switch to the back of the battery disconnect switch. (Remote Off leads have Faston receptacles crimped on them). Refer to Figure 9-12.
8. Mount the disconnect switch to the battery stand. Switch should be mounted on the right hand side as viewed from the front using the 1/4-20 bolts provided. Refer to Figure 9-14.



***Figure 9-14: Mounting Locations for Battery Disconnect Switch***

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 34 Battery Stand, continued***

9. Locate the cable that is marked with RED TAPE coming out of the top of the disconnect switch. Route the cable to the plant distribution (see Figures 9-9A and 9-9B) along the approximate path that it will be secured to and up to the distribution panel. Measure the cable to fit onto TB2 at the next available set of terminals. Mark or hold the cable at the desired length and pull it out of the distribution panel. Cut and strip the cable. Crimp the double hole, 45 degree lug supplied with the kit onto the cable and apply shrink wrap to cover the shiner.

**Caution: The work area inside the distribution panel should be insulated. Use insulated tools while working inside the distribution panel.**

10. Route the cable back into the Distribution Panel and connect it to TB2.
11. Locate the cable that is **not** marked with RED TAPE coming out of the top of the disconnect switch. Route the cable to the plant distribution along the approximate path that it will be secured to and up to the distribution panel. Measure the cable to fit onto TB1 at the next available set of terminals. Mark or hold the cable at the desired length and pull it out of the distribution panel. Cut and strip the cable. Crimp the double hole, straight lug supplied with the kit onto the cable and apply shrink wrap to cover the shiner.
12. Route the cable back into the Distribution Panel and connect it to TB1.
13. Dress and cable tie all cables from disconnect switch to the Distribution Panel into their proper place.
14. Remove the retaining bar on the shelf which will be populated with the new battery string.
15. Check the date codes on the batteries and if acceptable load batteries into shelf. (Do NOT connect intercell connectors at this time). Refer to Figure 9-9B for battery string location and numbering.

## ***Adding Battery Strings to Plants With Battery Disconnect and Group 34 Battery Stand, continued***

16. Reinstall retaining bar on shelf containing the new batteries.
17. Apply NO-OX-ID to all battery connection hardware and secure the cables to the battery terminals. Refer to Figure 9-10B for battery connections.
18. Install the Temperature Compensation cables from the INITIAL shelf (J10-J13) to the battery string. Note: The Temperature Compensation feature will not function if the Temperature Compensation probes are connected to a shelf other than the initial shelf.
19. Dress and cable tie all cables into place. Refer to Figure 9-10B for wire dressing information.
20. Apply NO-OX to the intercell connectors and connect them to the batteries. The Temperature Compensation probes should be connected at the same time.
21. Torque all battery and intercell connections to 60 lb-in.

The proper sequence for termination of the intercell connectors is:

- Intercell Connector
  - Temperature Probe Connector (negative terminal)
  - Flat Washer
  - Lock Washer
  - Nut
22. Install the protective cover over the battery terminals.
  23. Close the battery disconnect switch.

## ***Replacing Low Voltage Disconnect Contactor***

### ***Procedure***

**Caution: The best possible situation for replacing the low voltage disconnect contactor is with the plant completely de-energized, no ac to the rectifiers and all battery strings open. If this is not possible then all safety precautions in this procedure must be followed completely.**

1. Read the entire procedure before proceeding with any work.
2. The first step is to determine if the OPEN LVD alarm is factual. Open the Distribution panel door and visually inspect the Low Voltage Contactor to see if the contacts are open. If the contacts are open there will be a clear space between the contacts of the contactor and the bus bar of the contactor.
3. If the contacts are open then visually inspect the wiring harness of the Low Voltage Disconnect contactor. There are four wires connected to the microswitch on the front of the contactor and two wires connected to the solenoid of the contactor. Wiggle the wiring harness and see if there may be a bad contact causing the alarm. Pay particular attention to the RED and Black wires connected to the solenoid, they supply the voltage to the coil of the contactor to pull it in when it is initially powered up.
4. If the contacts of the Low Voltage Disconnect are open then there is also the possibility that the BSP1 circuit pack may be defective. Procure another BSP1 circuit pack from your spares.
5. Remove the cover on the right hand side of the initial rectifier shelf and check the DIP switch setting (SW201). It should be set for a default setting of 21.25 Volts. (Switch settings which correspond to a 21.25 Volt setting are: Switches 1 and 2 closed, switches 3 and 4 open.)
6. Set Switch 201 on the new BSP1 circuit pack to the same settings as the original BSP1 circuit pack.
7. Slide the new BSP1 circuit pack into the channel of the shelf and engage it into the backplane.
8. If the contactor closes and the alarm expires then the problem was with the BSP1 circuit pack. Return the defective BSP1 circuit pack for repair.

## ***Replacing Low Voltage Disconnect Contactor, continued***

9. If the contactor does not close and the alarm expire, then the LVD contactor is defective.

Note: With the LVD contactor open, battery reserve is not available to the plant. To replace the contactor, remove as much of the shorting potential as possible.

10. Open all battery disconnects or if there are no battery disconnects then remove the intercell connectors of all battery strings in the plant.
11. Disengage the BSP1 circuit pack from the right side of the initial rectifier shelf.
12. If the plant can not be taken off-line (ac input off) then it will be necessary to insulate the area inside the distribution around the bus bars to prevent any possibility of producing a short circuit condition between hot/live bus bars and frame ground.
13. The LVD contactor can be removed through the access area around the bus bars and out the front of the plant.
14. Use the smallest tools possible to allow more room for working inside the distribution panel. (1/4" drive ratchet and deep sockets will work well). Make sure that the tools are well insulated!
15. Locate the wiring harness of the LVD contactor situated behind the solenoid portion of the contactor and remove any cable ties which may hinder the removal of the contactor.
16. Make note of the wire colors of the wiring harness and where they are connected to the LVD for replacement on the new contactor.
17. Remove the four wires connected to the microswitch located on the bus bar side of the contactor.
18. Remove the four nuts, lockwashers, and flat washers which mount the contactor between TB2 and TB3 bus bars. Be careful not to drop any hardware into the rectifier shelf(s) below the distribution panel.
19. Pull the contactor out and into the bus bar area of the distribution panel and out the front of the plant.

## ***Replacing Low Voltage Disconnect Contactor, continued***

20. Note the locations of the RED and Black leads of the wiring harness on the solenoid housing and then remove them.
21. Replace the RED and Black leads onto their appropriate terminals prior to inserting the contactor into position.
22. Slide the contactor back into position between TB2 and TB3 making sure that the RED and Black leads are fed back into the cavity behind the contactor.
23. Secure the contactor in place with the flat washers, lockwashers, and nuts removed from the original contactor.
24. Replace the four wires back into their respective positions on the microswitch.
25. Remove all tools and insulating material from the distribution panel.
26. Close all battery string disconnects or replace all intercell connectors for all battery strings.
27. Engage the BSP1 circuit pack. The contactor should close and the LVD OPEN alarm should be retired.
28. Replace all covers and close the distribution panel door.

# ***10 Product Warranty***

A. Seller warrants to Customer only, that:

1. As of the date title to Products passes, Seller will have the right to sell, transfer, and assign such Products and the title conveyed by Seller shall be good;
2. Upon shipment, Seller's Manufactured Products will be free from defects in material and workmanship, and will conform to Seller's specifications or any other agreed-upon specification referenced in the order for such Product;
3. With respect to Vendor items, Seller, to the extent permitted, does hereby assign to Customer the warranties given to Seller by its Vendor of such Vendor Items, such assignment to be effective upon Customer's acceptance of such Vendor Items. With respect to Vendor items recommended by Seller in its specifications for which the Vendor's warranty cannot be assigned to Customer, or if assigned, less than Sixty (60) days remain of the Vendor's warranty or warranty period when the Vendor's items are shipped to Customer or when Seller submits its notice of completion of installation if installed by Seller, Seller warrants that such Vendor's items will be free from defects in material and workmanship on the date of shipment to Customer. In such an event, the applicable Warranty Period will be sixty (60) days.

B. The Warranty Period listed below is applicable to Seller's Manufactured Products furnished pursuant to this Agreement, unless otherwise stated:

**Warranty Period**

Product Type	New Product	Repaired Product or Part*
Central Office Power Equipment**	24 Months	6 Months
<p>* The Warranty Period for a repaired Product or part thereof is as listed or, in the case of Products under Warranty, is the period listed or the unexpired term of the new Product Warranty Period, whichever is longer.</p> <p>** The Warranty Period for Products ordered for Use in Systems or equipment Manufactured by and furnished by Seller is that of the initial Systems or equipment.</p>		

- C. If, under normal and proper use during the applicable Warranty Period, a defect or nonconformity is identified in a Product and Customer notifies Seller in writing of such defect or nonconformity promptly after Customer discovers such defect or nonconformity, and follows Seller's instructions regarding return of defective or nonconforming Products, Seller shall, at its option attempt first to repair or replace such Product without charge at its facility or, if not feasible, provide a refund or credit based on the original purchase price and installation charges if installed by Seller. Where Seller has elected to repair a Seller's Manufactured Product (other than Cable and Wire Products) which has been installed by Seller and Seller ascertains that the Product is not readily returnable for repair, Seller will repair the Product at Customer's site.

With respect to Cable and Wire Products manufactured by Seller which Seller elects to repair but which are not readily returnable for repair, whether or not installed by Seller, Seller at its option, may repair the cable and Wire Products at Customer's site.

- D. If Seller has elected to repair or replace a defective Product, Customer shall have the option of removing and reinstalling or having Seller remove and reinstall the defective or nonconforming Product. The cost of the removal and the reinstallation shall be borne by Customer. With respect to Cable and Wire Products, Customer has the further responsibility, at its expense, to make the Cable and Wire Products accessible for repair or replacement and to restore the site. Products returned for repair or replacement will be accepted by Seller only in accordance with its instructions and procedures for such returns. The transportation expense associated with returning such Product to Seller shall be borne by Customer. Seller shall pay the cost of transportation of the repair or replacing

Product to the destination designated by Customer within the Territory.

- E. The defective or nonconforming Products or parts which are replaced shall become Seller's property.
- F. If Seller determines that a Product for which warranty service is claimed is not defective or nonconforming, Customer shall pay Seller all costs of handling, inspecting, testing, and transportation and, if applicable, traveling and related expenses.
- G. Seller makes no warranty with respect to defective conditions or nonconformities resulting from actions of anyone other than Seller or its subcontractors, caused by any of the following:  
modifications, misuse, neglect, accident, or abuse; improper wiring, repairing, splicing, alteration, installation, storage, or maintenance; use in a manner not in accordance with Seller's or Vendor's specifications or operating instructions, or failure of Customer to apply previously applicable Seller modifications and corrections. In addition, Seller makes no warranty with respect to Products which have had their serial numbers or month and year of manufacture removed, altered, or with respect to expendable items, including, without limitation, fuses, light bulbs, motor brushes, and the like.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S SOLE AND EXCLUSIVE REMEDY SHALL BE SELLER'S OBLIGATION TO REPAIR, REPLACE, CREDIT, OR REFUND AS SET FORTH ABOVE IN THIS WARRANTY.

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## ***Appendix Glossary***

### ***A***

<b><i>ACU</i></b>	Alarm Control Unit, ES643, provides plant monitoring, controls, and office alarm outputs for the three-shelf 24V CPS plant.
<b><i>Ampere Hour (AH)</i></b>	Ampere hour is a rating for batteries that specifies duration of a discharge for a given load. It is a convention for expressing “drain (or load) current” multiplied by time.
<b><i>BD</i></b>	Battery on Discharge occurs when the rectifier plant voltage is below a preset threshold. Typically, the ac service voltage to the plant is low or missing and the load is being powered by the batteries. This condition results in a BD alarm.
<b><i>BSP1</i></b>	Distribution unit printed wiring board which low voltage disconnect control and thermal management circuitry.
<b><i>CPS</i></b>	Cabinet Power System
<b><i>ES643</i></b>	Alarm Control Unit
<b><i>ES661B</i></b>	24V CPS rectifier converts ac into 24V dc.
<b><i>ESD</i></b>	Electrostatic discharge
<b><i>LED</i></b>	Light emitting diode

<b><i>LVD</i></b>	Low voltage disconnect; preset voltage threshold at which the load is disconnected from the battery.
<b><i>MFJ</i></b>	Major Fuse Alarm signifies that an output distribution circuit breaker has operated due to excessive current. A circuit breaker in either the off or trip position results in an alarm condition.
<b><i>NEC</i></b>	National Electric Code
<b><i>PMJ</i></b>	Power Major Alarm. Conditions that impact service and require immediate attention are classified as major alarms and designated as Power Major (PMJ) alarms. (Red LEDs signify major alarms.)
<b><i>PMN</i></b>	Power Minor Alarm. Conditions requiring service, but having no immediate impact on the plant output are classified as minor alarms and designated as Power Minor (PMN) alarms. (Yellow LEDs signify minor alarms.)
<b><i>RTAC</i></b>	Regional Technical Assistance Center.
<b><i>Standby</i></b>	In this mode, the power unit control and alarm circuits are powered; however, the power circuits are inhibited to prevent these units from producing output power.
<b><i>TB</i></b>	Terminal block
<b><i>Temp Comp</i></b>	Temperature Compensation circuit active
<b><i>Thermal Alarm (TA)</i></b>	This red LED lights when the rectifier shuts down due to inadequate air flow indicating possible intake air blockage, fan failure, or inlet air temperature above 65 degrees Celsius.
<b><i>V Adj</i></b>	This is a recessed potentiometer used to adjust the plant output primary voltage on the ACU.