

**Lucent Technologies**  
Bell Labs Innovations



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

Product Manual  
Select Code 167-102-121  
Comcode 108007873  
Issue 4  
January 2000  
© 2000 Lucent Technologies



***Product Manual***  
***Select Code 167-102-121***  
***Comcode 108007873***  
***Issue 4***  
***January 2000***

***Lucent Technologies***  
***Upgrade Kits for***  
***CPS 4024 Frame Mount***  
***for Wireless Applications***  
***H569-424***

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.



# ***Table of Contents***

## ***1 Introduction***

<i>Overview of the CPS 4024 System</i>	<i>1 - 1</i>
<i>System Description</i>	<i>1 - 1</i>
<i>Upgrades and Additions to the System</i>	<i>1 - 1</i>
<i>Documentation References</i>	<i>1 - 2</i>
<i>Product Manuals</i>	<i>1 - 2</i>
<i>Customer Assistance Contacts</i>	<i>1 - 3</i>
<i>Customer Training</i>	<i>1 - 3</i>
<i>Customer Service</i>	<i>1 - 3</i>
<i>Technical Support</i>	<i>1 - 3</i>
<i>Product Repair and Return</i>	<i>1 - 3</i>
<i>Warranty Service</i>	<i>1 - 4</i>
<i>On-Line Power Systems Product Manuals</i>	<i>1 - 4</i>

## ***2 Product Information***

<i>Upgrade Shelf Kits</i>	<i>2 - 1</i>
<i>Battery Upgrade Cable Kits for Group 33 Battery Stands</i>	<i>2 - 2</i>
<i>Battery Upgrade Kits for Group 34 Battery Stands</i>	<i>2 - 3</i>

## ***3 Safety***

<i>Safety Statements</i>	<i>3 - 1</i>
<i>Warning Statements and Safety Symbols</i>	<i>3 - 4</i>
<i>Precautions</i>	<i>3 - 6</i>
<i>Handling Batteries</i>	<i>3 - 8</i>

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

<i>Preparation</i>	<i>4 - 1</i>
<i>Introduction</i>	<i>4 - 1</i>
<i>Tools</i>	<i>4 - 1</i>
<i>Safety</i>	<i>4 - 1</i>
<i>Torque Requirements for Electrical Connections</i>	<i>4 - 2</i>
<i>Adding Rectifiers/Converters to a Working Plant</i>	<i>4 - 3</i>
<i>Adding Upgrade Shelf Kits</i>	<i>4 - 4</i>
<i>Adding Battery Strings to Plants Without Battery Disconnect</i>	<i>4 - 13</i>
<i>Adding Battery Strings to Plants With Battery Disconnect     and Group 33 Battery Stand</i>	<i>4 - 19</i>

<i>Adding Battery Strings to Plants With Battery Disconnect and Group 34 Battery Stand</i>	<i>4 - 24</i>
<i>Replacing Low Voltage Disconnect Contactor</i>	<i>4 - 28</i>

## *List of Figures*

<i>Figure 4-1: H569-424 Framework</i>	<i>4 - 4</i>
<i>Figure 4-2: Baffle Location</i>	<i>4 - 5</i>
<i>Figure 4-3: Securing Conduit to Left Side of Frame</i>	<i>4 - 7</i>
<i>Figure 4-4: Supplemental Shelf Cabling (Front View)</i>	<i>4 - 8</i>
<i>Figure 4-5: Upgrade Shelf Cabling (Left Side View)</i>	<i>4 - 9</i>
<i>Figure 4-6: ES612 Cabling</i>	<i>4 - 10</i>
<i>Figure 4-7: DC Distribution Panel</i>	<i>4 - 11</i>
<i>Figure 4-8: Plug-in Circuit Breaker</i>	<i>4 - 12</i>
<i>Figure 4-9A: H569-424 Plant for Zone 2 and 3</i>	<i>4 - 13</i>
<i>Figure 4-9B: H569-424 Plant for Zone 4</i>	<i>4 - 14</i>
<i>Figure 4-10A: Battery Wiring (Zones 2 and 3)</i>	<i>4 - 15</i>
<i>Figure 4-10B: Battery Wiring (Zone 4)</i>	<i>4 - 16</i>
<i>Figure 4-11: Battery Disconnect Switch with Group 33 Battery Stand</i>	<i>4 - 19</i>
<i>Figure 4-12: Battery Disconnect Switch</i>	<i>4 - 20</i>
<i>Figure 4-13: Battery Disconnect Switch with Group 34 Battery Stand</i>	<i>4 - 24</i>
<i>Figure 4-14: Mounting Locations for Battery Disconnect Switch</i>	<i>4 - 25</i>



## ***List of Tables***

<i>Table 2-A: Upgrade Shelf Kits</i>	<i>2 - 1</i>
<i>Table 2-B: Battery Upgrade Cable Kits for Group 33 Battery Stands</i>	<i>2 - 2</i>
<i>Table 2-C: Battery Upgrade Cable Kits for Group 34 Battery Stands</i>	<i>2 - 3</i>
<i>Table 4-A: Minimum Torque for All Electrical Connections</i>	<i>4 - 2</i>



# ***1 Introduction***

## ***Overview of the CPS 4024 System***

***System Description***      The CPS 4024 is a cabinetized frame mount system for wireless applications. It incorporates the following products:

- J85500N-1 24V Cabinet Power System Shelves (single-shelf or two-shelf systems available)
- H569-424 Group 15, 16, or 17 Distribution Panel
- 12IR125 Batteries

***Upgrades and Additions to the System***

If the CPS 4024 includes the H569-424 Group 17 Distribution Panel, there are two upgrade kits available:

- 1st Upgrade Shelf adds a second shelf to a single-shelf system
- 2nd Upgrade Shelf adds a third shelf to a two-shelf system

If the CPS 4024 includes a Group 33 or Group 34 Battery Stand, Battery Upgrade Cable Kits With or Without Disconnect are also available.

## ***Documentation References***

### ***Product Manuals***

- This Product Manual, Select Code 167-102-121, provides complete descriptions and installation procedures for the upgrades and additions to the CPS 4024 System.
- Product Manual, Select Code 167-102-120, provides information on the CPS 4024 System, including ordering information for the H569-424 Distribution Panels.
- Product Manual, Select Code 167-790-071 provides information on the J85500N-1 24V Cabinet Power System Shelves.
- For 12IR125 Batteries, refer to Product Manual, Select Code 157-622-020.

## ***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                      *Product Information***

### ***Upgrade Shelf Kits***

**Table 2-A: 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.

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

**Table 2-B: 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

## ***Battery Upgrade Kits for Group 34 Battery Stands***

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

<b>Qty</b>	<b>Description</b>
<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



# 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***

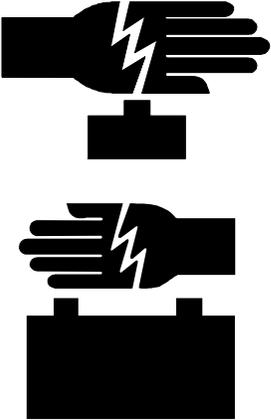
- For installations in the United States, Listed compression connectors are to be used to terminate Listed field-wired conductors where required. For all installations, the appropriate connector is to be applied only to the correct size conductor as specified by the connector manufacturer using only 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.

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

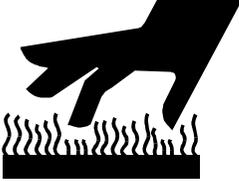
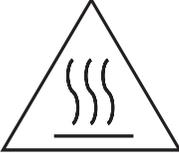
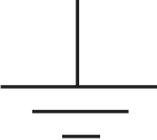
- Insulation on field-wired power conductors should be rated no less than 90° Centigrade. Wire conductor size should be no less than allowed by electrical codes for 60° Centigrade wire (regardless of insulation temperature rating used) and based on the ampacity of the associated protection device. Insulation 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***

	<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>
	<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>
	<p>This symbol is used to identify the protective safety earth ground for the equipment.</p>
	<p>This symbol is used to identify other bonding points within the equipment.</p>
	<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***

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.

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

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:



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**                      ***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 4-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 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)

## ***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 4-1.

### 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-A).
2. Place CPS Shelf in position on the frame and secure with mounting screws provided in kit. Refer to Figure 4-1 for mounting positions.

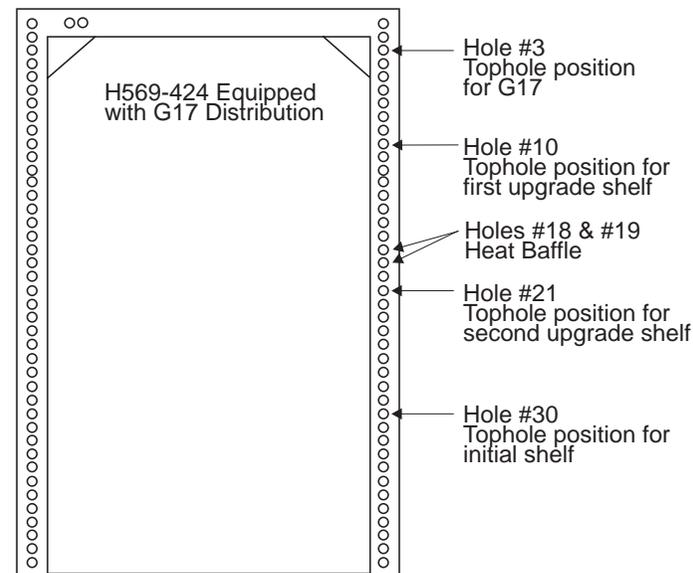
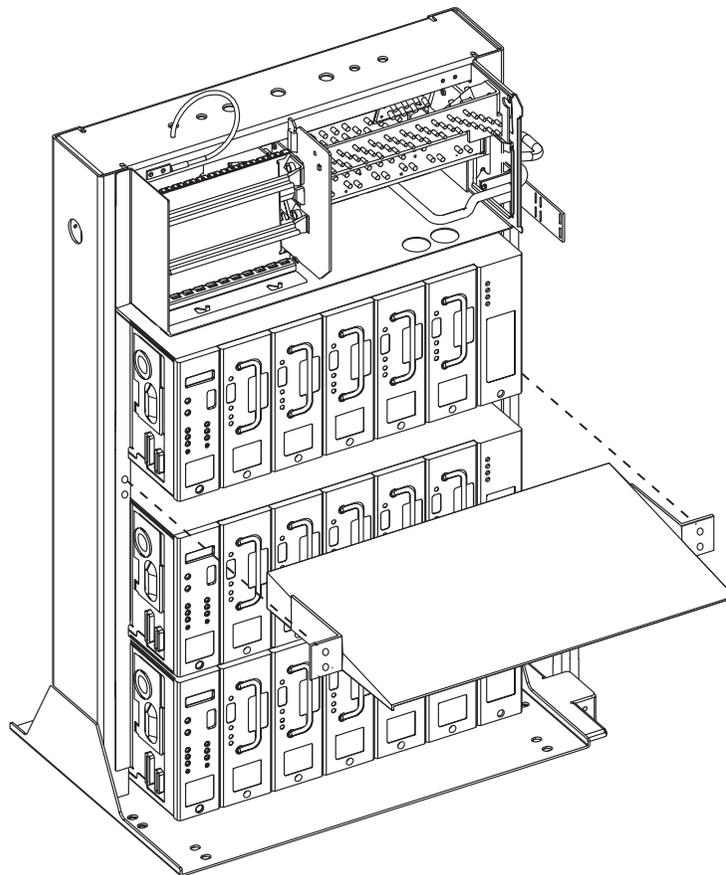


Figure 4-1: H569-424 Framework

## ***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 4-2 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 4-2: Baffle Location***

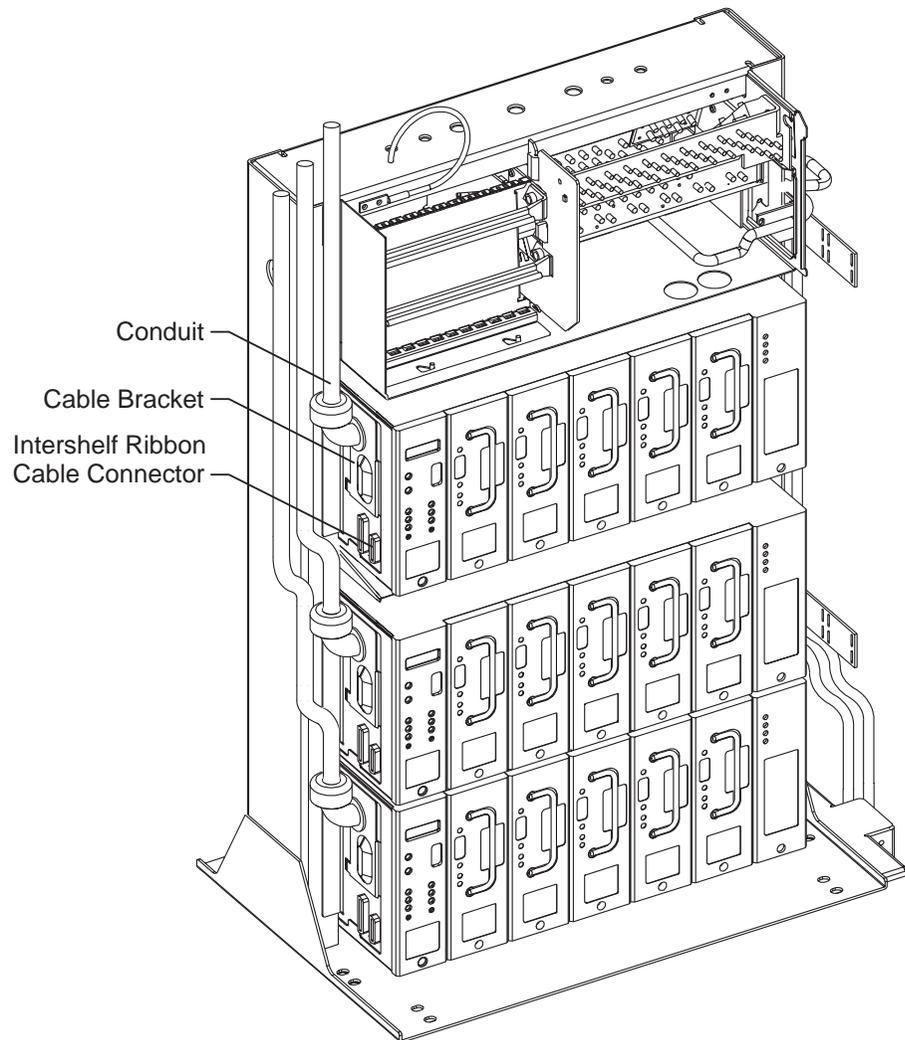
## ***Adding Upgrade Shelf Kits, continued***

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 4-3.

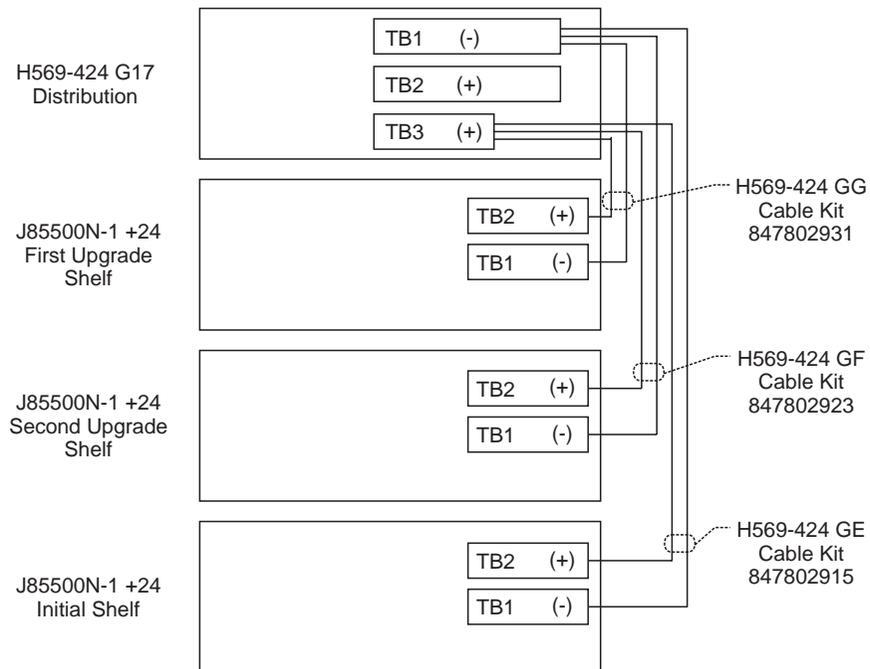
Note: Do not allow the conduit to impede access to connectors.



***Figure 4-3: 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 4-4.

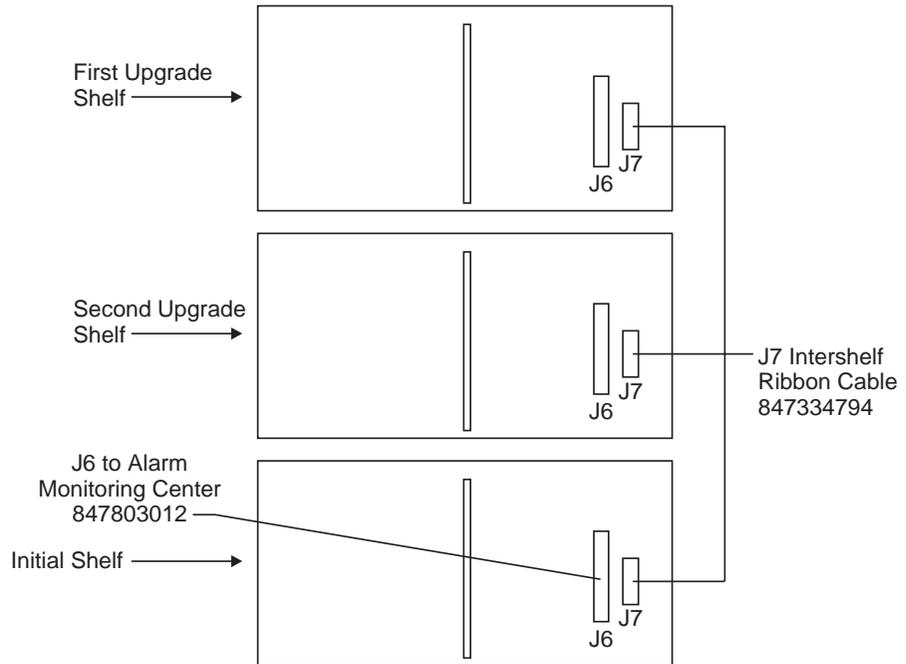


**Figure 4-4: Supplemental Shelf Cabling (Front View)**

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 4-5.



***Figure 4-5: 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 4-6.

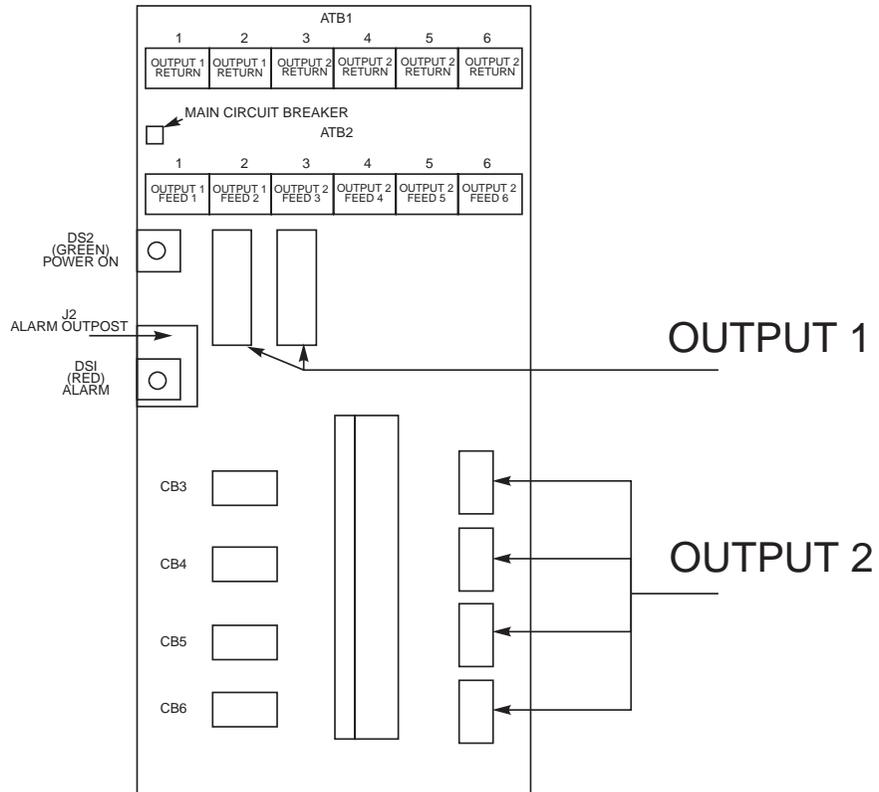
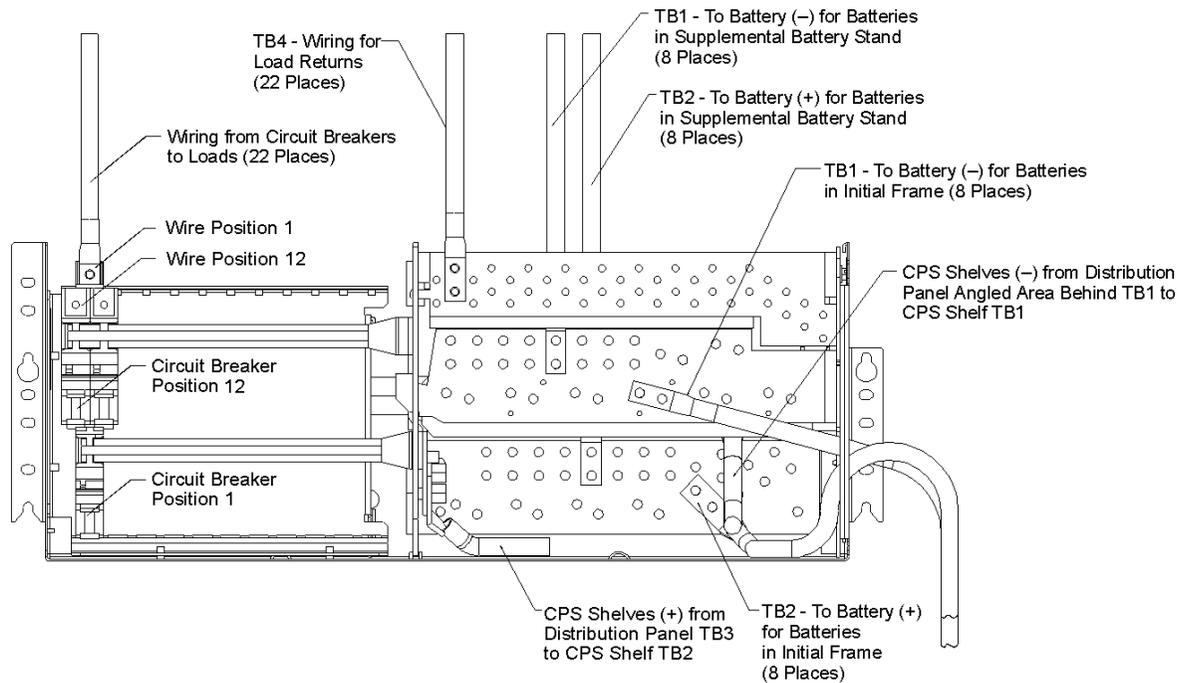


Figure 4-6: ES612 Cabling

## 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 4-7.

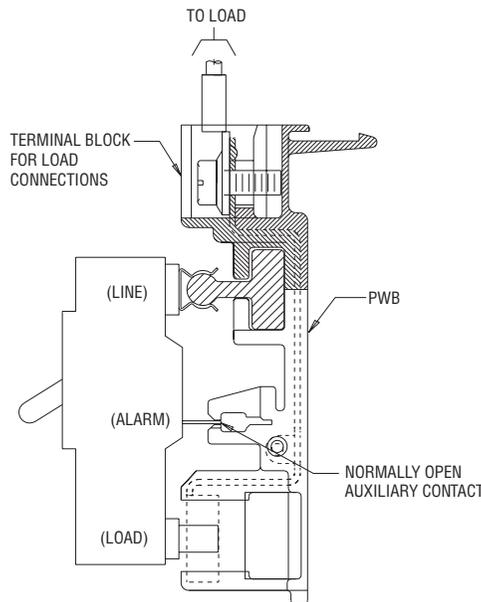


**Figure 4-7: DC Distribution Panel**

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 4-8 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.



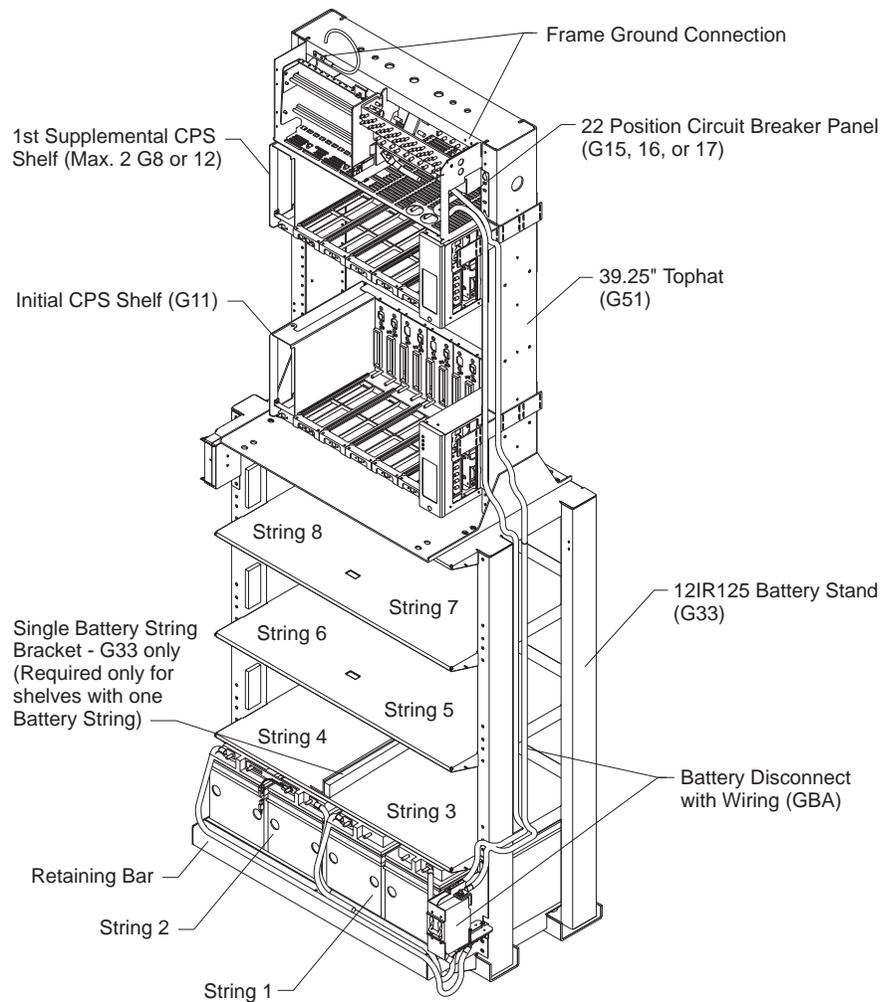
***Figure 4-8: Plug-in Circuit Breaker***

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***

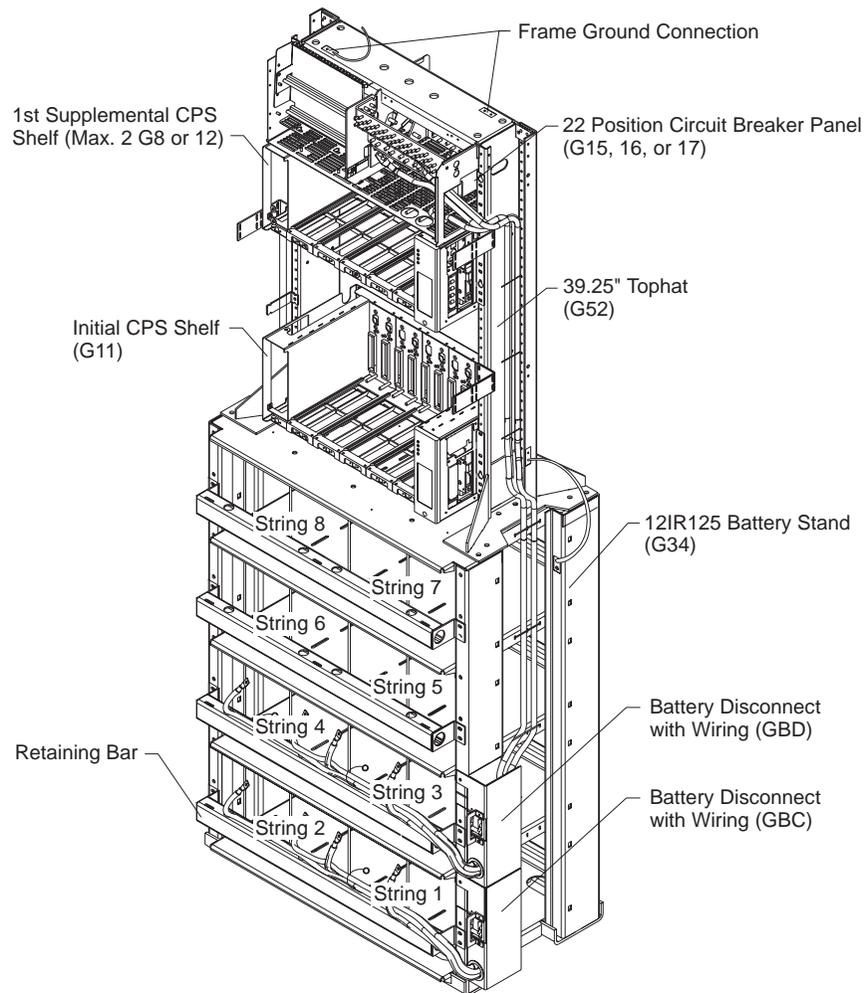
1. Unpack the Battery Upgrade Kit and inventory parts to insure that all necessary items are present (see Table 2-B for Group 33 Battery Stands and Table 2-C for Group 34 Battery Stands). Remove the retaining bar on shelf which will be populated with the new battery string and retaining bar on the shelf 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 4-9A.



***Figure 4-9A: H569-424 Plant for Zone 2 and 3***

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

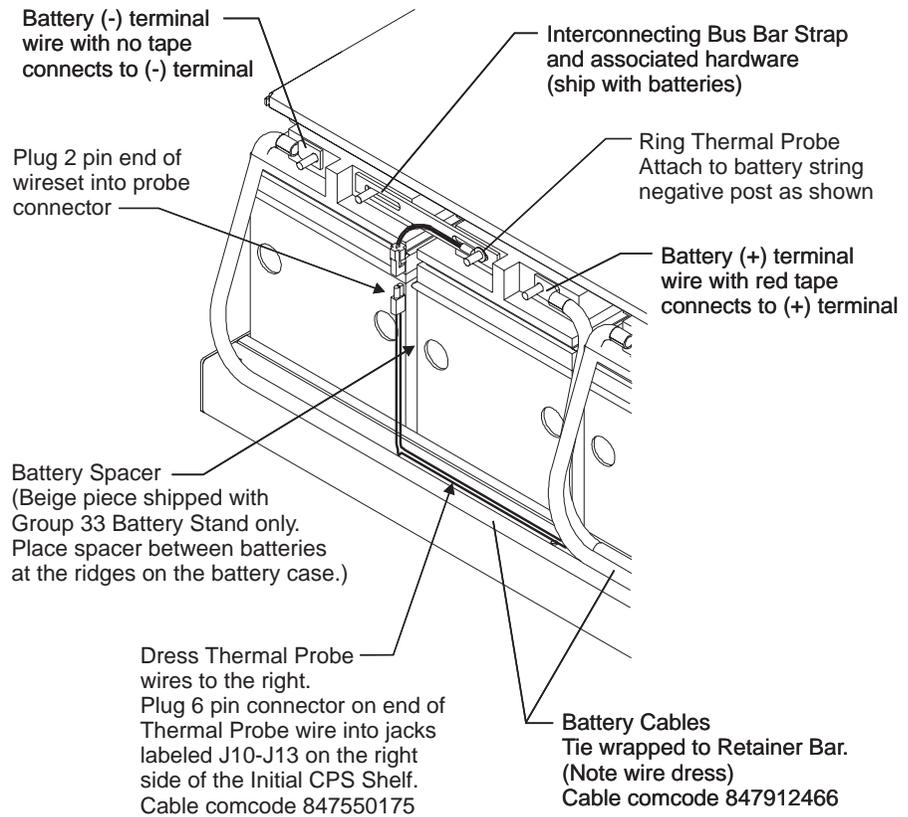
3. Check the date codes on the batteries and if acceptable load batteries into shelf. (Do NOT connect intercell connectors at this time). Refer to Figures 4-9A and 4-9B for battery string location and numbering.



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

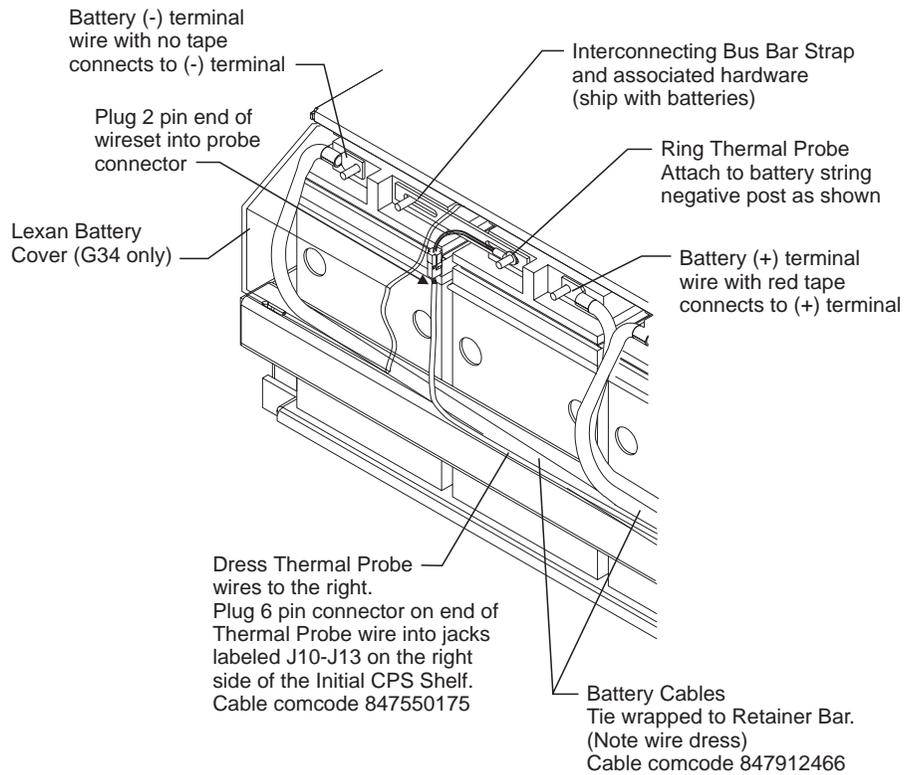
## ***Adding Battery Strings to Plants Without Battery Disconnect, continued***

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



***Figure 4-10A: Battery Wiring (Zones 2 and 3)***

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



***Figure 4-10B: 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

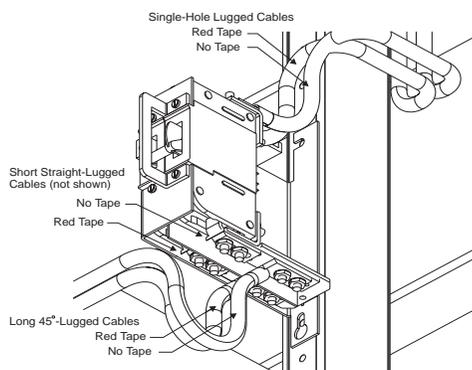
9. Torque all battery and intercell connections to 60 lb-in.
10. Install the protective cover over the battery terminals.
11. Reinstall the retaining bus bar on the shelf above (Group 33 only).

## ***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.**

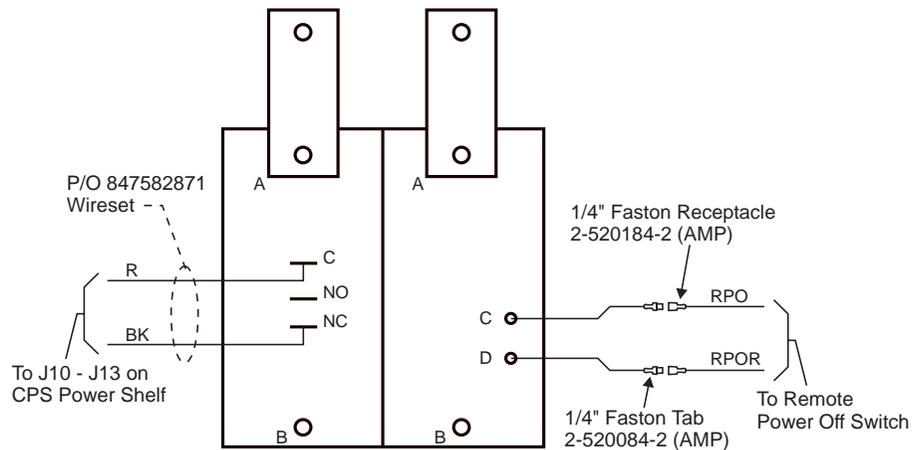
1. Unpack the Battery Upgrade Kit and inventory parts to insure that all necessary items are present (see Table 2-B).
2. Remove Lexan cover on the disconnect switch.
3. Make connections from battery strings to disconnect switch and from disconnect switch to Distribution Panel. Reference H569-424, Sheet 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 4-11.



***Figure 4-11: 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 4-12.



***Figure 4-12: 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 4-12.
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 4-9A.
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 4-9A for battery string location and numbering.
20. Install spacers in between batteries. Refer to Figure 4-10A.
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***

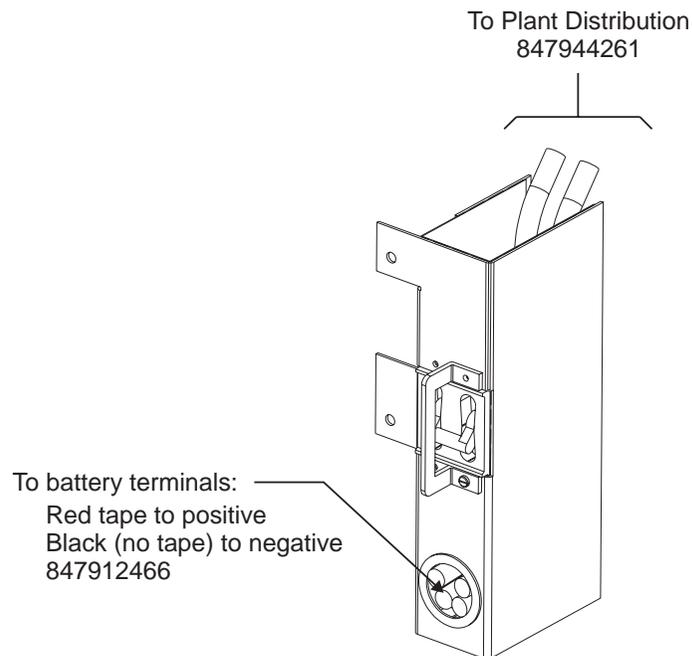
31. Reinstall the Lexan cover onto the battery disconnect switch.
32. Close the battery disconnect switch.

## ***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.

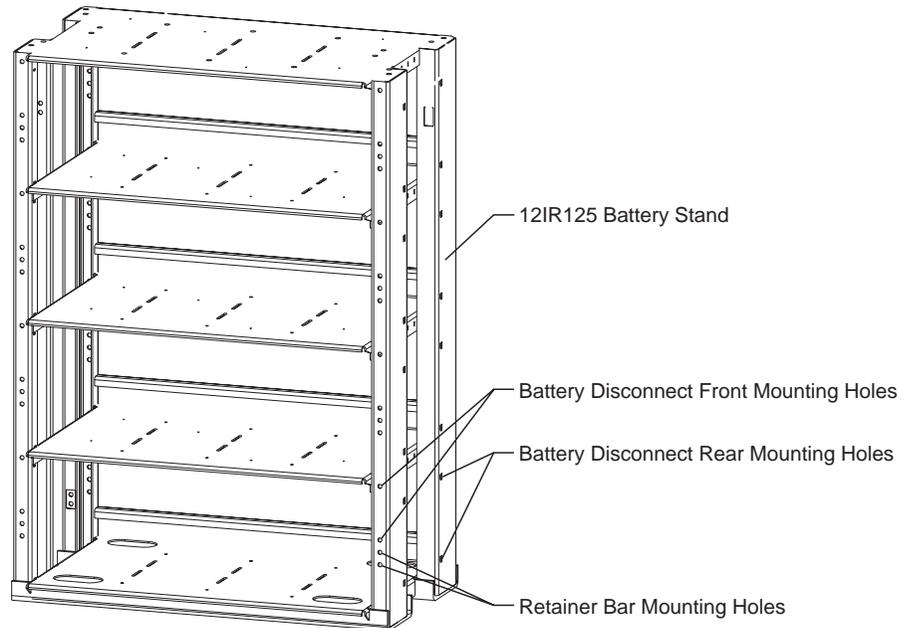
1. Unpack the Battery Upgrade Kit (ED83123-30 G14) and inventory parts to insure that all necessary items are present (see Table 2-C).
2. Make connections from battery strings to disconnect switch and from disconnect switch to Distribution Panel. Reference H569-424, Sheet B8 for connecting points.
3. 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 4-13: 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 4-12.
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 4-12.
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 4-14.



***Figure 4-14: 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 4-9A and 4-9B) 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 4-9B 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 4-10B 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 4-10B 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.