

IM6C55A

Candeo *SP* 48300 power system

AP6C55AA

Installation Manual



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1. About this document

1.1. Purpose of this document

This document provides detailed guidelines and procedures for the installation of an AP6C55AA Candeo *SP* 48300 power system.

This document is intended to be used by Emerson Energy Systems (EES) installers, and non-EES installers such as value added resellers and sub-contractors, installing power equipment on behalf of Emerson Energy Systems, as well as end users performing their own installation.

Note: Hazardous voltages are present in the Candeo *SP* 48300 power system and the installation must be done only by qualified personnel having prior knowledge of AC to DC power system installation.

1.2. Notice of disclaimer

Emerson Energy Systems reserves the right, in its sole discretion, to revise the information contained in this document at any time without notice.

Emerson Energy Systems expressly advises that any use of or reliance upon information or opinion in this manual is at the risk of the user and that Emerson Energy Systems shall not be liable for any damage or injury incurred by any person arising out of the use of said information or opinion.

Note also that local conditions may give rise to a need for additional professional investigations, modifications, or safeguards to meet site, equipment, environmental safety, or operating company specific requirements. In no event is the information or opinion contained in this manual intended to replace federal, state/provincial, local, or other applicable codes, laws, or regulations. Specific applications will contain variables unknown to or beyond the control of Emerson Energy Systems. As a result, Emerson Energy Systems cannot warrant that the application of the information or opinion in this manual will produce the technical result or safety originally intended.

1.3. Applicability of this document

This document applies specifically to the initial installation of a Candeo *SP* 48300 power system. For upgrades or modifications to an existing Candeo *SP* 48300 power system, refer to the “Maintenance” Chapter of user manual UM6C55A or the dedicated method of procedure (MOP) written specifically for your project.

For installation guidelines applying to other equipment, refer to the applicable Emerson Energy Systems manuals (see list in section 1.5) or, in the case of non-EES equipment (ex.: batteries), refer to manufacturer’s guidelines.

Figure 1.1 illustrates a basic 120 A Candeo *SP* 48300 power system consisting of the initial power shelf equipped with a Controller *SP* and five 1500 W rectifiers (N+1), as well as the initial distribution and battery connection panel equipped with 18 plug-in positions for load protection devices and 8 positions for battery protection devices. Such a system is typically used for embedded applications with standard 23” mounting, but is also available shop-installed on a standard relay rack type frame.

Figure 1.1 – Front view of a 120 A Candeo *SP* 48300 power system



Figure 1.2 illustrates a 300 A Candeco *SP* 48300 power system consisting of the initial power shelf equipped with a System Manager *SP* and five 1500 W rectifiers, the initial distribution and battery connection panel with 18 plug-in positions for load protection devices and 8 positions for battery protection, as well as a supplementary power shelf equipped with six 1500 W rectifiers. Such a system is typically used for medium power applications.

Figure 1.2 – Front view of a 300 A Candeco *SP* 48300 power system



1.4. How this document is organized

This document is divided into seven parts:

- 1) Front matters: contain the document information, the Table of Contents and the present Chapter.
- 2) Preparation: describes the procedures when receiving, handling and storing the equipment, the tools and test equipment requirements, and the warning and cautions.
- 3) Physical installation: describes the procedures to mount a Candeco *SP* in existing facilities.
- 4) Cabling and connecting: describes the procedures to cable and connect the safety and reference grounds for the system, the AC supply for the

- rectifiers, the DC cables for the batteries and the loads, as well as the wiring for the alarms.
- 5) Equipment start-up and adjustment procedures: describes the procedures to install the rectifiers in the shelves and to bring the power system to a fully operational state.
 - 6) End of job routines and turnover: describes the items to be completed to ensure that the equipment meets all applicable quality standards before it is turned over to the Customer.
 - 7) Appendices: provide information on spare parts, technical support, as well as a list of terms describing the acronyms and abbreviations used throughout the document.

1.5. Reference documents

In addition to the present manual, it is recommended that the following documentation be also available to perform the installation of a Candeo *SP* 48300 power system:

- user manual UM6C55A, Description, Operation and Maintenance Manual for the AP6C55AA Candeo power system,
- other Emerson Energy Systems manuals as required, such as UM7C76BA for the Candeo Temperature Probe Interface,
- other Emerson Energy Systems manuals as required,
- all job specifications and drawings,
- other applicable manufacturer's user guides (for example: batteries)
- specific Customer requirements and guidelines, if any.

2. Preparation

2.1. Installation overview

The following is the recommended sequence for the installation and start-up procedures. The sequence may change according to job and site conditions.

- Obtain the recommended tools and test equipment.
- Read the "Precautions" section carefully.
- Check that all the equipment and materials have been delivered.
- Proceed with the physical installation of the Candeco *SP* 48300 power system frame or enclosure.
- Install and connect the safety ground and battery return reference cables.
- Install and connect the AC input cabling for the rectifiers.
- Install and connect the DC cabling between the Candeco *SP* and the batteries.
- Connect the loads to the distribution panel(s) as required.
- Insert the controller in the Candeco *SP*.
- Install and connect the external alarm and monitoring wiring as required.
- Insert the rectifiers in the Candeco *SP*.
- Start-up, verify and adjust the complete system.

2.2. Tools and test equipment


The following tools and test equipment are required (items marked with an asterisk are required only if the system is shipped shop-installed on a relay rack frame):

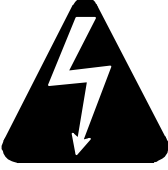
- dolly truck *
- safety goggles
- screwdriver, flat blade, 10 mm (3/8")
- screwdriver, flat blade, 2 mm (3/32")
- cable strippers/electrician's knife
- wire stripper
- linesman pliers
- hacksaw
- cable cutters (up to 2/0)

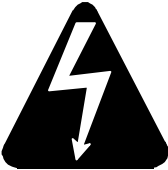
- crimper and die set (up to 2/0)
- open end and box end wrench sets
- socket set (10 mm [3/8"] drive)
- ratchet set (10 mm [3/8"] drive)
- torque limiting wrench (10 mm [3/8"] drive)
- canvas sheets, 1 m x 2 m (4 ft x 6 ft)
- hammer drill *
- 13 mm (1/2" [standard]) or 18 mm (11/16" [earthquake]) concrete bit *
- vacuum cleaner *
- Hilti HST 3/8" anchor setting tool *
- digital multimeter, Fluke 8050A or equivalent
- dry load bank, 48 V (optional, required only if customer requires load test to be performed)

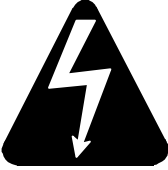
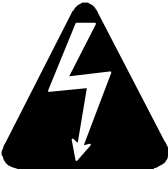

2.3. Precautions

The following precautions shall be observed at all time when handling and installing power equipment:

	<p>CAUTION Generator requirements</p> <p>For proper operation and reliability of your Candeo <i>SP</i> 48300 power system, AC generators should meet requirements set forth in the EES “Engine Alternator Standard” document, available from EES. Contact your applicable technical support line or your local sales representative for a copy of this manual (refer to the 2nd page before last of this manual for the applicable telephone number).</p>
--	---

	<p>WARNING Preventing electrical shocks</p> <p>For safety reasons, the frame ground lead must always be connected before any other leads. This is to prevent the shelf enclosures and/or the frame and any other metallic structures from carrying dangerous AC or DC voltage levels.</p>
---	--

	<p>WARNING Protecting the equipment against electrical damage.</p> <p>Do not perform the final connecting of the battery leads to the batteries before being instructed to do so in the appropriate section of this manual.</p>
---	--

	<p>WARNING High Current Hazard</p> <p>The rectifiers, and especially the batteries, can deliver high current should a short to ground occur. When working on live equipment, remove all personal jewelry, use properly insulated tools, and cover any live busbars with a canvas sheet to prevent short circuits caused by falling tools or parts.</p>
	<p>WARNING Protecting personnel against electrical shocks</p> <p>The power system cabling shall be performed by qualified personnel in conformance with local and national electrical codes.</p> <p>Input voltages to the rectifiers are at a dangerous level. Ensure that the circuit breakers are locked in the OFF position at the AC service panel before attempting to work on the power system. Dangerous voltages may still be present at the terminals even if the rectifiers are OFF. Use a voltmeter to verify for the presence of such voltages. Do not switch circuit breakers to ON until the entire system has been assembled and that you have been instructed to do so in the appropriate procedure.</p> <p>Improper wiring can cause personal injury and equipment damage. Verify for proper polarity of the battery leads before connecting them to the power system by clearly identifying the positive and the negative leads.</p>
	<p>CAUTION Safety and equipment protection</p> <p>Power equipment is heavy (pre-assembled frames, batteries, etc.). Use a dolly truck, forklift, or hoist whenever possible for handling and moving the equipment. If a forklift is used, do not remove the shipping crates before the equipment has been moved near its final installation location. If a dolly truck is used, the shipping packages may be removed at the point of reception. When handling frames with equipment mounted on them, care must be exercised to ensure that they do not tip over, as some of these are top heavy.</p>

**CAUTION****Protection of Customer premises**

Protect the floors and walls against damage when handling the equipment.

**CAUTION****Preventing over torque damage**

Do not apply excessive torque to nuts and bolts. Excessive torque causes the threads to strip or the bolt to break. Use the appropriate torque values indicated in Table 4.6 or in the applicable section and/or procedure.

**CAUTION****Optimizing equipment life**

To optimize the service life of this equipment, make sure there are no obstructions in front of the ventilation openings. A minimum of 1" (25 mm) clearance is required to insure proper ventilation.

2.4. Receiving the material

All modules for the Candeco *SP* 48300 power system are shipped shop-installed in the shelves. For a system shipped loose (not mounted on a framework), the initial distribution panel and rectifier shelf, as well as the supplementary rectifier shelf, if provided, are shipped as one unit sharing common mounting brackets, but the supplementary distribution panel, if provided, is shipped as a separate item. Some material, such as cables, wires, connecting material, fuses, and mounting hardware, are also shipped separately.

Upon receiving your Candeco *SP* 48300 power system, remove the packaging on all items and inspect for damage. Verify that all material ordered is received and is in good condition. Report any missing or damaged items to your Emerson Energy Systems Customer Services department. Refer to the 2nd before last page of this document for the telephone number of the nearest Customer Services Department.

3. Locating the Candeco SP 48300 power system

3.1. General

This Chapter provides the requirements and procedures for the physical installation of Candeco SP 48300 power system shelves in existing facilities.

For a Candeco SP 48300 power system shipped shop-installed on a relay rack type frame, follow standard requirements for floor anchoring of such a frame.

Note: Whether it is mounted on a relay rack or in an embedded application, a minimum spacing of 51 mm (2") is required behind the Candeco SP 48300 power system for ventilation purposes.

3.2. Mounting Candeco SP 48300 power system shelves in existing facilities

When shipped separately for embedded applications, mount the Candeco SP 48300 shelves as described in Procedure 3.1 and as shown in Figure 3.1 and Figure 3.2.

Note 1: The Candeco SP 48300 is shipped from the factory with mounting brackets on each side of the shelves installed for either projected or flush mounting, as specified when ordering the system. The system illustrated in Figure 3.2 has the mounting brackets installed for projected mounting. The factory configuration cannot be modified in the field.

Note 2: To facilitate mounting of the shelves and access to the connecting points, and to prevent damage to the modules during cabling operations, remove all the plug-in modules from the shelves and store them in a safe place until told to reinstall them in the appropriate Chapter of this manual.

Note 3: The Candeco SP 48300 shelves must be mounted on supporting uprights spaced for 23" c-c mounting as shown in Figure 3.2.

Note 4: If the rectifier shelf/shelves of the system is/are equipped with a front access AC interface, remove the AC interface box(es) as described in

steps 1 to 4 of the procedure in Figure 4.3 to gain access to the mounting screws on the left side of the shelf/shelves.

Procedure 3.1 – Mounting Candeco SP shelves in an existing facilities

Step	Action
1	When installing the new shelves in a working environment, install the required protection to prevent any short circuits and any tools or part from falling into lower equipment.
2	Position the Candeco SP shelves on the framework so that the mounting holes on the mounting brackets of the shelves align with the mounting holes of the supporting uprights as shown in Figure 3.2.
3	Secure the shelves to the uprights using the mounting screws supplied for that purpose with the Candeco SP 48300 power system. Note: Use at least one star washer per shelf, as shown in Figure 3.1, to ensure adequate frame ground continuity.
4	Repeat steps 2 and 3 for the supplementary distribution panel, if provided.
-end-	

Figure 3.1 – Star washer installation for ground continuity

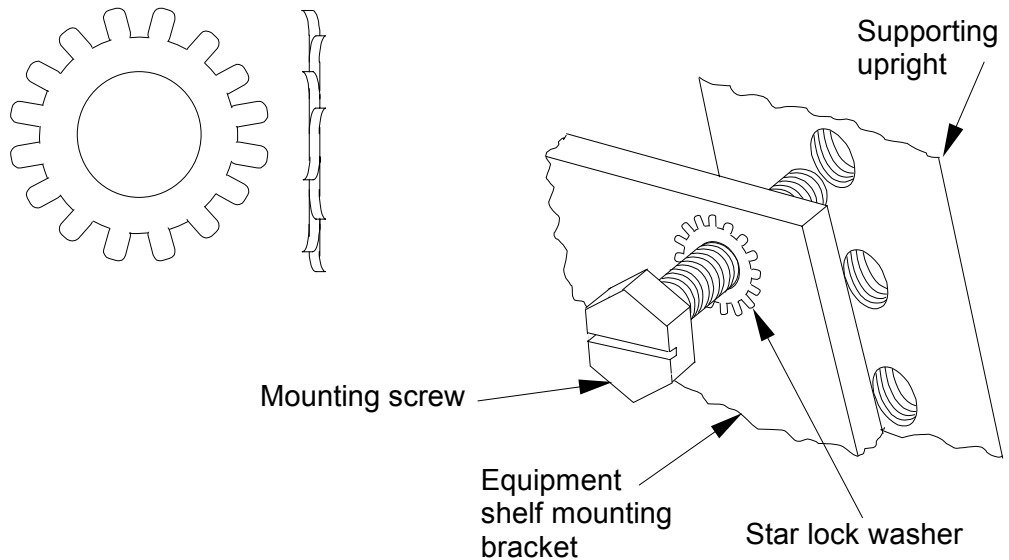
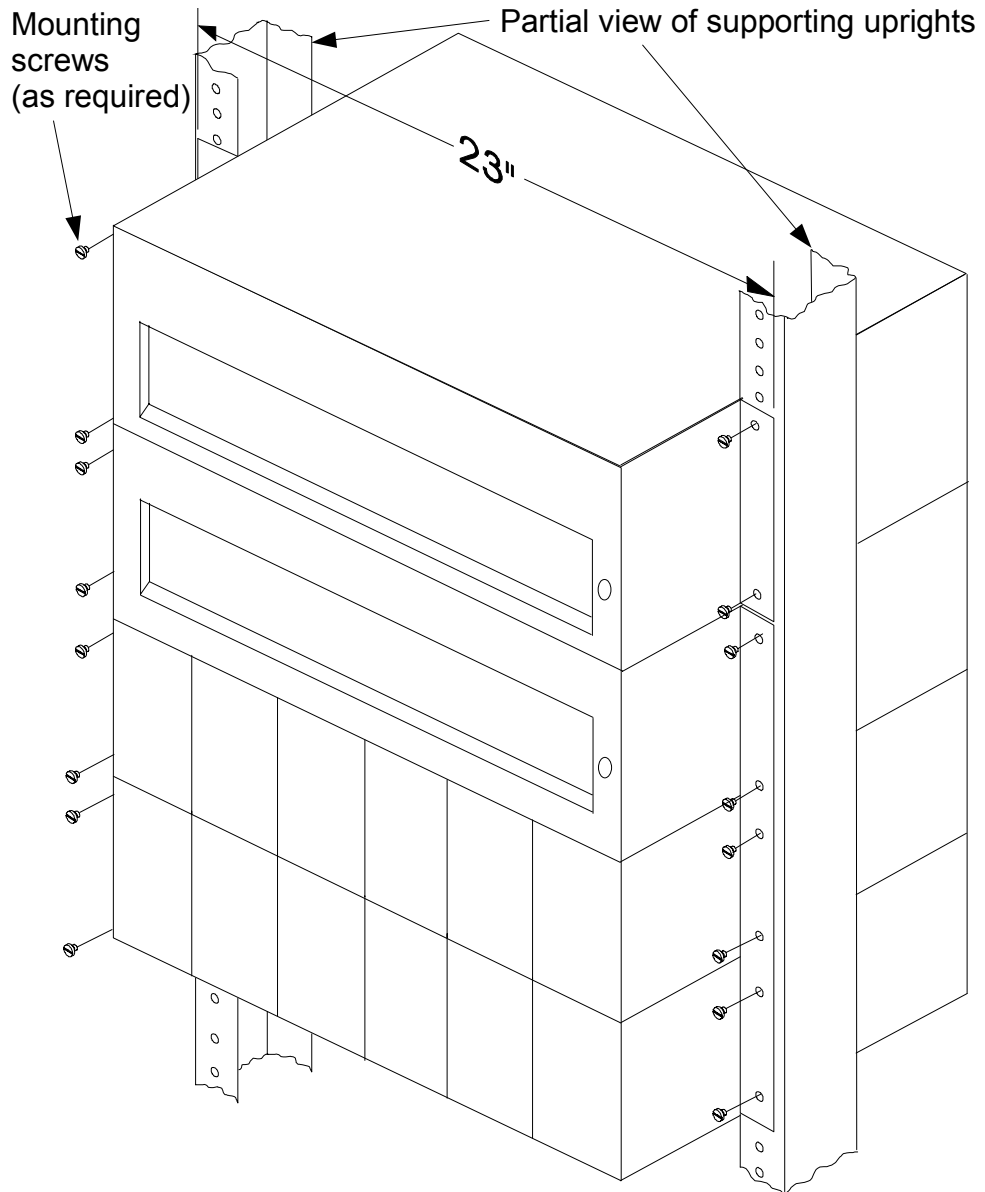


Figure 3.2 – Mounting Candeo SP shelves in embedded applications

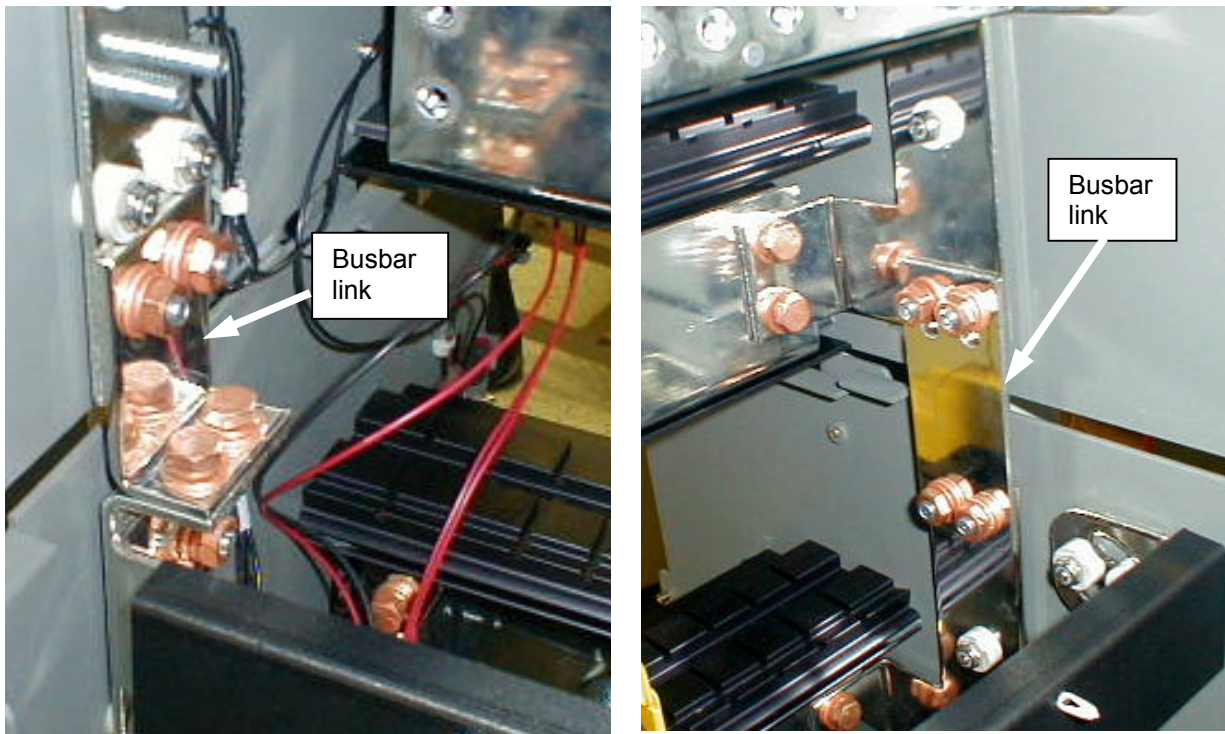
3.3. Bridging the supplementary distribution panel, if furnished, to the initial distribution panel

As mentioned in section 2.4, for a system shipped loose (not mounted on a framework), the supplementary distribution panel, if provided, is shipped as a separate item. After installing the system shelves as described in Procedure 3.1, bridge the -48 V and BR+ busbars of the supplementary distribution panel to those of the initial distribution panel as described in the following procedure and as shown in Figure 3.3 and Figure 3.4.

Procedure 3.2 – Bridging the supplementary distribution panel to the initial distribution panel

Step	Action
1	Open the front cover of the initial distribution panel and remove it by forcing it slightly to one side to disengage the hinge pin on the opposite side, then sliding it the other way to disengage the second hinge pin.
2	Remove the front cover of the supplementary distribution panel in the same manner.
3	Remove the top cover of the supplementary distribution panel.
4	If the system is accessible from the rear, remove also the rear covers of the initial and supplementary distribution panels.
5	Install the -48 V and BR+ busbar links between the two distribution panels. Refer to Figure 3.3. Apply a torque value of 6.7 ft-lb (9 N-m) to the bolted connections.
6	Bridge the alarm circuit of the supplementary distribution panel (pin J5) to the alarm circuit of the supplementary distribution panel (pin J5). Refer to Figure 3.4.
7	If ready to proceed with the cabling of the system, go to the next Chapter. If not, reinstall the rear, top and front covers on the distribution panels.
-end-	

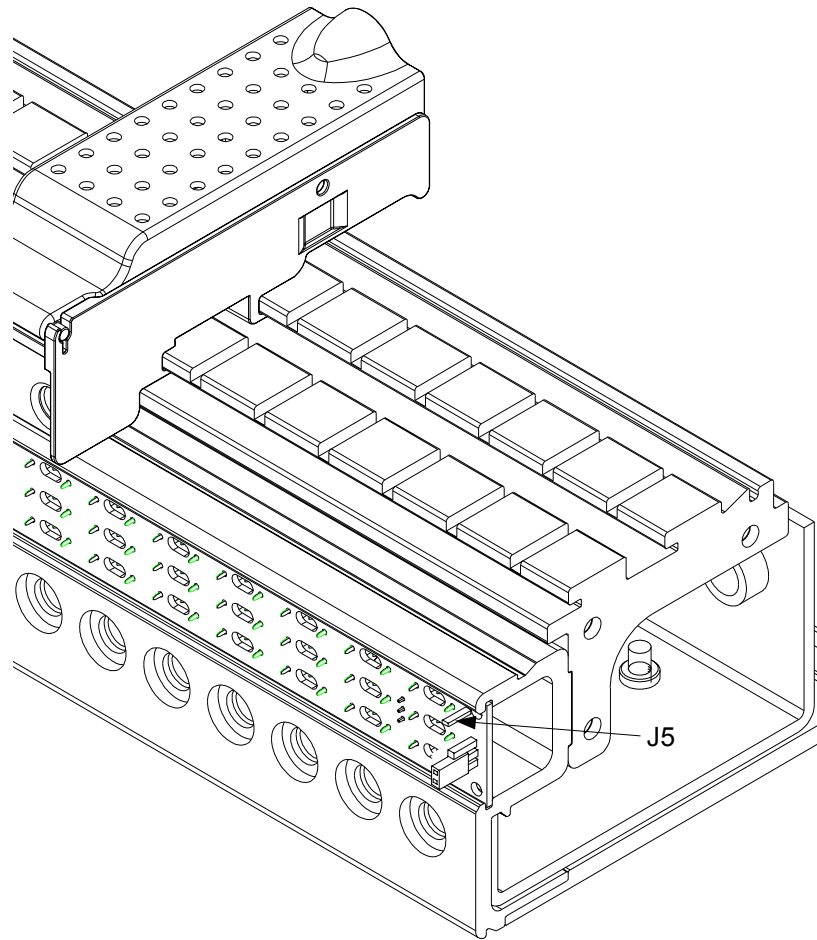
Figure 3.3 – Linking the supplementary distribution panel to the initial distribution panel



Left side, as viewed from rear

Right side, as viewed from rear

Figure 3.4 – Location of the alarm pin J5 on the distribution panels



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4. Cabling and connecting

4.1. General

This Chapter covers the cabling and connecting procedures for the Candeo *SP* 48300 power system. These procedures are divided into five sections:

- cabling and connecting the frame ground and battery return reference leads,
- cabling and connecting the AC supply for the rectifiers,
- cabling and connecting the DC cables from the batteries,
- cabling and connecting the DC cables between the Candeo *SP* power system and the loads, and
- miscellaneous cabling and connecting.

4.1.1. Basic ruling

The followings are basic rules applying to cabling and connecting:

- It is very important that properly sized conductors be installed between the AC service panel and the rectifiers, as well as between the power system, the batteries and the loads. The protective circuits in the equipment, the performance, and the overall safety of the equipment depend on the proper amperage and acceptable voltage drops.
- Although DC power wiring and cabling in telecommunication applications tend to exceed electrical code requirements, mostly due to the voltage drop requirements, all applicable electrical code(s) take precedence over the guidelines and procedures in the present Chapter, wherever applicable.
- When terminal lugs are used, these should be of the crimped type, shall have two holes for ground cables, and should preferably have two holes also for other cables.
- All connections inside the Candeo *SP* involve tin-plated contact surfaces and do not require the use of anti-corrosion compound. For connections

involving non-plated contact surfaces, these surfaces must be cleaned and coated with a thin coat of NO-OX-ID “A” compound, or an approved equivalent, before making the connection.

- DC leads are usually all black. However, there may be exceptions where the Customer requires that the equipment ground be green, and some battery feeders be color coded if several feeds are used.
- In a zone 4 seismic application, all cables shall be of the flex type. Since the Candeco *SP* is a very compact power system, the turning radius for cabling within the shelves is limited. It is therefore recommended to use flex type cables in all situations, even if the application is not seismic.
- All wires and cables used shall be made of copper covered with insulation having the flammability rating required by the governing code. Refer to Table 4.1 and Table 4.2 for guidelines based on the National Electrical Code (USA) and the Canadian Electrical Code (Canada) respectively.

Table 4.1 – Flammability rating of wires and cables for the United States

If the cables are used in:	they must meet the following rating (note 2):
Plenum (note 1)	UL910 (“CMP” marking) (or FT1 in conduit)
Commercial buildings, including risers	UL1666 (“CMR” marking)
Commercial buildings, general purpose (no risers)	UL1581 or IEEE383 (“CMG” or “CM” marking)

Table 4.2 – Flammability rating of wires and cables for Canada

If the cables are used in:	they must meet the following rating (note 3):
Plenum (note 1)	FT6 (“CMP” marking) (or FT1 in conduit)
Commercial buildings	FT4 (“CMR” marking)

Note 1: Plenums are defined as suspended ceilings or raised floors whose space is used in the handling of air.

Note 2: If the building is a utility as defined by the NEC Article 90-2(b)(4), then UL VW1 rated cable is permitted but not preferred.

Note 3: If the building is a utility as defined by the CEC Section 0, then FT1 rated cable is permitted but not preferred.

4.1.2. Connecting lugs

Table 4.3 shows the connecting facilities available on the Candeco *SP* bussing, while Table 4.4 shows the two-hole connecting lugs available from EES. Table 4.5 provides a list of equivalent metric size cables for commonly used American Wire Gauging (AWG) cables.

Table 4.3 – Connecting facilities of the Candeco SP 48300 power systems

Connecting point	Available terminations
Single load clips	• 1 set of 1/4" studs at 5/8" c-c per load clip
Double load clips	• 1 set of 3/8" studs at 1" c-c per load clip
BR+ busbar in the distribution panels	• 26 sets of holes tapped for 1/4" bolts at 5/8" c-c
Battery connection kit	• 8 sets of 1/4" studs at 5/8" c-c (max. tongue width = 0.72")
BRR cable terminations	• 1 set of 1/4" studs at 5/8" c-c

Table 4.4 – Two-hole connecting lugs

Terminal lug CPC	Gauge	Bolt size	Holes spacing c-c (in.)	Tongue width (approx. in.)	Fits single (S) or double (D) load clips
A0650368	10 AWG	1/4 in.	5/8 in.	0.43 - 0.47	S
A0344529	8 AWG / 8 Flex	1/4 in.	5/8 in.	0.43 - 0.47	S
A0377621	8 AWG / 8 Flex	3/8 in.	1 in.	0.57	D
A0367944	6 AWG / 6 Flex	1/4 in.	5/8 in.	0.42 - 0.45	S
A0605216	6 AWG / 6 Flex	3/8 in.	1 in.	0.58	D
A0378678	4 AWG / 4 Flex	1/4 in.	5/8 in.	0.5 - 0.56	S
A0902814	4 AWG / 4 Flex	3/8 in.	1 in.	0.58	D
A0698478	2 AWG	1/4 in.	5/8 in.	0.59 - 0.61	S
A0360768	2 AWG	3/8 in.	1 in.	0.67	D
A0666799	2 Flex	1/4 in.	5/8 in.	0.67 - 0.68	S
A0668309	2 Flex	3/8 in.	1 in.	0.67 - 0.68	D
A0618236	1/0 AWG	1/4 in.	5/8 in.	0.75	
A0297944	1/0 AWG	3/8 in.	1 in.	0.75	D
A0380048	2/0 AWG or 1/0 Flex	1/4 in.	5/8 in.	0.83	
A0320864	2/0 AWG or 1/0 Flex	3/8 in.	1 in.	0.83	D
A0902928	2/0 Flex	1/4 in.	5/8 in.	0.94	
A0368787	2/0 Flex	3/8 in.	1 in.	0.94	D
-end-					

Table 4.5 – Cable size equivalents (AWG to Metric)

Cable size (see note)	Circular mils	Square millimeters	Equivalent metric cable
20 AWG	1020	0.519	1
18 AWG	1624	0.8232	1
16 AWG	2583	1.309	1.5
14 AWG	4107	2.081	2.5
12 AWG	6530	3.309	4
10 AWG	10380	5.261	6
8 AWG	16510	8.368	10
-continued-			

6 AWG	26250	13.30	16
4 AWG	41740	21.15	25
2 AWG	66370	33.63	35
0 AWG (or 1/0)	105600	53.48	50 or 70
00 AWG (or 2/0)	133100	67.42	70

Note: Wire sizes 0 and 00 are also represented as 1/0 and 2/0.

4.1.3. Torque values for bolted lug to busbar connections

Bolted lug to busbar and busbar to busbar connections should be properly tightened to ensure appropriate contact without stressing or breaking the bolts. This is done by using a torque wrench to apply the appropriate torque value. The following Table provides a list of torque values applying to various sizes of bolts and studs when making such connections. Note that these values do not apply to connections made to the load clips inside the Candeco *SP* distribution panels per section 4.4.3, for which the appropriate torque values are given in Procedure 4.2.

Table 4.6 – Torque values for bolted connections

Bolt size	Threads/inch	Torque (in-lb)	Torque (ft-lb)	Torque (N-m)	Tension (lb)
# 8	32	18	1.6	2.2	625
	36	20	1.7	2.3	685
#10	24	23	1.9	2.6	705
	32	32	2.7	3.6	940
1/4"	20	80	6.7	9	1840
	28	100	8.3	11.2	2200
5/16"	18	140	11.7	15.8	2540
	20	150	12.5	16.9	2620
3/8"	16	250	21	28	3740
	24	275	23	31	3950
7/16"	14	400	33	45	5110
	20	425	35	47	5120
1/2"	13	550	46	62	6110
	20	575	48	65	6140

4.1.4. Cabling layout


The Candeco *SP* 48300 power system makes use of plug-in modules that reduce cabling operations to a minimum. The cabling required to be done at the time of installation is very straightforward.


- The rectifier's AC cables are brought down to the power shelf or shelves level, on the left side as viewed from the front, then fed into the shelf or shelves through strain relief connectors at the rear side of the shelf or

- shelves for regular applications, or through an optional AC interface box at the front side of the shelf or shelves for front access applications.
- The battery cables to the load clips in the 8 positions dedicated to batteries or to the optional battery link kit are entering through the rear or top of the initial distribution and battery connection panel, whichever is most convenient for the application.
 - The load cables to the protection devices and the BR+ busbar(s) are entering through the rear or top of the distribution panel(s), whichever is most convenient for the application.
 - Alarms and communication cables from the controller and interfacing with the outside world are entering through the rear or top of the initial distribution and battery connection panel, whichever is most convenient for the application, and on the right side, as viewed from the front.

4.2. Cabling and connecting the ground leads

This section covers the cabling and connecting of the ground leads for the Candeo *SP* 48300 power system: the frame or safety ground and the battery return reference (BRR) lead for the system.

	<p>CAUTION Follow local requirements and electrical code. The grounding methods described in this section are generic. Specific local, provincial, state or federal electrical codes and grounding requirements, as well as specific Customer or communication equipment requirements shall prevail.</p>
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	<p>CAUTION Maintain the integrity of the frame or safety ground. The frame or safety ground shall not be confused with the battery return reference lead, nor with the load battery return leads. The frame or safety ground shall be wired in such a way as not to be carrying any AC or DC current at any time.</p>
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Note 1: In some equipment sites, depending on the grounding topology and the size of the building, the floor ground bar (FGB) and the building principal ground (BPG) may be the same busbar.

Note 2: In some equipment sites, depending on the grounding topology, the power system battery return busbar (BR) may be determined as being the single point ground (SPG). Then, the battery return reference (BRR) lead is usually run to the floor ground bar (FGB).

4.2.1. Connecting the power system frame ground (or safety ground) lead

For a Candeco *SP* 48300 power system factory-installed on a full size relay rack type framework, follow standard methods for grounding of such a frame.

For a Candeco *SP* 48300 power system enclosure installed in existing facilities, ground continuity is provided by means of the washers installed per Procedure 3.1 and Figure 3.1. Verify with the Customer that the equipment on which the enclosure is installed has been grounded properly as required.

4.2.2. Connecting the power system battery return reference (BRR) lead

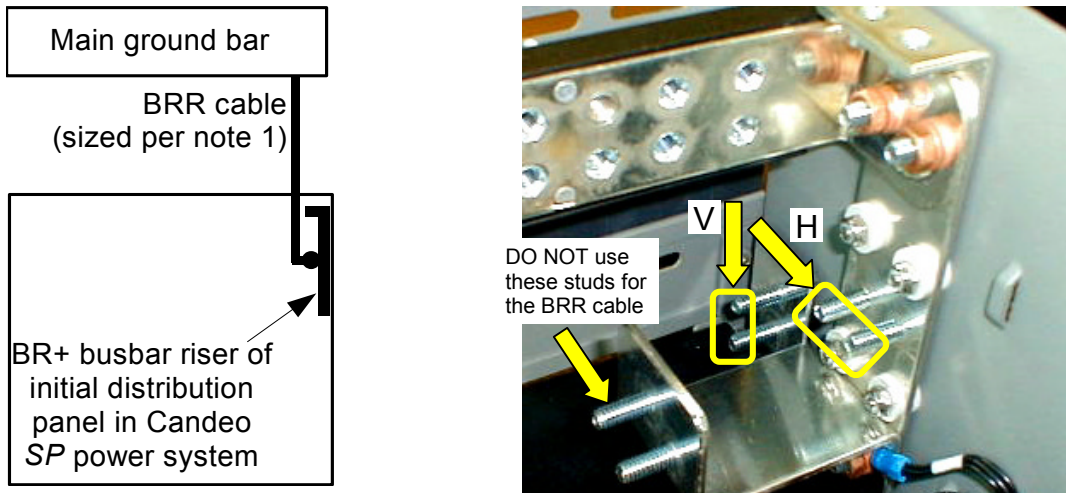
Unless specifically instructed otherwise in the specifications or by the Customer, the battery return reference (BRR) lead is usually connected as described in Procedure 4.1 and as shown in Figure 4.1.

Note 1: The battery return reference cable should be sized equal to or larger than the size of the largest distribution cable used in the power system.

Note 2: In some cases, the power system battery return busbar may be determined to be the *SPG*. In such cases, the BRR lead should be run to the nearest FGB or BPG.

Procedure 4.1 – Cabling and connecting the battery return reference lead

Step	Action
1	<p>Connect one end of the battery return reference (BRR) cable to the appropriate set of studs on the BR+ busbar riser on the right side of the initial distribution panel in the Candeco <i>SP</i> 48300 power system as shown in Figure 4.1.</p> <p>Note 1: If the power cabling is to enter the distribution panel from the rear, the BR+ busbar should be placed horizontally and the BRR cable connected to the horizontal (H) set of studs. If the power cabling is to enter the distribution panel from the top, the BR+ busbar should be placed vertically and the BRR cable connected to the vertical (V) set of studs. The system is shipped from the factory with the BR+ busbar in the vertical position. To change the position of the busbar, loosen the two nuts holding the busbar at each end, rotate the busbar to the desired position, and retighten the nuts to secure the busbar in place.</p> <p>Note 2: Do not use the third set of studs (these are reserved for the addition in the field of a second rectifier shelf) nor any of the positions on the horizontal BR+ busbar (these are reserved for the 26 battery return cables for the batteries and the loads).</p>
2	<p>In a standard building, connect the other end of this cable to the <i>SPG</i> ground bar as per above. In other applications (hut, cabinet, CEV, etc.), connect the other end of this cable to the main ground bar for the site.</p>
3	<p>At each end of this cable, install a permanent brass or fiber tag bearing the mention "DO NOT DISCONNECT", as well as a second tag bearing the mention "BRR".</p>
4	<p>Secure the cable as required.</p>
<p>–end–</p>	

Figure 4.1 – Installation of the battery return reference lead in a Candeco SP 48300 power system

4.3. Cabling and connecting the AC supplies for the rectifiers

This section covers the AC portion of the cabling and connecting. On a Candeco SP 48300 power system, AC power is used to feed the rectifiers.

The Candeco SP 48300 power system uses plug-in type rectifiers fed from a single-phase AC source and having a -48 V dc, 1500 W dc output. The rectifiers plug into power shelves which provide support and connection interface.

Each power shelf requires two AC feeds, one for rectifiers 1, 3 and 5, and one for rectifiers 2 and 4, as well as rectifier 6 on the supplementary power shelf.

Each group of rectifiers can be connected either:

- phase-to phase to a 120/240 V single phase or 120/208 V 3-phase AC source, in which case the recommended size for the circuit breaker at the AC distribution panel is 30 A, 2-pole, or
- phase-to-neutral to a 220/380 V or 230/400 V or 240/415 V 3-phase AC source, in which case the recommended size for the circuit breaker at the AC distribution panel is 30 A, single-pole, or
- phase-to neutral to a 120/240 V single phase or 120/208 V 3-phase AC source, in which case the recommended size for the circuit breaker at the AC distribution panel is 30 A, single-pole.

Note 1: When operated from a 110/120 V ac source, the rectifier's output is limited to 60% of the nominal 1500 W rating at 120 V ac input, and to 50% at 100 V ac input.

Note 2: The operating voltage range is 75 V ac to 310 V ac at 45-65 Hz. Do not operate from a higher voltage source.

When a 3-phase AC source is being used, it is preferable to distribute the rectifiers evenly among the three phases.

In a rear access application, the AC feeds can enter the shelves through regular connectors at the left rear side of the shelves. In a front access application, an optional AC interface box is required so that the AC feeds can enter the shelves at the right front side of the shelves.

For information on subjects such as basic rulings about AC wiring and connecting, electrical code requirements, certified or licensed electricians requirements, permit requirements, methods of bringing the AC supply to the equipment, etc., refer to project or customer specifications, specific customer guidelines and local codes and bylaws.

4.3.1. Segregation between AC conductors and other conductors

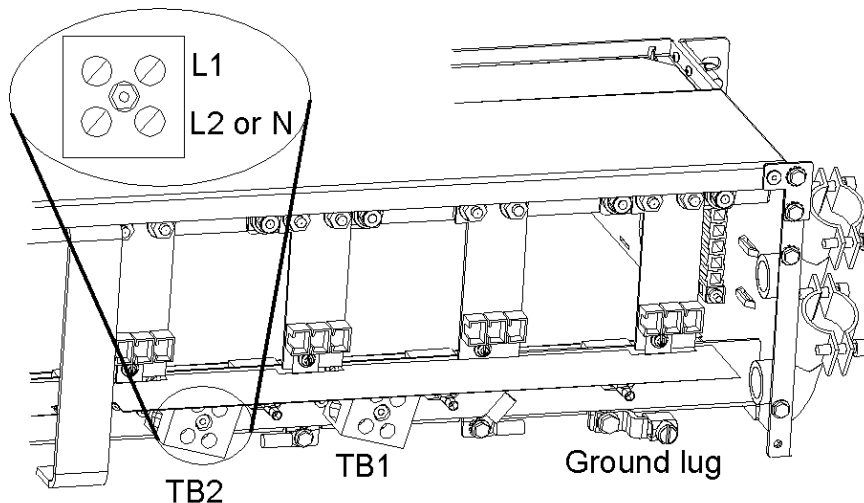
Electrical codes require that conductors carrying AC current be installed separately from conductors carrying DC current and signals. Furthermore, some Customer may require that the minimum distance between the AC and DC conductors exceed that of the electrical code requirements (for noise induction purposes for example).

On the Candeo *SP* 48300 power system, this is not a problem since the AC cabling for the rectifiers is installed on the left side of the frame where there are no other cables. However, the installer shall attempt to maintain segregation when running AC cables on cable racks used for other types of cables.

4.3.2. Cabling and connecting the rectifier AC supplies for the rectifiers

Cable and connect the AC supplies into a Candeo *SP* 48300 power system with rear access as illustrated in Figure 4.2.

Figure 4.2 – Rear access method of cabling and connecting the AC supplies for the rectifiers

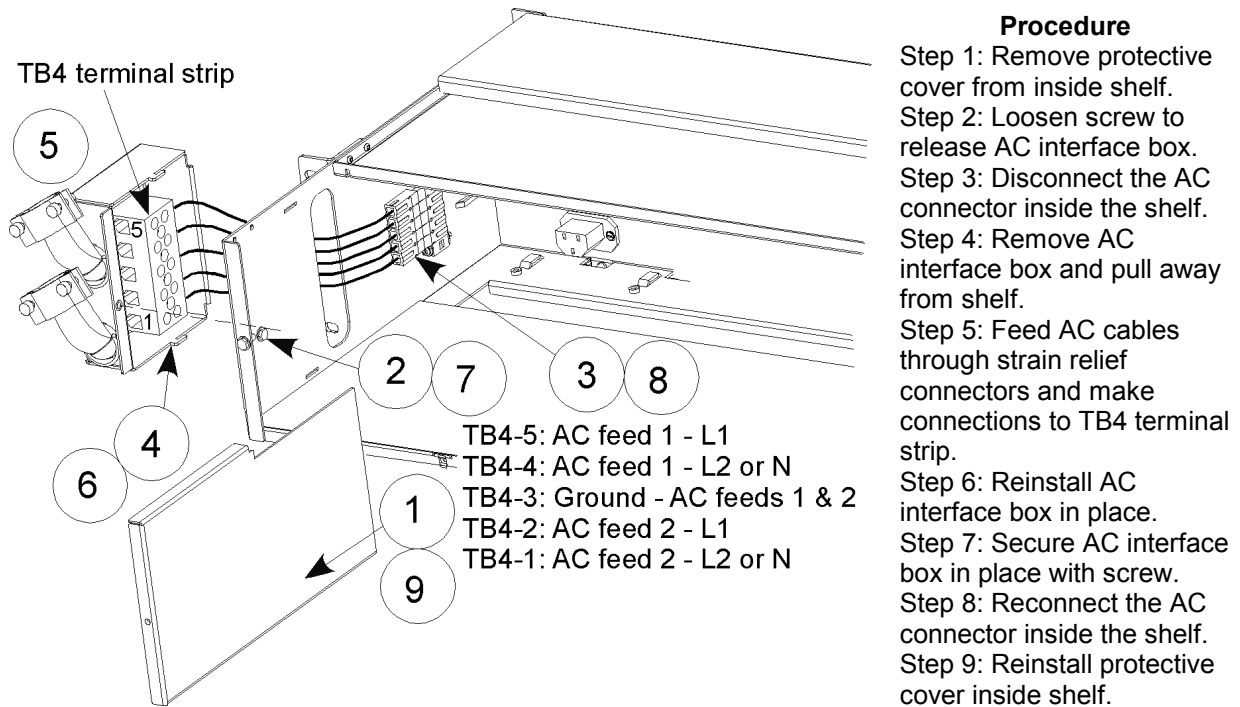


Procedure

- Step 1: Remove rear cover of power shelf.
- Step 2: Feed AC cables through the strain relief connectors.
- Step 3: Make connections to TB1 and TB2 terminal strips and ground lug at rear of shelf.
- Step 4: Reinstall rear cover of power shelf.

Cable and connect the AC supplies into a Candeco *SP* 48300 power system with only front access as illustrated in Figure 4.3.

Figure 4.3 – Front access method of cabling and connecting the AC supplies for the rectifiers



Note that the rectifier numbering sequence is from left to right on the shelves.

4.4. DC cabling and connecting

This section covers the DC portion of the cabling and connecting. On the Candeco *SP* 48300 power system, DC cabling is used mainly:

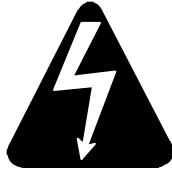
- between the batteries and the initial distribution panel,
- between the distribution panel(s) and the loads.

The present section provides only the specific “in-box” procedures for bringing the DC feeders in the Candeco *SP* 48300 power system and to the appropriate connecting interfaces, as well as connecting the feeders to these.

4.4.1. Segregation from AC cables

DC current carrying wires and cables are normally segregated from AC current carrying cables as mentioned in section 4.3.1 of the present Chapter.

4.4.2. Cabling the batteries to a Candeo SP 48300 power system



WARNING

Protect the equipment against electrical damage.

To avoid the presence of potential in the power system during the cabling and wiring operations, the final connecting of the battery leads at the batteries shall be done as the last item (see section 4.5.5). If the battery leads in your Candeo SP 48300 power system are connected through load clips and circuit breakers, both ends of the battery cables may be connected now providing the circuit breakers for the batteries are installed and/or placed in the ON position **only after** all cabling and wiring operations are completed.

In a Candeo SP 48300 power system, the -48 V battery cables are connected to load clips or the a battery connection kit in the eight rightmost positions in the initial distribution panel, while the BR battery cables are connected to the corresponding positions on the BR+ busbar at the top rear of the panel. The battery cable numbering sequence is from left to right (1 to 8).

If a battery connection kit is used, skip Figure 4.4 to Figure 4.7 and go now to Figure 4.8. If load clips are used, install these and connect the -48 V cables from the batteries in the initial distribution panel as illustrated in Figure 4.4 to Figure 4.7. Note that the load clip covers are removable to facilitate the cabling and connecting operations. Set the J4 alarm jumper, at the right end of the initial distribution panel, for the appropriate type of battery circuit breaker alarm (refer to Figure 4.13).

Figure 4.4 – Perspective views of load clips

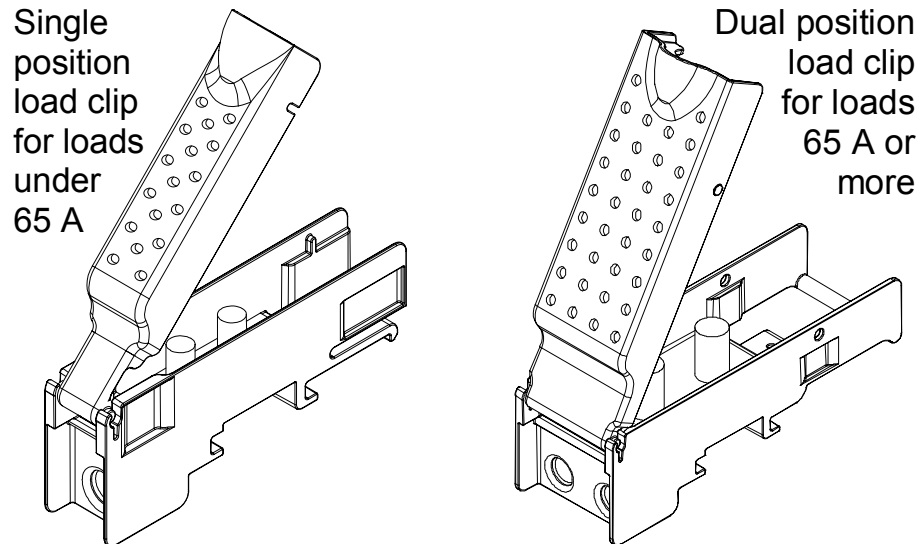


Figure 4.5 – How to install load clips

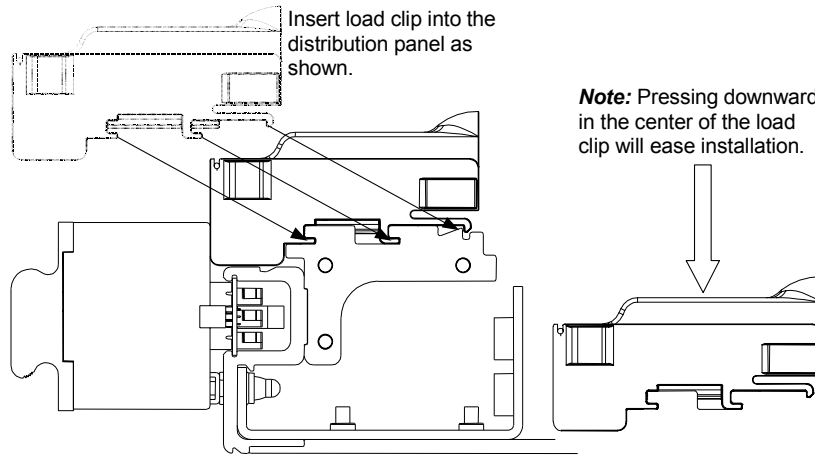


Figure 4.6 – How to remove load clips

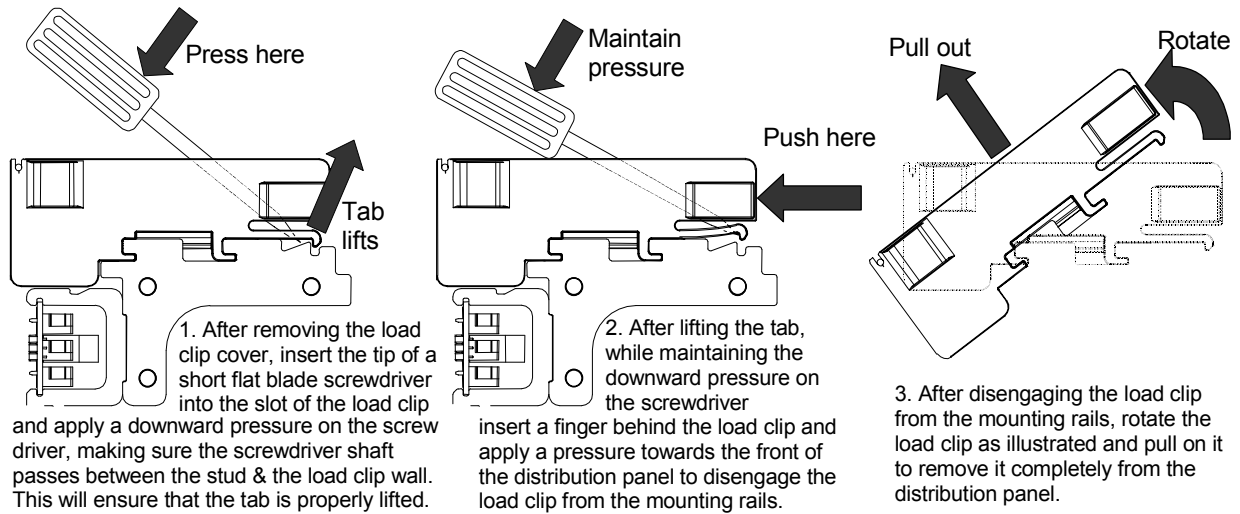
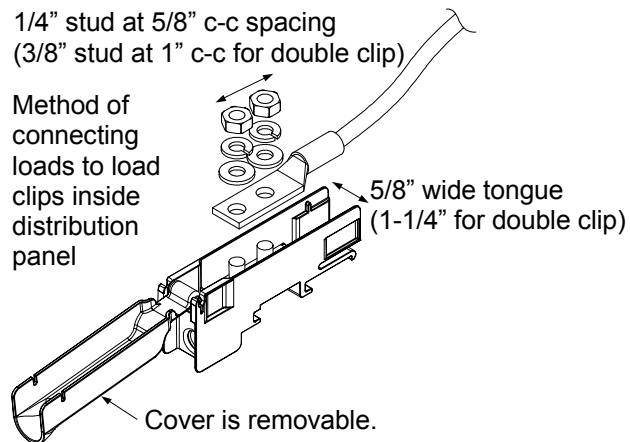
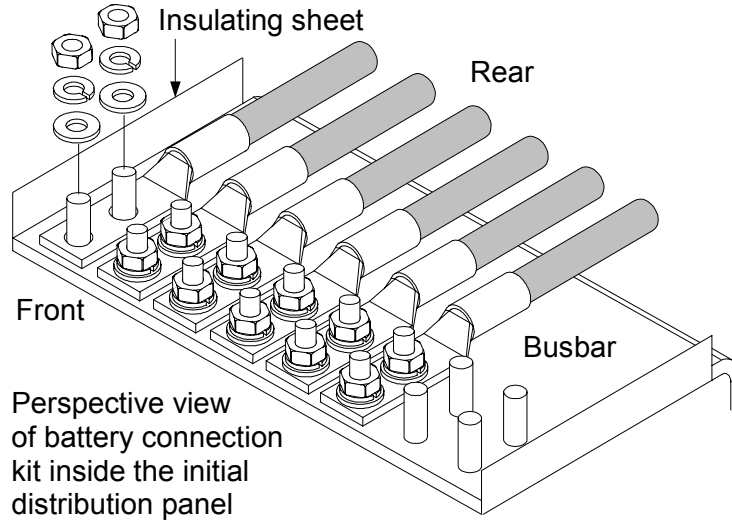


Figure 4.7 – Connecting cables to load clips



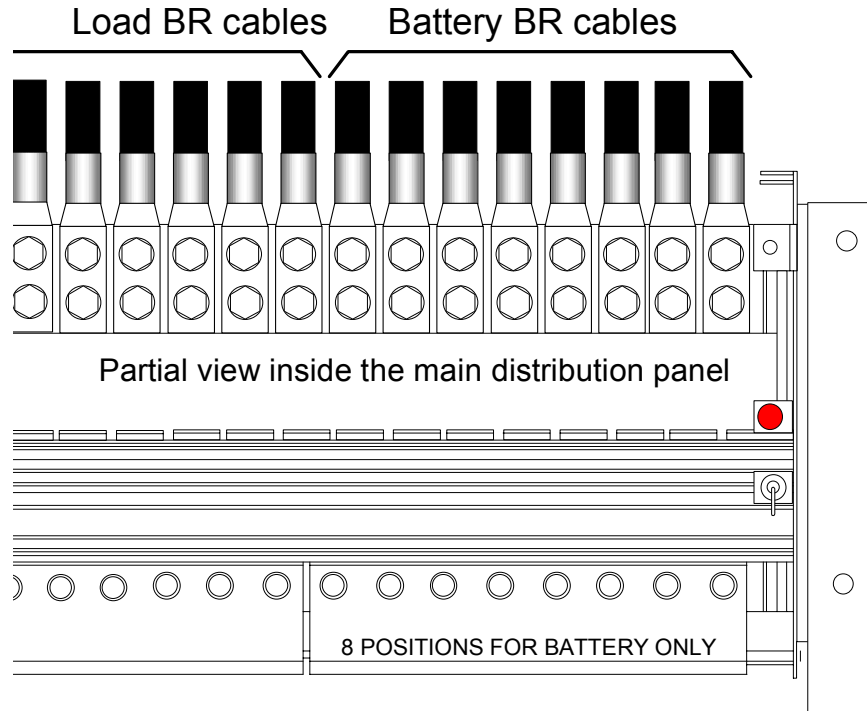
If a battery connection kit was provided (factory-installed – no field retrofit possible), connect the –48 V battery cables to it as illustrated in Figure 4.9.

Figure 4.8 – Connecting the –48 V cables for the batteries on the battery connection kit



Connect the battery BR cables to the BR+ busbar in the initial distribution panel as illustrated in Figure 4.9.

Figure 4.9 – Connecting the BR cables for the batteries and the loads in the initial distribution panel



Although it is recommended to connect the battery cables at the battery end once all other cabling operations are completed, if you decide to connect the battery cables at the battery end now, refer to Procedure 4.4 in section 4.5.5.

4.4.3. Connecting the DC load cables

The load cables can exit the top or the rear of the distribution panels.

In a Candeo *SP* distribution panel, a single load clip can accommodate bullet-type single-pole circuit breakers or fuse holders in sizes from 1 to 60 A, while a double load clip can accommodate bullet type single-pole circuit breakers or double pole fuse holders in sizes from 65 to 100 A or 150 A double-pole circuit breakers. An optional 10-position fuse kit, which does not require load clips, is available for small 0 to 10 A loads. At temperatures up to 50°C, observe the requirements per the following notes. At temperatures between 50°C and 65°C, the protective devices should be limited to 50 A capacity (40 A load) as described in the “Specifications” Chapter of UM6C55A.

Note 1: When 65 to 100 A circuit breakers or fuses are used, the double load clips are installed side-by-side but all circuit breakers or fuses shall be on the same side of the clips to insure that there is an empty space between adjacent circuit breakers or fuse holders. Small red caps are available to insert into the empty holes on the load clips and on the main bus.

Note 2: When 150 A circuit breakers are used, there shall be one empty space between adjacent load clip/circuit breaker assemblies. Small red caps are available to insert into the empty holes on the main bus.

Note 3: Do NOT mix standard trip and mid-trip circuit breakers or standard trip circuit breakers with fuses (except a 10-position fuse kit) on the load bus within a distribution panel. In an initial distribution panel, do NOT mix standard trip and mid-trip circuit breakers or standard trip circuit breakers with fuses on the battery bus. Refer to section 4.4.2 and Figure 4.13 for information on setting the battery alarm jumper, as well as to step 13 of Procedure 4.2 and Figure 4.13 for information on setting the load alarm jumper(s).

Note 4: Do NOT use a double load clip to install two 1 to 60 A circuit breakers or fuse holders.

Note 5: Bussmann type TPS fuses shall be used for 1 to 70 A loads. Littlefuse type TLS fuses shall be used for 100 A loads.

Note 6: Use only San-O brand AX-1 fuses in the 10-position fuse kit.

Note 7: On a 10-position fuse kit, the largest loads must be installed starting from bottom of the block (F1), going to the smaller loads towards the top of the block (F10), and leaving an empty space (dummy fuse) above fuses larger than 5 A (ex.: 7.5 A and 10 A).

The single load clip can accommodate lugs for cable sizes up to 2 AWG, while the double load clip can accommodate lugs for cable sizes up to 2/0 AWG. For loads using only one cable up to size 2 AWG on a single load clip or 2/0 AWG on a double load clip, this single cable is connected directly to the load clip. For loads requiring cables larger than 2 AWG on a single load clip or 2/0 AWG on a double load clip, a 2 AWG or 2/0 AWG riser must be connected directly to the load clip, brought out of the distribution panels, and tapped to the appropriate size cable(s) above the power system. The 10-position fuse kit can accommodate wires in sizes up to No. 10 AWG.

The holes in the battery return (BR) busbar can accommodate lugs using 1/4" bolts at 5/8" c-c; this is sufficient for cable sizes up to 2/0 AWG. For loads requiring cables over 2/0 AWG, a 2/0 AWG riser can be connected to the BR busbar, brought out of the distribution panel, and tapped to appropriately sized cable(s) above the power system.

Connect the distribution loads to a Candeco *SP* distribution panels as described in Procedure 4.2 and as shown in Figure 4.4 to Figure 4.12. Refer to the rightmost column of Table 4.4 for the lugs that fit the single and double load clips respectively.

Note: The hinged cover of the load clips can also be removed completely to facilitate cabling and connecting operations.

Figure 4.10 – Installing circuit breakers and fuse blocks in distribution panels

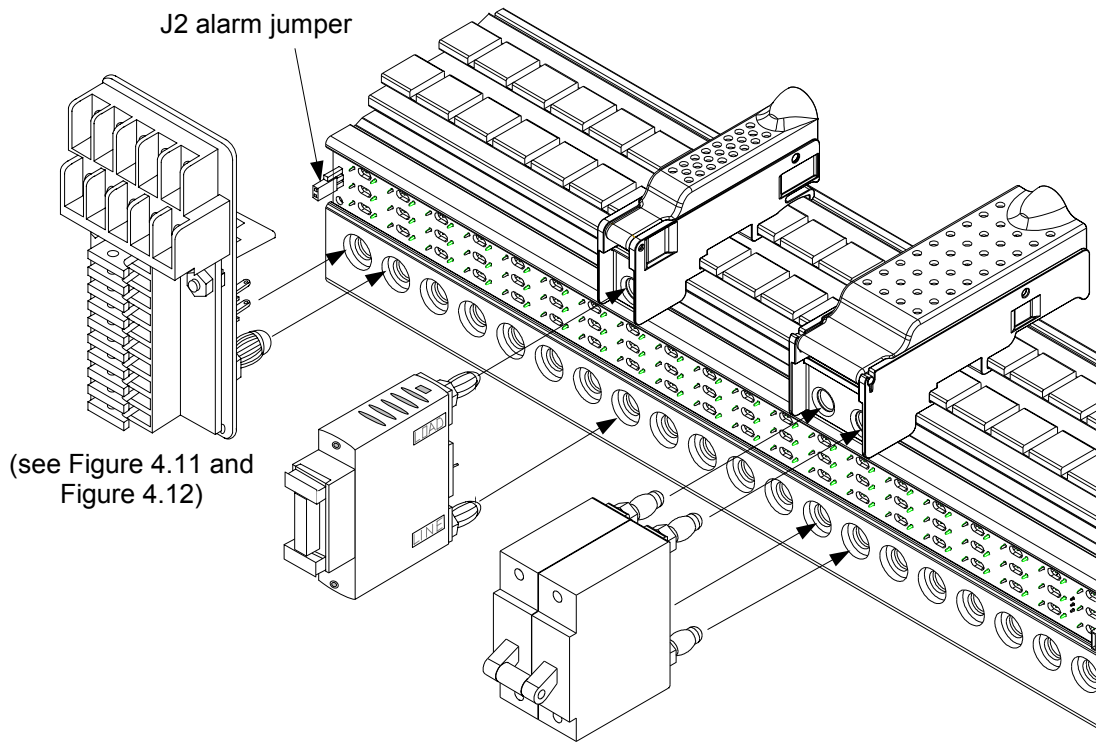


Figure 4.11 – Installing a 10-position fuse kit and the associated BR+ busbar

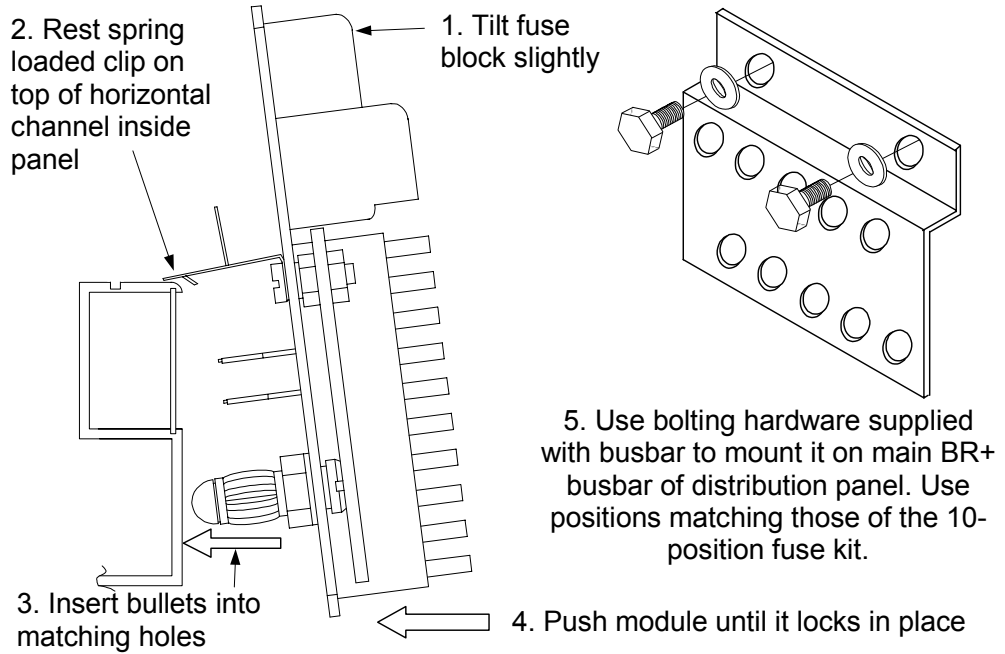


Figure 4.12 – Cabling the 10-position fuse kit and associated BR+ busbar

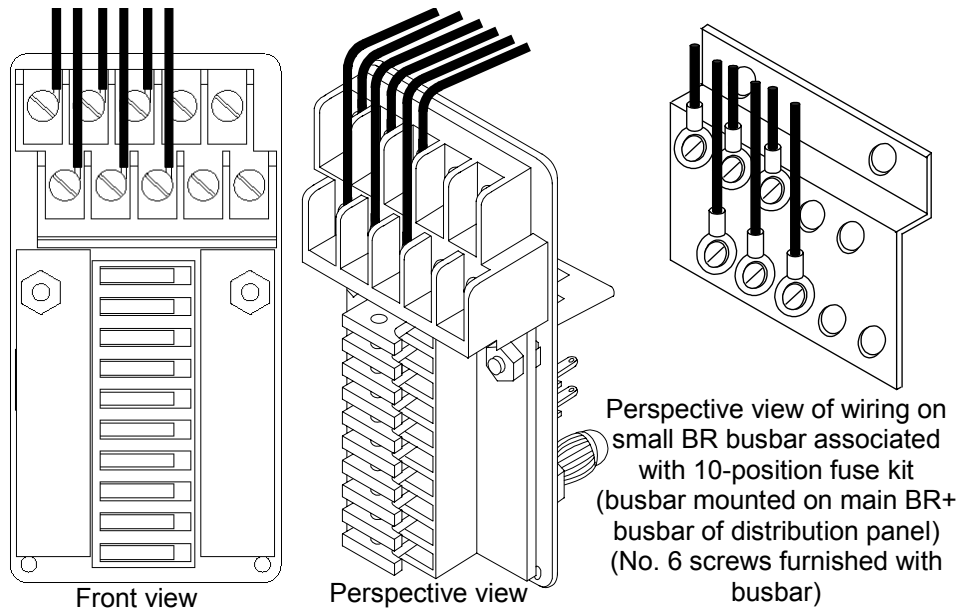
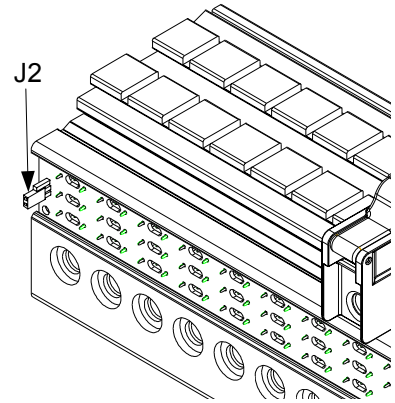


Figure 4.13 – Setting the J2 jumper for fuses and mid-trip circuit breaker alarm, or standard circuit breaker alarm

Insert the J2 alarm jumper, on the left side of the distribution panel, over the two upper pins for fuses or mid-trip circuit breakers, or over the two lower pins for standard-trip circuit breakers.

On an initial distribution panel, the J4 jumper, on the right side of the panel, is dedicated to the battery circuit breaker alarm and should be set according to the type of circuit breakers used for the batteries (refer to section 4.4.2).

On a supplementary distribution panel, ensure that the J4 jumper, on the right side of the panel, is removed (preferred) or is in the same position as the J2 jumper (non-preferred).



Procedure 4.2 – Connecting the loads in the distribution panels

Step	Action
1	Verify that all circuit breakers are open (OFF) and that all fuses, if any, are removed from the distribution panels.
2	Determine the length, size and quantity of load cables required, cut to the appropriate length, install, and secure in place as required.
3	It is suggested to connect the load cables at the equipment end first.
4	At the Candeco SP 48300 power system, form the load cables into their final position inside the distribution panels, then cut to exact length.
5	Use the appropriate lug to mark and strip the cables to correct length.
6	Crimp the appropriate two-hole lugs onto the cable ends.
7	If not previously done, install the appropriate load clips required for the load cables (see Figure 4.5), as well as the 10-position fuse kit(s) and associated BR busbar(s) if provided (see Figure 4.11).
8	Connect the first –48 V load cable to the appropriate load clip inside the distribution panels as shown in Figure 4.4 to Figure 4.7 and Figure 4.10. For a single load clip, apply a torque value of 4.25 ft-lb (5.75 N-m), and for a double load clip, apply a torque value of 15 ft-lb (20 N-m).
9	Repeat step 8 for each –48 V load cable in turn.
10	Connect the BR+ load cables to the BR+ busbar inside the applicable distribution panel as shown in Figure 4.9. Torque according to Table 4.6 depending on the size of the bolts.
11	If a 10-position fuse kit is provided, connect the –48 V and BR+ load wires to the fuse block and the associated BR busbar as shown in Figure 4.12.
12	Once all loads have been connected, use a multimeter to verify the polarity and continuity of the cables, and that there are no short circuits.
13	Insure that the load alarm jumper(s) is(are) set for fuse and mid-trip circuit breaker alarm or standard-trip circuit breaker alarm as applicable as shown and as described in Figure 4.13.
–continued–	

Step	Action
14	<p>If not previously done, install the required circuit breakers or fuses for the loads. Refer to Figure 4.10 and to the important notes in section 4.4.3.</p> <p>Note: The circuit breakers must be inserted so that the toggle is downward in the “OFF” position and upward in the “ON” position, while the fuses must be inserted with the “LINE” bullet in the bottom position and the “LOAD” bullet in the top position.</p>
–end–	

4.5. Miscellaneous cabling and connecting

This section covers the wiring and connecting of miscellaneous circuits and equipment associated with a Candeo *SP* 48300 power system, such as:

- the FA alarm lead between the supplementary distribution panel, if provided and shipped loose, and the main distribution panel,
- the alarm leads between the Candeo *SP* and the office alarm circuit,
- the external sensor for the temperature compensation option, if provided,
- the digital inputs on the System Manager *SP*, if provided,
- the remote communication cable on the System Manager *SP*, if provided.

If not previously done, reinstall the Controller *SP* or System Manager *SP* removed per note 2 of section 3.2 at this time, prior to performing the connections described in subsections 4.5.2 to 4.5.5.

4.5.1. Connecting the FA alarm lead from the supplementary distribution panel to the main distribution panel

If a supplementary distribution panel was provided for your system and that it was shipped loose, ensure that the FA alarm lead from the supplementary distribution panel is connected the FA alarm circuit of the main distribution panel as described in step 6 of Procedure 3.2 and as shown in Figure 3.4, in Chapter 3.

4.5.2. Connecting the alarms to the office alarm circuit

In a Candeo *SP* 48300 power system, the interface with the outside world (incoming alarms from supplementary or optional equipment, outgoing alarms to office alarm circuits, etc.) is done through the screw type terminal strips located on the upper edge of the PC board inside the Controller *SP* or System Manager *SP* as illustrated in Figure 4.14 and Figure 4.15.

Use the appropriate switchboard type cable to connect all applicable signals according to job specifications, configuration sheets, drawings, equipment, and customer requirements. The terminal strips can accommodate wire gauges 16 to 26.

Figure 4.14 – Location of the output relay contacts on the Controller SP

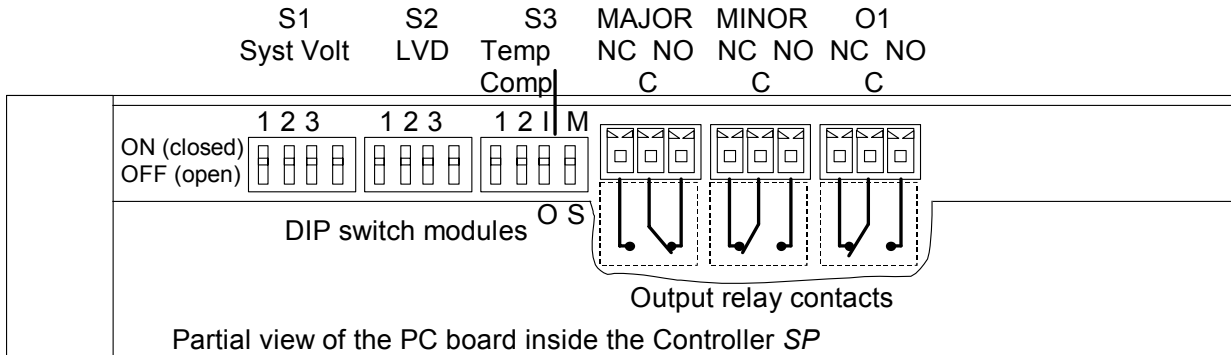
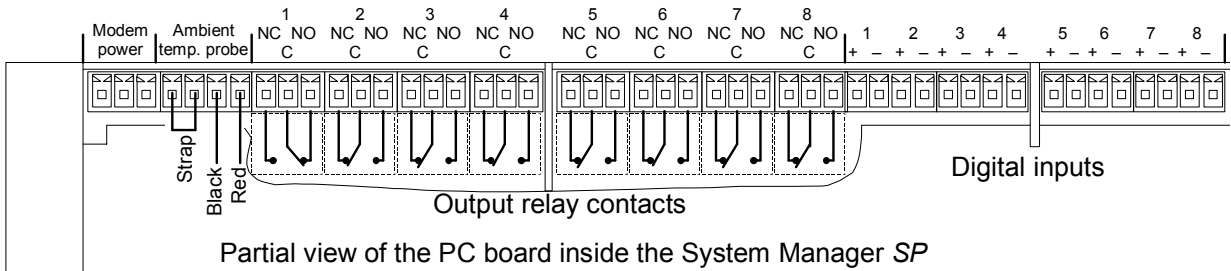


Figure 4.15 – Location of the input/output connection interface on the System Manager SP



Note 1: All COM (center) terminals of the output relay contacts on the Controller SP or System Manager SP shall be looped, then connected to a battery return (BR+) or –48 V battery source according to Customer alarm system requirements. For a BR+ signal, use an O-ring type lug to connect the wire to one of the BRR studs on the BR+ busbar. For a –48 V signal, use a fused supply.

Note 2: Connect the wires going to the alarm circuit to the NC contact of the major alarm relay (position 1) and to the NO contacts of the other alarm relays (position 2 to 8) to detect the presence of a signal when an alarm condition occurs, or to the NO contact of the major alarm relay (position 1) and to the NC contacts of the other alarm relays (position 2 to 8) to detect the absence of a signal when an alarm condition occurs.

4.5.3. Connecting the inputs to the System Manager SP

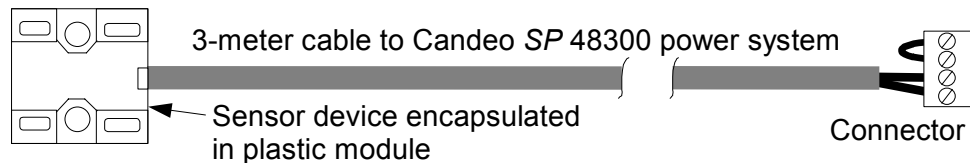
The eight digital inputs on the System Manager SP can be used to monitor specific values as programmed in the controller. These values need to be DC signals having the correct polarity as shown in Figure 4.15. For example, if alarm No. 1 uses a BR+ signal, the alarm lead must be connected on the + terminal of input 1 and a continuous –48 V signal must be connected on the – terminal of input 1. Inversely, if alarm No. 1 uses a –48 V signal, the alarm lead must be connected on the – terminal of input 1 and a continuous BR+ signal must be connected on the + terminal of input 1. The inputs of the

System Manager *SP* can also be configured to provide an alarm when the signal is applied (48 V level) or removed (0 V level), as described in the “Configure digital Input” screen of the “Digital inputs” section of UM6C55A.

4.5.4. Installing and connecting the temperature probe(s)

If the temperature compensation feature of your Candeco *SP* 48300 power system is to be used, it is necessary to install a temperature probe to monitor battery temperature. For a Candeco *SP* 48300 power system using a System Manager *SP*, a second probe (optional) may be used to monitor ambient temperature. Each probe consists of a semiconductor temperature sensor encapsulated in a plastic module at one end of a 3-meter cable, and a matching connector for the Candeco *SP* 48300 power system at the other end. Refer to Figure 4.16.

Figure 4.16 – Details of a temperature probe



Locate and install the temperature probes as described in the following procedure and as illustrated in Figure 4.17, Figure 4.18 and Figure 4.15.

Procedure 4.3 – Installing and connecting the temperature probe(s)

Step	Action
1	Locate and install the temperature probe used for battery temperature measurements as shown in Figure 4.17.
2	Run the cable attached to the probe to the controller connection interface box in the initial power shelf (rightmost position, as seen from the front).
3	Connect the connectorized cable into the J3 connector in the controller connection interface box as illustrated in Figure 4.18. Note: It may be necessary to pull the controller connection interface box out of the shelf to access the connectors within the box. To do so, remove the screw inside the box securing it to the shelf, squeeze the top and bottom plate of the box to disengage it from the shelf, and pull it carefully towards the front of the shelf.
4	If a System Manager <i>SP</i> controller is used, locate and install the optional temperature probe (if provided) used for ambient temperature measurements in the most convenient place possible, away from direct sources of heat or cold.
5	Run the cable attached to the probe to the controller in the initial power shelf (rightmost position, as seen from the front).
6	Connect the connectorized cable into the connector identified “Ambient temp. probe” on the controller as illustrated in Figure 4.15. Note: It is necessary to pull the controller partially out of the shelf to access the connector.
–continued–	

7	Secure the cable(s) as required.
-end-	

Figure 4.17 – Locating a temperature probe for battery temperature measurements

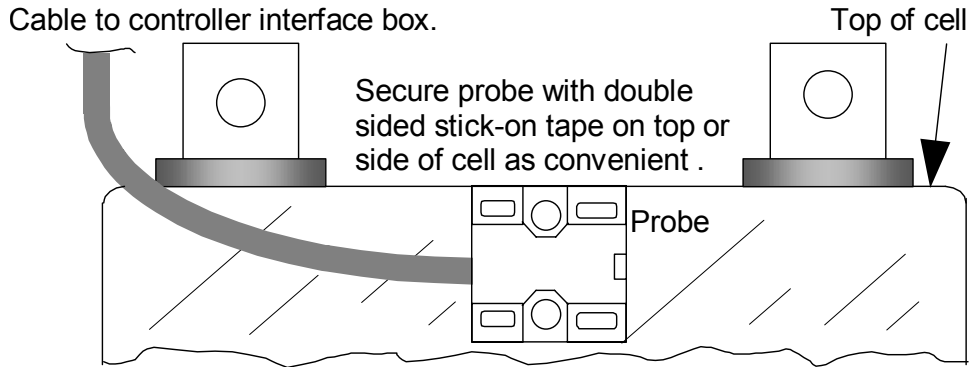
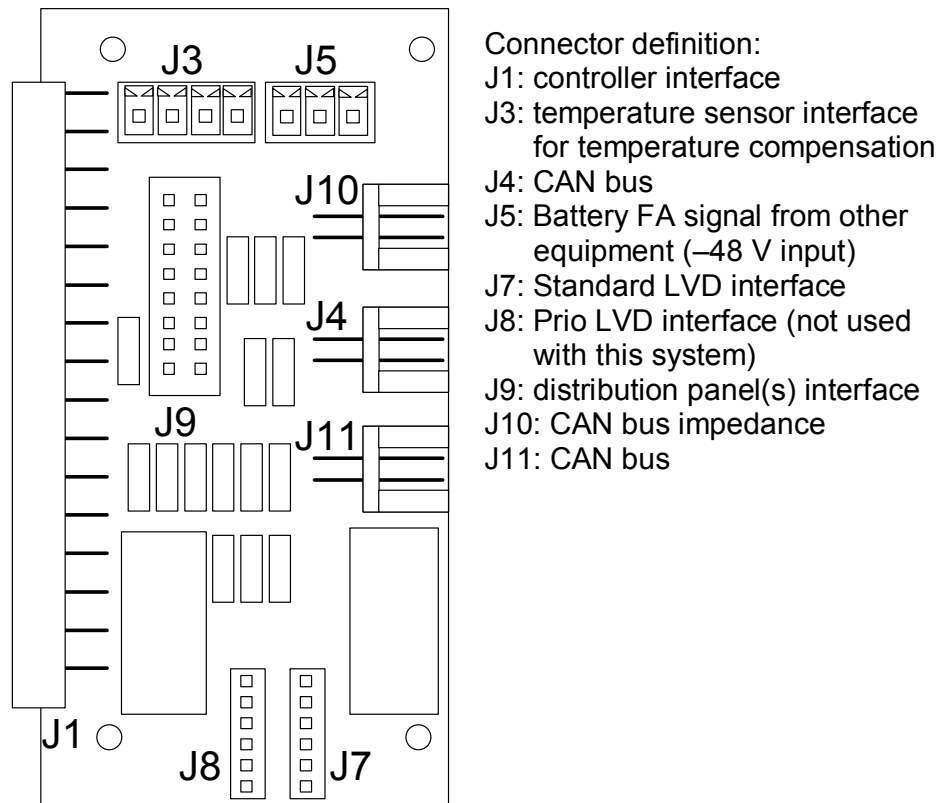


Figure 4.18 – Connector definition in the controller connection interface box



4.5.5. Connecting a computer to the System Manager SP

Connect the remote communication cable to the System Manager *SP*, if used, as illustrated in Figure 4.19 and Figure 4.20.

Figure 4.19 – Typical remote connections to the System Manager SP

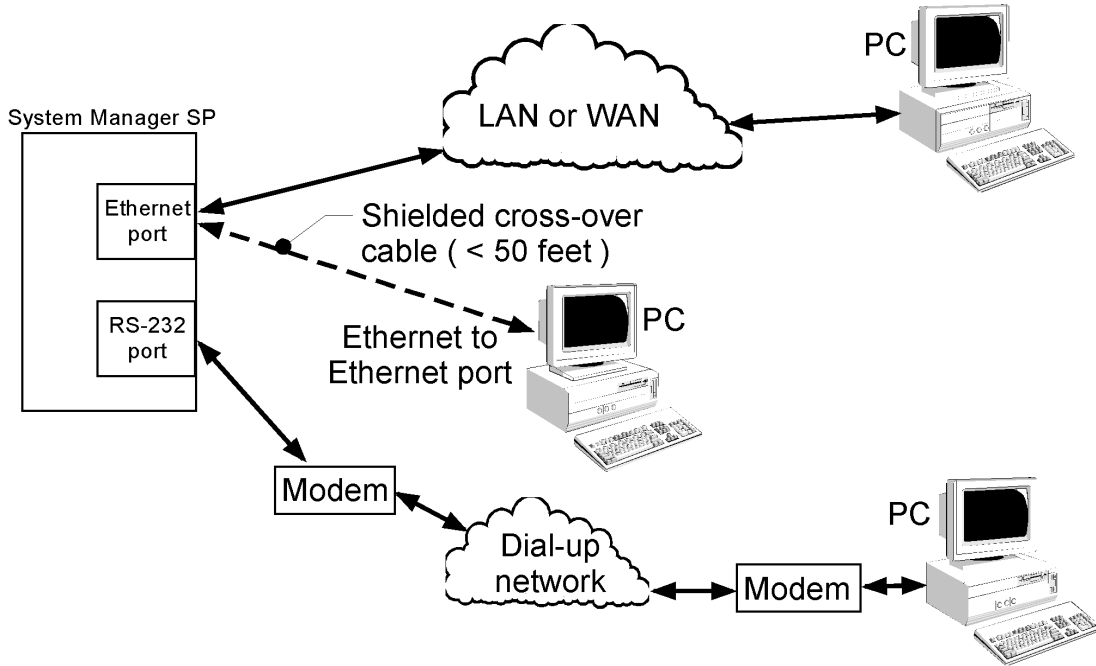
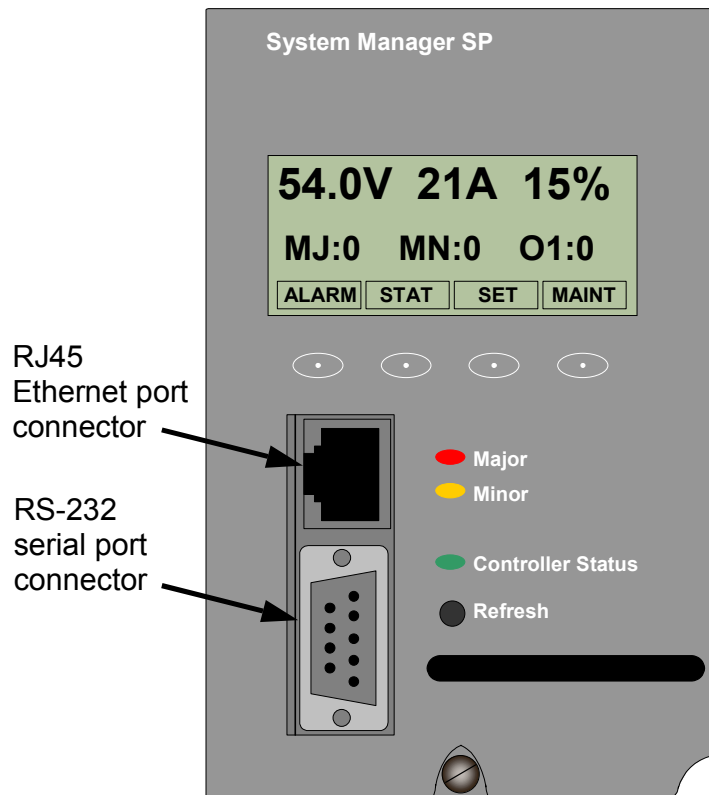


Figure 4.20 – Location of the communication ports on the front panel of the System Manager SP



4.6. Final connections at the batteries

Make the final connection of the battery cables at the batteries as described in the following procedure.

Procedure 4.4 – Connecting the battery string cables at the batteries

Step	Action
1	Verify that all circuit breakers are open (OFF) and that all fuses, if any, are removed on the Candeo <i>SP</i> 48300 power system.
2	Form the cables into their final position at the batteries and cut to exact length.
3	Use the appropriate lug to mark the cables, then strip the cables to correct length.
4	Crimp the appropriate two-hole lugs onto the cable ends.
5	Connect the –48 V lead(s) at the negative (–) terminal(s) of the battery string(s). Apply the torque value recommended by the battery manufacturer.
6	<p>Connect the battery return lead(s) (+) at the positive (+) terminal(s) of the battery string(s). Apply the torque value recommended by the battery manufacturer.</p> <p>WARNING! Before completing the connection of the battery return leads (+) from the Candeo <i>SP</i> 48300 power system battery return busbar (BR+) to the positive (+) terminals of the battery strings, measure with a voltmeter across the connection to be made. The voltage difference measured must not be greater than 0.05 volt. This is necessary to prevent significant current flow and thus any sparking. If the voltage difference is greater than 0.05 volt, then use a resistance lamp in series across the connection to equalize the potential.</p> <p>Note: Any potential difference that may exist should be small and would be caused by internal circuits of the Candeo <i>SP</i> 48300 power system. If the resistance lamp continues to glow brightly as the connection is being made, the installer should discontinue from making the connection and rather proceed to re-verify all cabling for possible short circuits. Verify again that all circuit breakers are in the OFF position and that all fuses are removed on the power system.</p>
–end–	

Once the battery string cables have been connected, use a multimeter to check for proper polarity at the charge and discharge busbars before installing any fuses or operating any circuit breakers.

5. Start-up and adjustment procedures

5.1. General

The Candeo *SP* 48300 power systems make use of a microprocessor-based controller. On the Controller *SP*, there are some settings to be done by means of DIP switch modules, whereas with the System Manager *SP*, there are absolutely no hardware based adjustments such as potentiometers, switches, etc. In both cases, the rectifiers are fully dependent on the controller for their settings.

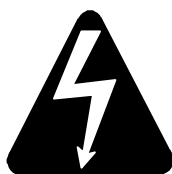
5.2. Voltage levels

Operating and alarm voltage levels for the Candeo power systems are dependent upon the type of batteries being used with the system and whether the temperature compensation function is used or not.

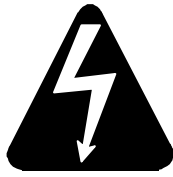
For non-listed battery types, refer to the battery manufacturer's specifications and recommendations. Refer also to the customer specifications and requirements.

5.3. Installation of the rectifiers in the power shelves

Once the installation of your Candeo *SP* 48300 power system has been fully completed per the preceding Chapters, install the rectifiers as described in the following procedure prior to starting-up and testing the system.

**WARNING****Protecting personnel against electrical shocks.**

Input voltages to the rectifiers are at a dangerous level. Ensure that the circuit breakers are locked in the OFF position at the AC service panel before installing the rectifiers.

**WARNING****Protecting personnel against electrical shocks.**

Except for the fan module, these rectifiers contain no field serviceable parts. Dangerous voltages are present inside the rectifier while it is in operation. Do not attempt field repair. Send to your nearest EES Customer Services department. Refer to the 2nd before last page of this document for the telephone number of the nearest EES Customer Services department.

Procedure 5.1 – Installing the rectifiers in the power shelves

Step	Action
1	Verify that the AC cabling for the power shelf has been installed and verified.
2	If so equipped, remove any blank plates occupying rectifiers slots on the power shelf.
3	Carefully slide each rectifier in turn into the shelf, making sure that it is fully inserted, then secure it in place by means of the captive screw.
4	Repeat steps 1 to 3 for the second power shelf, if provided.
-end-	

5.4. Initial start-up, testing and adjustment of the power system

Once all rectifiers have been installed, the system is ready for start-up and testing. Close the circuit breakers for the rectifier shelves at the AC service panel. Upon applying AC power to the rectifiers, these should start and provide their factory default voltage (-54.0 V) at the output.

If a Controller *SP* is provided, set the DIP switches as required for your application as described in the “Configuring and operating the system” Chapter of UM6C55A.

If a System Manager *SP* controller is provided, use a computer to set it as required for your application as described in the “Configuring and operating the system” Chapter of UM6C55A.

If not previously done, install the battery circuit breakers and operate these to ON

6. End of job routines and turnover

6.1. General

This Chapter covers the job routines to be performed towards the end of the installation project to ensure that the finished product meets all Emerson Energy Systems and Customer standard requirements.

6.2. Designation

Designation is a process by which all power circuits and equipment are stamped for proper identification, fast locating and future maintenance.

It can be done with a manual designating kit using individual rubber stamps with paint or ink, an electronic designating kit using stick-on ribbon, a fine-tip black permanent marker, or individual stick-on letters and numbers.

Verify with the customer for the acceptable method(s). Some customer may even have color preferences for the designation. If the Customer has no preference, other factors may govern the final choice, such as consistency with existing equipment, availability of a particular designating kit, etc.

The smallest acceptable character size is 3/16".

Stamp the equipment as described in the following sections and according to the information in the drawings and specifications.

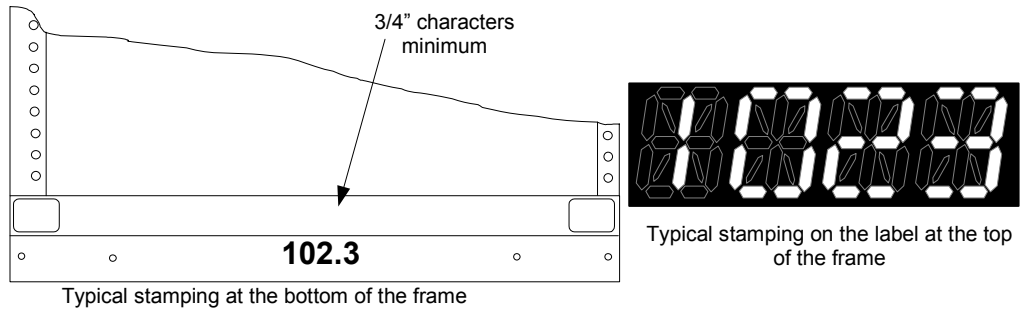
6.2.1. Frame numbering

If your Candeo *SP* is mounted on a relay rack type frame, if this frame is added to an existing lineup or starting a new lineup in an equipment room with existing equipment, the designation should match the existing stamping (method, color and size) for consistency, unless the Customer or the specification says otherwise.

Relay rack type frames are usually stamped at the front and rear of the frame, at the bottom, as shown in the left illustration of Figure 6.1. However, the EES Candeo frame is provided with a special label on its top, on which the

installer can use a permanent ink marker to blacken the appropriate segments of the blank numerals in order to identify the frame as shown in the right illustration of Figure 6.1 (the label having a black background, it is necessary to leave the segments necessary to form white digits). If more than four digits are required, use an alternate method, such as new label over the existing one.

Figure 6.1 – Typical stamping of Candeco frame(s)



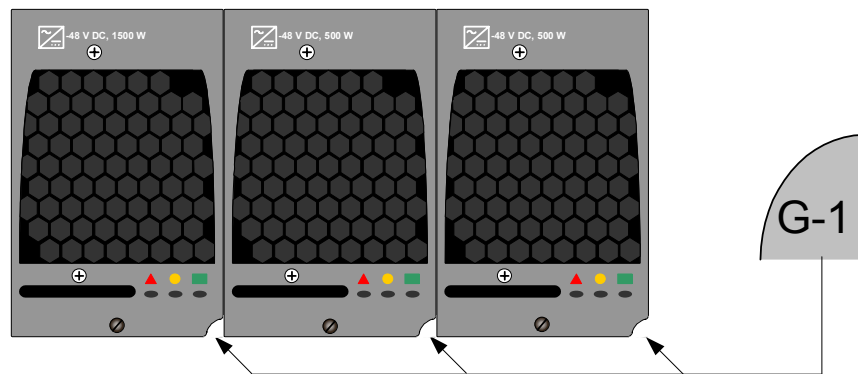
6.2.2. Rectifiers

Unlike on older power plants, the rectifiers used in a Candeco *SP* 48300 power system need not to be identified by physical designation, this for two reasons:

- These rectifiers are of the plug-in type. Should a rectifier become defective, it would then be replaced by a spare unit and the designation sequence would thus be broken.
- Each rectifier has an electronic signature associated with its serial number. This signature is programmed in the controller where it is also associated with its physical position in the power shelves.

The rectifiers have thus a virtual designation. However, should the end user wish to identify the rectifiers with a specific numbering sequence, it is recommended to do so on the bottom edge of the shelf, in the small space visible at the bottom right side of each rectifier front plate, as shown in the following illustration.

Figure 6.2 – Typical stamping of Candeco frame(s)



6.2.3. Distribution

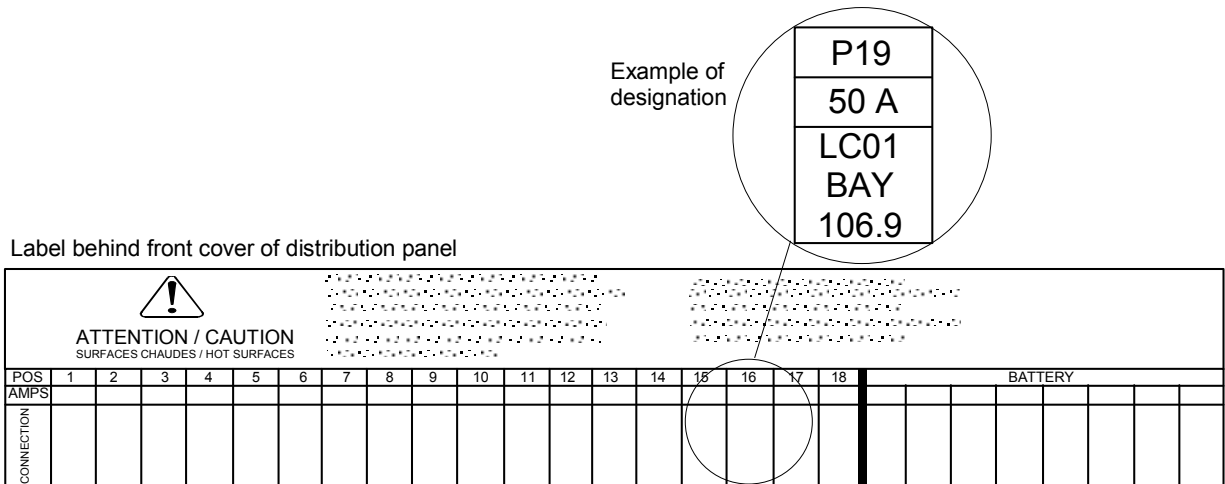
All distribution circuits shall be properly identified at the front and, if possible, at the rear of the protection devices (circuit breakers and/or fuses) without any exception.

On a Candeco *SP* 48300 power system, the front designation of distribution circuits is done on the label on the back of the front covers of the distribution panels.

Refer to the job drawings for the name of the circuit associated with each circuit breaker, and to Figure 6.3 and Figure 6.4 for the location of the stamping inside the distribution panels. The stamped information should at least include the equipment name, the equipment location (bay No.) and the circuit breaker and/or fuse rating.

Figure 6.3 shows a typical example of stamping on the label inside the initial distribution and battery connection panel.

Figure 6.3 – Typical stamping on the label inside a distribution and battery connection panel

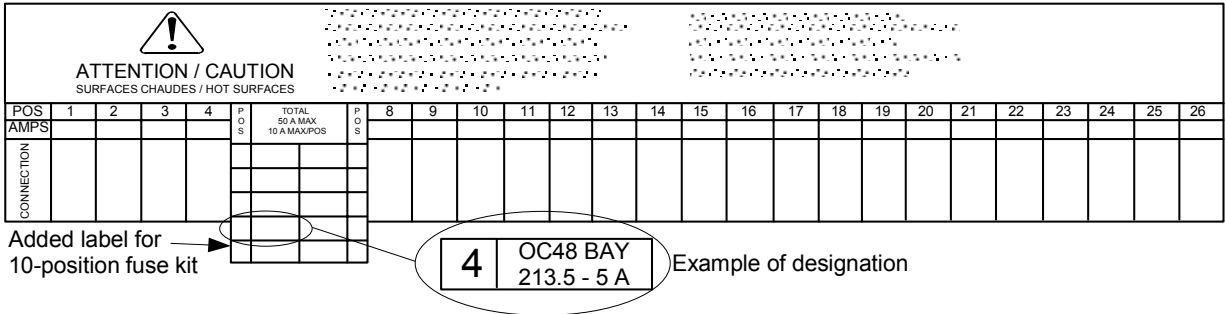


Note that the designation for the 26 load positions in a supplementary distribution panel is similar to that illustrated in Figure 6.3.

If a 10-position fuse kit is provided in a distribution panel, the label supplied with the kit must be added on the standard label, over the three positions matching those occupied by the block. Figure 6.4 shows a typical example of stamping for a 10-position fuse kit on the added label inside a distribution panel.

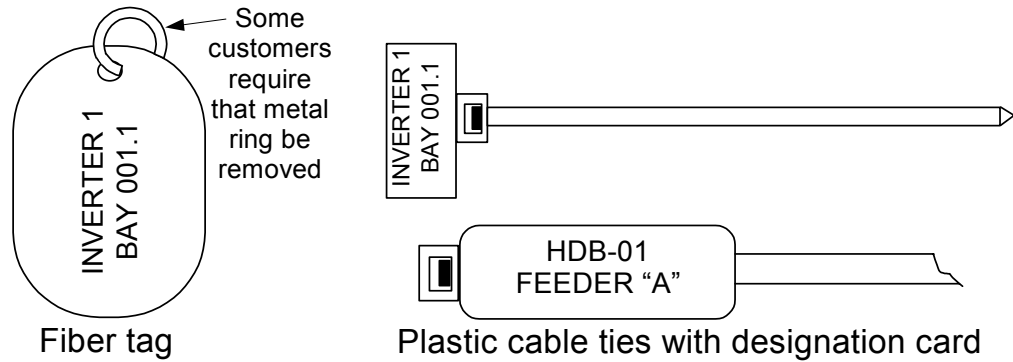
Figure 6.4 – Typical stamping on the 10-position fuse kit label inside a distribution panel

Label behind front cover of distribution panel



All battery return cables shall also be identified using fiber tags or plastic cable ties with a designation card (such as those shown in the following illustration). The stamped information must include the same circuit number and load name as the corresponding protection device.

Figure 6.5 – Typical stamping tags for conductors



Since the Candeo *SP 48300* power system is a front access power system, there is no provision for stamping at the rear of the Distribution Modules. If a second mean of identifying –48 V distribution loads is required, fiber tags or plastic cable ties with a designation card (such as in the above illustration) may also be used on the distribution conductors.

6.3. Touch-up of damaged and/or scratched painted surfaces

Touch-up any scratched, marred or damaged painted surfaces to ensure that no bare metal is exposed. Use the appropriate matching color: matching paint is available from Emerson Energy Systems for this equipment.

Cut ends of floor anchoring studs and overhead structure hardware shall be touched-up as well to prevent corrosion by rust.

6.4. Equipment turnover

Once the installation of your Candeo power system has been fully completed, including all the operational tests and adjustments, turnover the system to the customer, including all spares and documentation supplied per the specifications for the system.

Obtain the applicable customer acknowledgments.

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Appendix A: Recommended replacement parts

Refer to Appendix A of user manual the UM6C55A for the recommended replacement parts for the Candeco *SP* 48300 power system.

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List of terms

A	ampere
AC or ac	alternating current
AWG	American Wire Gauging
BAT	battery
BAT RTN	battery return
BPG	building principal ground
BR	battery return
BRR	battery return reference
c-c	center to center
CEC	Canadian Electrical Code
DC or dc	direct current
EES	Emerson Energy Systems
F	fuse
FG	frame ground
FGB	floor ground bar
ft-lb	foot-pound
GRD or GRND	ground
Hz	hertz
IM	installation manual
in-lb	inch-pound
ISG	isolated system ground
kcmil	thousand circular mils
kW	kilowatt
L	line
lb	pound
MGB	main ground bar
MOP	method of procedure
NC	normally closed
NEC	National Electrical Code

N-m	Newton-meter
NO	normally open
NT	narrow tongue
PLT	plant
PWR	power
SPG	single point ground (connection)
TB	terminal block
UL	Underwriters Laboratories
UM	user manual
V	volt
VRLA	valve regulated lead acid

Technical service assistance

For technical assistance, 24 hours / 7 days a week, dial (972) 367- 4598 (direct access) or one of the following toll-free numbers. This service complements the services offered by field support organizations such as Emergency Technical Assistance Service (ETAS) and Installation Technical Assistance Service (ITAS).

In the U.S.A.: 1-800-992-8417

In Canada: 1-800-363-2288

Candeo *SP* 48300 power system AP6C55AA Installation Manual

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