

# Battery Charger Installation

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# 1 . General

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- 1.1 Purpose** This practice provides procedures to be followed when installing battery chargers in Central Office (CO) power rooms.
- 1.2 Filing Instructions and Supersedures** Discard all previous issues and associated addenda of this practice and file this issue numerically in your GTE Telephone Operations practices set.
- This practice supersedes and cancels:
- All policies, procedures, general instructions, letters, and memoranda which address this subject.
  - Any document which provides information contrary to the information contained in this practice.
- 1.3 Reason for Reissuing** This practice is being reissued to:
- Include reference to Telemail forms for acceptance information (see Section 2.3).
  - Clarify Section 6 on charger grounding.
- Read this entire practice to ensure your familiarity with the new information.
- 1.4 Responsibility** This practice was published by the GTE Telephone Operations Enterprise Services Department. For more information about this practice, contact the Headquarters COE Construction Department.
- 1.5 Disclaimer** This practice was prepared solely for the use of GTE Telephone Operations. It must be used only by its employees, customers, and end users when installing, operating, maintaining, and repairing GTE Telephone Operations' equipment, facilities, and services. Any other use of this practice is forbidden. The information contained in this practice may not be applicable in all circumstances and is subject to change without notice. By using this practice the user agrees that GTE Telephone Operations will have no liability (to the extent permitted by applicable law) for any consequential, incidental, special, or punitive damages that may result.

## 2. Overview

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### 2.1 Definitions

The following chart provides definitions for the acronyms and terms used in this practice.

Acronym or Term	Definition
AC	Alternating Current
ANSI	American National Standard Institute
AWG	American Wire Gauge
Battery Charger	A device that changes the AC power to DC power of a suitable voltage to maintain the office power requirements and the battery cells in a fully charged condition.
CHGR	Charger Frame
CO	Central Office
COEC	Central Office Equipment Construction
DC	Direct Current
DVOM	Digital Volt-Ohm Meter
ID	Item Identification
MGB	Master Ground Bar
PCU	Power Control Unit
PDU	Power Distribution Unit
VOM	Volt-Ohm Meter

### 2.2 References

The following chart provides sources of supplementary information relating to this practice. The documents could be required for performing certain tasks.

See...	For Information About...
004-200-001	Quality Assurance Operational Review -- COE Construction
009-026-300	Lockout/Tagout Safety Procedures
200-001-000	Safety Precautions -- Central Office

(continued)

## 2. Overview, continued

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### 2.2 References, continued

See...	For Information About...
205-000-500	Power Connections – CO Fuse Inspection and Tightening Procedures
205-005-200	Batteries, Central Office and Remote, Installation, and Maintenance
244-251-200	Numbering and Lettering Power and Lighting
795-805-071	Central Office Grounding Systems – Engineering Applications
795-805-072	AC Service Grounding Engineering Applications
795-805-074	Inspecting Central Office Grounding and Electrical Protection
AG Communications Systems Practice 109-850-505*	Charger load testing
AG Communications Systems Practice 780-805-071*	Earthquake bracing
Engineering Specifications supplied with the job**	Job drawing, circuits, and wiring diagrams
Manufacturer's instructions?	Battery charger
NPFA70+	National Electrical Code (NEC)

\* Published by AG Communication Systems.

\*\* Available as part of the Work Order package from the Operations Center.

† Available from the individual manufacturers.

†† The NEC is published by the National Fire Protection Association (NFPA), Quincy, MA.

### 2.3 Forms for Acceptance and Maintenance

The following describes the acceptance and maintenance forms for power plant installations.

Coordinate power plant acceptance with acceptance of the switch/other hardware categories. The Basic Equipment (Form COECV02) and the various parts relate to each core category requiring physical equipment acceptance. Form COECV02 is a dual-purpose form/checklist used for both quality reviews and acceptance. The forms are described in GTE Telephone Operations Practice 004-200-001, and the basic equipment acceptance test is described in GTE Telephone Operations Practice 200-002-700.

## 2. Overview, continued

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### 2.3 Forms for Acceptance Maintenance, continued

Obtain the latest version of COEC prefixed forms by accessing the COEC Electronic Bulletin Board entitled COEC.GTEP. Enter Scan *All* to review the bulletin board posting for:

- and**
- Selecting and downloading the forms to a diskette to print later.  
OF?
  - Selecting and printing the forms required.

If PC or terminal access is not possible, order the COEC prefixed forms described in the following chart from the Operation Center. Order the 9000xxx forms through normal supply channels.

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Form Number	Form Description
COECV02	Acceptance CO Facilities -- Basic Equipment (a seven-part form): A. Central Office Construction Quality Assurance or Equipment Acceptance COE Superstructure/Office Conditions B. Central Office Construction Quality Assurance or Equipment Acceptance COE Cable and Wire C. Central Office Construction Quality Assurance or Equipment Acceptance COE Power Installation D. Central Office Construction Quality Assurance or Equipment Acceptance Safety and Housekeeping E. Central Office Construction Quality Assurance or Equipment Acceptance Equipment Erection F. Central Office Construction Quality Assurance or Equipment Acceptance COE Administration G. Central Office Construction Quality Assurance or Equipment Acceptance COE Grounding, Isolation, and Protection  Use the parts of Form COECV02 as required that apply to the particular work order-type equipment. At times, certain parts might not be required. When installed/completed, initial the applicable items in the space provided on the right-hand side of the forms. The individual items acceptance signoff on these forms can be optional for the COEC final inspection and Switching Service acceptance representatives, if mutually agreed. However, the individual items signoff provides for a more thorough audit trail if further investigation is required. The signoff on Form COECVOI A is the required controlling acceptance document.
90002456	Record the initial installation and ongoing maintenance of battery and charger performance on the Storage Battery/Charger Record discussed in GTE Telephone Operations Practice 205-005-200. Order this form through normal supply channels.

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(continued)

## 2. Overview, continued

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### 2.3

#### Forms for Acceptance and Maintenance, continued

Form Number	Form Description
COECVO1A	GTE Telephone Operations Practice 200-002-700 describes the Formal Summary, which is posted on the electronic bulletin board entitled COECGTEP, for total work order/project acceptance.
90001528	GTE Telephone Operations Practice 795-805-074 describes the power plant grounding and protection standards for new installation. Order this form through normal supply channels.

### 2.4

#### Manufacturer's Documentation

The requirements and specifications for installing, operating, and maintaining equipment differ among manufacturers. This practice is intended to be generic. Always refer to the manufacturer's documentation for the equipment in question, especially in the case of multiplex/digital loop carrier systems.

Leave the manufacturer's charger instruction manuals with the CO Maintenance Coach/Supervisor who is in charge of the site documentation files.

## 3. Safety Precautions

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### 3.1

#### Guidelines

The GTE Telephone Operations Practice ZOO-001 -xxx subdivision contains the general safety precautions to be observed around power equipment. Review these precautions with all personnel before beginning installation operations.

Apply the following guidelines when working with power equipment:

- Because of the size and weight of some chargers, two or more people might be required when lifting or moving chargers.
- While an installation is in progress, ensure that:
  - All electrical disconnects and circuit breakers are locked in the off position with either a key or combination lock.
  - All fuses are removed.

**NOTE: Identify all locked electrical disconnects and circuit breakers with a tag (ID 680921) which states "Danger - Do Not Operate." Refer to GTE Telephone Operations Practice 009-026-300.**

- Protect live equipment by attaching approved sturdy material (e.g., masonite, ¼" [6 mm] plywood, etc.) to the equipment framework if live equipment will be jeopardized:
  - When moving new equipment into the building.
  - When moving new equipment to locations on the floor.
  - By installation personnel going to or from work locations.

**WARNING: Do not wear metal jewelry (e.g., rings, watches, large belt buckles, earrings, necklaces, etc.) while working in an equipment room.**

# 4. Handling Battery Chargers

## 4.1 Moving

Floor-mounted chargers are delivered to the CO while still crated. This provides maximum protection for the charger while in transit. Use an approved block and tackle, or power hoist, to lift a charger from the delivery vehicle.

Use standard hand trucks to move the heavy chargers into position.

**CAUTION:** To avoid floor damage, do not slide the charger across the floor.

If it is necessary to move a charger from one floor to another, use the building hoist, if available. In the event it is necessary to raise or lower a charger from a basement access well and the building hoist cannot be used, use a vehicle equipped with a lifting boom.

**NOTE:** With floor-mounted chargers, at least four people are required for this operation.

**CAUTION:** If it is necessary to rest a floor-mounted charger on its side, exercise extreme caution. Before proceeding, ensure that the sides are adequate to support the weight of the unit in order to eliminate the possibility of causing internal damage to the charger.

Leave a floor-mounted charger in the shipping crate until it is moved into the power room. Place the charger as near as is practical to the location shown on the floor plan drawing and/or local engineering specification (see Exhibit 1).

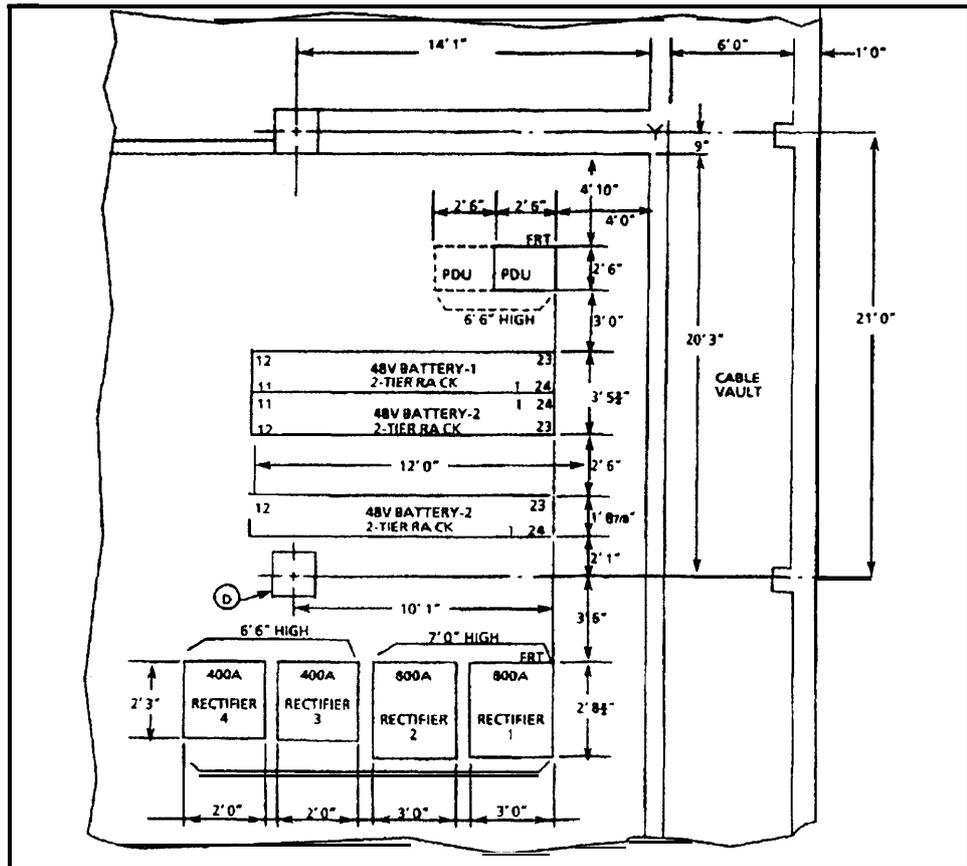


Exhibit 1 - Typical Floor Plan (Power)

## 4. Handling Battery Chargers, continued

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### 4.2 Uncrating

If the shipping crate is nailed together, remove the nails with a nail puller. Start at the top of the charger, then remove the crating material from the sides, and finally the rear.

Leave cardboard or other packing material between the charger and the floor to protect the floor as the charger is raised into place.

Remove the crating material from the power room. Dispose of it outside the building in the designated trash location.

## 5. Mounting Battery Chargers

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### 5.1 Guidelines

After the charger is uncrated, but before securing it to the floor:

- Check for:
  - Physical damage.
  - Loose connections and components.
- Tighten any loose nuts or screws.

Use approved lifting devices to lift charger frames into place.

Charger frames normally do not require isolation material as ground loops do not need to be avoided for most power room type equipment. Isolation would be required to maintain integrity of the Single Point Ground System when charger equipment is mounted within equipment lineups.

**NOTE:** Normally, chargers should not be mounted within 3 feet (0.91 m) of processor/memory equipment, or within 6 feet (1.82m) for older noise generating chargers. This might vary per switch manufacturer equipment layout design, which would take precedence.

## 5. Mounting Battery Chargers, continued

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### 5.1 Guidelines, continued

Use anchors, bolts, and washers to secure charger/frame to the floor as follows.

Step	Securing Charger/Frame to the Floor						
1	Position the charger in place.						
2	Mark the floor with a felt-tip marker.						
	<table border="1"><thead><tr><th>If Mounting in...</th><th>Then...</th></tr></thead><tbody><tr><td>Earthquake Zone</td><td><ul style="list-style-type: none"><li>• Use <math>\frac{1}{2}</math>" (12 mm) bolts.</li><li>• Use all four holes.</li><li>• See Step 6.</li></ul></td></tr><tr><td>Non-Earthquake Zone</td><td><ul style="list-style-type: none"><li>• Use:<ul style="list-style-type: none"><li>- Two <math>\frac{1}{2}</math>" (12 mm) bolts (opposite mounting comers).</li></ul>OR<ul style="list-style-type: none"><li>- Four <math>\frac{3}{8}</math>" (10 mm) bolts (opposite mounting comers).</li></ul></li><li>• See Step 6.</li></ul></td></tr></tbody></table>	If Mounting in...	Then...	Earthquake Zone	<ul style="list-style-type: none"><li>• Use <math>\frac{1}{2}</math>" (12 mm) bolts.</li><li>• Use all four holes.</li><li>• See Step 6.</li></ul>	Non-Earthquake Zone	<ul style="list-style-type: none"><li>• Use:<ul style="list-style-type: none"><li>- Two <math>\frac{1}{2}</math>" (12 mm) bolts (opposite mounting comers).</li></ul>OR<ul style="list-style-type: none"><li>- Four <math>\frac{3}{8}</math>" (10 mm) bolts (opposite mounting comers).</li></ul></li><li>• See Step 6.</li></ul>
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3	Slide the charger to one side.						
4	Drill the holes.						
5	Slide the charger back.						
6	Insert anchor bolts in the predrilled holes. Torque bolts (minimum SAE Grade 5) without lubrication as follows: <ul style="list-style-type: none"><li>• <math>\frac{3}{8}</math>" (10mm) -40 ft-tbs.</li><li>• <math>\frac{1}{2}</math>" (12mm) -60 ft-lbs.</li></ul>						

Use shims under the charger to provide a solid footing and to ensure that the charger is plumb, especially where the floor is not level.

Ensure that ventilating openings are unobstructed. This is essential to proper cooling during operation. Refer to the manufacturer's instructions for recommended clearance(s).

# 6. Power Connections

## 6.1 General Information

Before making any power connections, ensure that the automatic on/off switch is set to the OFF position.

Exhibit 2 shows typical installer's connections. Refer to the manufacturer's battery charger installation manual and any job documents for more specific information.

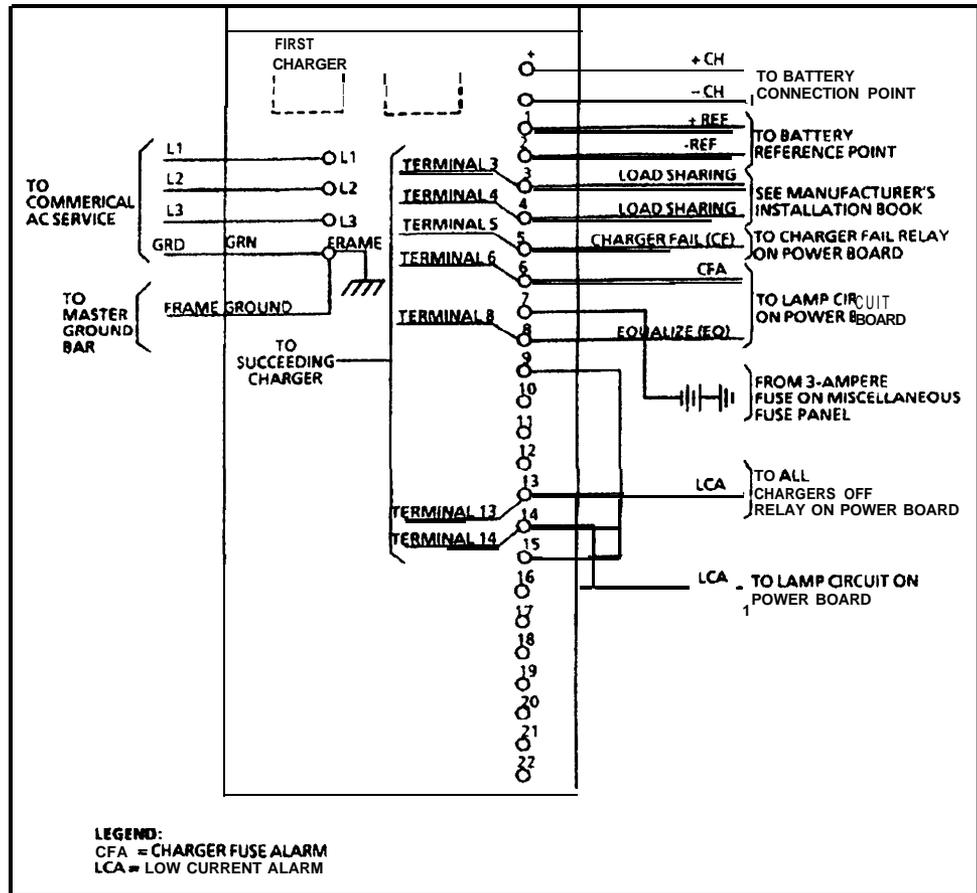


Exhibit 2 - Typical Installer Connections

## 6. Power ConnectionsNS continued

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### 6.2 AC Input

**NOTE:** Before proceeding with AC connections, verify the local procedure on responsibilities for working with commercial AC circuits.

Connect the AC input leads to the lugs at the input contactor or terminal block, if the unit is not equipped with a contactor.

Refer to the manufacturer's instructions for recommended:

- Input wire size.
- Wire capacity of input terminal lugs.
- Current rating of AC branch circuit fusing.
- Fusing arrangements (e.g., individual, shelf basis, stagger over two shelves: 1 and 3, 2 and 5, and 3 and 6. If options exist, typically the individual charger fusing method is preferred.

Ensure that charger circuit breakers in AC wall panels are:

- Off and locked with either a key or combination lock.
- Temporarily marked with a tag (ID 680921) stating "Danger – Do Not Operate." Refer to GTE Telephone Operations Practice 009-026-300.

Ensure that AC power is disconnected from the battery charger by measuring across the AC input terminal pins with a VOM. Upon completion, perform the following activities:

- Remove all fuses and check them for proper ratings.
- Clean **all** copper contact surfaces, cartridge fuses, disconnect switch, etc.
- Coat the contact areas lightly with No-Ox-ID Type A (ID 883037), or equivalent, grease.
- Replace all fuses with the exception of the DC OUTPUT fuse/switch.
- Ensure that a fuse fits properly in its housing when replacing it.
- When three-phase power is used:
  - Read the AC voltage at the breaker box (208, 240, etc.).
  - Verify connections of the input voltage power transformer adjustment taps.
  - If necessary, reconnect the taps by following the procedures stated in the manufacturer's manual.
- Verify the connections of the phase shift transformer (on older chargers) adjustment; if necessary, reconnect the taps by following the procedures stated in the battery charger manufacturer's manual.

**NOTE:** Phase shift adjustment is not an option on most new chargers, but is required on some older chargers to shift the phase of the input voltage of the battery charger with respect to the AC line. This lowers the accumulative distortion of the AC line when two or more battery chargers are connected in parallel.

- Remove the protective housing that covers the printed wiring cards and ensure that the cards are all firmly seated in the connector slots.
- Replace the protective housing.

## 6. Power Connections, continued

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### 6.3 Grounding

Ensure that earth ground is sufficient and connected to the charger ground terminal (leads 29, 31, or 32) in accordance with standard procedures. Refer to GTE Telephone Operations Practices 795-805-071 and 795-805-072.

Terminate lead(s) 29 (AC ground) and lead(s) 31 or 32 from lead 31 via the MGB at the same termination point (charger ground terminal) as separate connectors. If the manufacturer of the charger provides a mechanical lug, change out the lug to a compression lug unless the charger chassis would require disassembly to perform this change-out.

**NOTE: Lead 32 is not required if lead 31 terminates to modular power board framework and rectifier shelves are intentionally grounded (cut in washers).**

### 6.4 Non-Modular Charger Grounding

Perform the following grounding procedures on the non-modular type charger applications:

- Free-standing chargers or relay rack-mounted chargers with no other type of equipment within the relay rack.
  - Bond lead 32 directly to the termination point of lead 29 (same clamp).
  - Bond lead **32** to lead 31.
  - Extend lead 31 to the MGB or FGB (refer to GTE Telephone Operations Practice **795-805-071**).
- Relay rack-mounted chargers with other type of equipment within the relay rack (other than a Modular Power Board application).
  - Connect the appropriate lead(s) 33-37 (depending on the frame application) via lead 31 directly to the relay rack.
  - Connect lead(s) 32 to each charger termination point of lead 29.

With the use of various Modular Power board types where modular chargers, PCU, PDU, and sometimes batteries are mounted on the same rack, GTE Telephone Operations Practice **795-805-072**, Section 6, provides more grounding detail:

- Tie lead 29 (sized according to the information in NEC Article 250, Grounding Table **250-94**) to the AC ground position on the charger shelves.
- Ensure deliberate ground connection between:
  - Lead 29 AC ground positions and the chassis of the rectifier shelf. Each lead 29 is terminated with a lead 32.
  - The chassis of the rectifier shelf and the frame ironwork.

**NOTE: The deliberate ground connection can be via a ground strap or through the use of approved external tooth star-type washers.**

- Charger ground lead 31 (minimum #6 AWG stranded conductor) from the MGB connects directly to the top of the Modular Power Board frame ironwork. The connection must be to a non-painted surface using compression lugs and joint compound.
- All ground connections must be deliberate. When the requirements of this section cannot be met, lead 32 must be added to terminate on the same point (electrically) as lead 29 on a one per charger shelf basis (see Exhibit 3).

## 6. Power Connections continued

### 6.5 Modular Charger Grounding

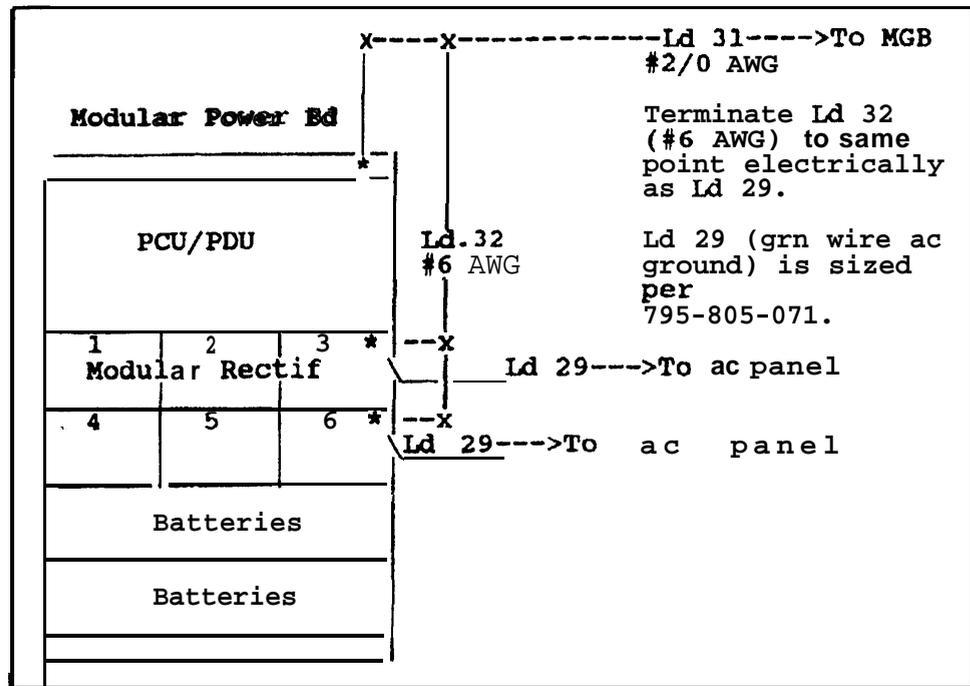


Exhibit 3 - Grounding - Modular Chargers

### 6.6 Alarms

Before operating a battery charger, wire the alarms and controlling functions located in the battery charger to either a control plug or terminal block (depending on applicability). The battery charger manual shows the locations of these leads.

Run alarm leads to the alarm sending unit according to the site-specific Work Order specifications.

### 6.7 Reference/Sense Leads

Connect the voltage regulating circuitry of most rectifiers at the point where closest voltage regulation is desired via remote sense leads.

## 6. Power Connections, continued

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6.7 Sense (reference) leads are run according to the Work Order specifications.

**Reference/Sense Methods are:**

**Leads, continued**

- in-line sense lead fusing when controllers are not used.  
Run a #10 AWG stranded wire from battery system No. 1 to the charger(s). Connect each charger via a #18 stranded AWG wire to the #10 AWG stranded wire. Fuse the lead with a 10-amp fuse (AGCS fusing kit I-I-890370 or similar). Install this in-line fuse in the negative lead as close as possible to battery cell 1, which must be visually and readily accessible. This wire fusing is required to minimize wire damage in the event of a short circuit on the wire. The intent is to comply with ANSI to eliminate unsheathed wire (P wire) on cable racking of less than the size of a #16 AWG stranded wire.
- Modular power/charger frame fusing.  
Modular power/charger configurations that have controller systems normally use internal-type sense lead fusing. The modular power frame fusing will be done according to the manufacturer's specifications. Typically a #12 stranded AWG intrabay wire is connected to the batteries in the base unit, and a #14 stranded AWG wire is used to connect the batteries in the remotes. The controller systems normally use intrabay factory wiring connected to the individual chargers.

6.8  
**DC Output**

Output cables must have a compression lug installed if the existing mechanical lug is mounted to an exposed bus and the bolts can be removed easily. If the existing mechanical lug cannot be changed without taking apart the charger chassis (i.e., the Lorain RL100B50<sup>®</sup> charger), use the mechanical lug.

Apply No-Ox-ID Type A (ID 883037)<sup>®</sup>, or equivalent, grease to:

- Cables before they are inserted into the mechanical lug.
- Lug/bus contact surfaces before torquing bolts. (Refer to GTE Telephone Operations Practice 205-000-500 for torque values.)

**WARNING:** There might be a current surge when connecting the DC output leads to the battery. This is caused if the filter capacitors are not charged. To prevent an arc, proceed as instructed in Section 7.

## 7. Charger Turn-Up

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7.1  
**General Information**

GTE Telephone Operations Practice 205-005-200 describes the standard GTE power equipment voltage threshold values for batteries, chargers, and controllers.

Steps regarding charger installation and adjustment potentiometers, which are not described in this text, must be obtained from the manufacturer's manual.

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All marks are the property of their respective owners.

# 7. Charger Turn-Up, continued

7.1

Begin charger installation by ensuring the following conditions exist:

**Introduction, continued**

- Charger input AC and output DC breaker/fuse is off or removed. Associated output alarm fuse is removed.

**NOTES: AC and DC breakers must be:**

- Locked in the OFF position with either a key or combination lock.
- Marked with a tag (ID 680921) which states "Danger - Do Not Operate."

**Refer to GTE Telephone Operations Practice 009-026-300.**

- Battery cables disconnected.
- Charger optioned for battery eliminator (will be changed later).
- Charger optioned for internal sense rather than external/remote sense (will be changed later).

**7.2 High Voltage Shutdown and Filter Charging**

When installing chargers (of any type), or returning them to service after the DC has been removed from the filter capacitors (charger output breaker or fuse has been opened), use the following procedures. The high voltage shutdown only needs to be adjusted (per the threshold values in GTE Telephone Operations Practice 205-005-200) upon installation to ensure that the charger filter capacitors are fully charged before the DC output is connected to the load (fuse or breaker applied, etc.).

Step	Performing High Voltage Shutdown and Filter Charging						
1	Lift the load share lead (if it was previously connected) and store.						
2	Use a DVOM to read and record the battery voltage at the charger, across the cables coming from the batteries.  <b>NOTE: Read all voltages with a calibrated DVOM (Fluke 8060A ID 631425, or equivalent).</b>						
3	Use a DVOM to read the voltage at the output jacks on the front of the charger. (Leave meter connected.) Since the charger is optioned for internal sense and is off, the meter should read zero (0) volts (or close to zero if the filter capacitors are bled down).  When the charger has been on-line and the DC breaker/fuse opened, do the following.						
	<table border="1"> <thead> <tr> <th>If...</th> <th>Then...</th> </tr> </thead> <tbody> <tr> <td>The test jacks read battery voltage, 52 volts, etc.</td> <td>Recheck the sense leads to ensure the charger is not on remote sense.</td> </tr> <tr> <td>The charger is optioned for internal sense, but still reads voltage.</td> <td>Find the alternate test point. (Check the schematic diagram to find a point on the circuit to read the charge on the filter capacitors.)</td> </tr> </tbody> </table>	If...	Then...	The test jacks read battery voltage, 52 volts, etc.	Recheck the sense leads to ensure the charger is not on remote sense.	The charger is optioned for internal sense, but still reads voltage.	Find the alternate test point. (Check the schematic diagram to find a point on the circuit to read the charge on the filter capacitors.)
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(continued)

## 7. Charger Turn-Up, continued

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### 7.2

#### High Voltage Shutdown and Filter Charging, continued

Step	Performing High Voltage Shutdown and Filter Charging
4	Connect a token load (Lorain toad box, Y2, ID 718042, or similar) to the output terminals of the charger for new installations when DC cables have not been connected. Provide enough load (a few amps) to keep the charger out of low current alarm when power is applied.  <b>NOTE:</b> Refer to AG Communications Systems Practice 108-850-505 or other equipment manufacturers' documentation for load box hook-up and test procedures, if required.
5	Turn on the AC breaker at the charger.
6	Switch the charger to equalize.
7	After five seconds, switch on the DC output switch or insert fuse.
8	Check to see if the charger is out of low current alarm. If not, add more load until the alarm light goes out.
9	Increase the output voltage by adjusting the charger equalize adjustment screw until the charger trips the high voltage shutdown circuit. (Monitor the DVOM and note the voltage at charger shutdown.)
10	Adjust the high voltage shutdown adjustment screw to obtain a shutdown at the proper voltage.
11	Readjust to the proper equalize voltage (per the section regarding Power Equipment Threshold Values in GTE Telephone Operations Practice 205-005-200) and switch the charger to float. If using a load box, adjust the equalize voltage at the expected, on-fine, amperage output.
12	With the charger on float, adjust the float voltage to match the voltage measured on the battery cables in Step 2.
13	Turn off the DC output breaker or remove the output fuse.
14	Remove the temporary load connected in Step 4 and connect the DC output cables.  <b>NOTE:</b> If a load box is being used, do the load share adjustments in Sections 7.3 and 7.4 while the box is still connected before connecting the output cables.

(continued)

## 7. Charger Turn-Up, continued

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### 7.2 High Voltage Shutdown and Filter Charging, continued

Step	Performing High Voltage Shutdown and Filter Charging
15	Double check the voltage on the cables versus the charger output voltage and readjust (if necessary) to make them identical. <b>NOTE: If a filter charge button is provided on the charger, Step 15 must be:</b> <b>A. Turn off the AC breaker.</b> <b>B. Press on the filter charge button until the DVOM (connected in Step 3) reads the same as the voltage recorded in Step 2.</b>
16	Turn on the DC output breaker (or install the output fuse if applicable) and reinstall the alarm fuse. <b>NOTE: If a filter charge button is provided on the charger, Step 16 must be:</b> <b>A. Apply the DC breaker/fuse.</b> <b>B. Turn on the AC breaker.</b>
17	Adjust the load share voltage per the manufacturer's instructions and Sections 7.3 and 7.4 (if not done before Step 14).
18	Turn off the charger AC breaker. Do <b>not</b> turn off the DC output breaker or remove the output fuse.
19	Option the charger for: <ul style="list-style-type: none"><li>• External/remote sense.</li><li>• Battery charger (versus battery eliminator).</li></ul>
20	Turn on the charger AC breaker.
21	Make the proper float and equalize adjustments detailed in Section 7.5 and the section regarding Power Equipment Threshold Values in GTE Telephone Operations Practice 205-005-200.
22	Test all the charger alarms.

### 7.3 Load Share Adjustment

Compare the charger amp and voltage meter with a calibrated digital meter, and adjust (if required) before beginning.

Before connecting the load share lead to the chargers (TB3A pin 3 on the Lorain charger), set the load share potentiometer. The load share potentiometer can be set with one or more chargers on-line to obtain the necessary output.

Adjust the load share potentiometer by reading the DC load share voltage (with the load share lead lifted) between the negative sense lead, pin 2, load share, pin 3 (pins are located on terminal strip TB3A).

**NOTE: Adjustment at 100% is desired but cannot always be achieved.**

## 7. Charger Turn-Up, continued

### 7.3 Load Share Adjustment, continued

The following chart provides examples of load share adjustments. The percent (%) signifies the percent of the chargers' rated output.

output Current...	Adjust Load Share Voltage to...
110%	8.8 volts
100%	8 volts
75%	6 volts
50%	4 volts
25%	2 volts

### 7.4 Load Share Calculations

If the exact output current cannot be achieved by adjusting the voltage, adding extra load, etc., use a percentage method. A load box, if available, provides the exact output required.

If a...	Then...
100 amp charger is putting out 28 amps	$28/100 = .28 \times 8 \text{ volts} = 2.24 \text{ volts}$ Adjust the load share potentiometer for 2.24 volts.
50 amp charger is putting out 40 amps	$40/50 = .8 \times 8 \text{ volts} = 6.4 \text{ volts}$ Adjust the load share potentiometer for 6.4 volts.

**IMPORTANT: Once the load share potentiometer has been adjusted according to the above voltages, do not change it. Adjust the float/equalize voltages must to provide identical output currents.**

### 7.5 Float/Equalize Voltage Adjustment

Adjust float voltage according to battery plant per the section regarding Power Equipment Threshold Values in GTE Telephone Operations Practice 205-005-200.

The typical charger has a 0.5% output voltage tolerance over the output range above 20% of the charger rating. This means that if a 100-amp charger was putting out 20 amps and then the output increased to 100 amps (shutting down other paralleled chargers), the voltage could fluctuate as much as 0.5% or 0.26 volts at 52.08 volts. This explains why the voltage goes up if each charger is adjusted alone, at a high output, and then put on-line with other chargers, resulting in a lower output.

# 7. Charger Turn-Up, continued

## 7.5 Float/Equalize Voltage Adjustment, continued

Take the following steps to ensure proper charger adjustment, assuming that AC and DC power connections have been made.

Step	Ensuring Proper Charger Adjustment								
1	Measure the voltage at the battery posts with the DVOM.								
2	Measure the voltage at the charger jacks (with the charger optioned for remote sensing).								
3	Subtract the reading obtained in Step 2 from that of Step 1								
4	Add the result of Step 3 to the float/equalize voltage measurement taken at the charger jacks. The batteries will always read that amount higher than the jacks, due to voltage drop in sense leads.								
5	Adjust each charger, on-line by itself, to approximately 0.1 volts less than the desired voltage, to allow for the 0.5% tolerance based on output. If one charger will not handle the load, place additional chargers on-line.								
6	After all chargers have been adjusted individually, put them all on-line and read voltage at the charger jacks.								
<table border="1"><thead><tr><th>If the Voltage Is...</th><th>Then Adjust...</th></tr></thead><tbody><tr><td>Low</td><td>The low output charger up.</td></tr><tr><td>High</td><td>The high output charger down.</td></tr><tr><td>Equally high or low in all chargers</td><td>All chargers up or down as required.</td></tr></tbody></table>		If the Voltage Is...	Then Adjust...	Low	The low output charger up.	High	The high output charger down.	Equally high or low in all chargers	All chargers up or down as required.
If the Voltage Is...	Then Adjust...								
Low	The low output charger up.								
High	The high output charger down.								
Equally high or low in all chargers	All chargers up or down as required.								
7	Repeat Steps 5 and 6 on both float and equalize to attain the proper voltage and charger output current to within 5% of each other.								
	<b>NOTE: Chargers are normally factory-set to equalize at 54 volts for 23 or 24 cells. This is 2.35 volts per cell for 23 cells and 2.25 volts per cell for 24 cells. The actual equalize voltage is determined by the high voltage limit of the switching systems the power plant is running. For the proper settings, refer to the section regarding Power Equipment Threshold Values in GTE Telephone Operations Practice 205-005-200.</b>								
a	Read the voltage at the battery terminals and ensure that the float/equalize voltage is correct. Readjust if necessary; your sense lead voltage drop reading might have been slightly off.								

## 7. Charger Turn-Up, continued

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### 7.6 Limiting Current

Verify that the current limit has been strapped or adjusted not to exceed the manufacturer's recommendation or setting. Unless stated differently in the charger manufacturer's documentation, set the charger for 110% of the rated output of the charger.

Push the charger into current limiting by:

- Turning off other paralleled chargers.
- OR
- Turning off all chargers for a short time to allow the battery to drain down slightly. When one charger is turned on, it draws sufficient current to activate the current limiting circuit.

### 7.7 Identification

In addition to labeling the chargers, label all voltage settings established for power equipment on the face of that equipment. Refer to GTE Telephone Operations Practice 244-251-200 and Series 075-222-XXX for information pertaining to labeling and materials.

Designate each AC circuit breaker or electrical disconnect as to which charger it serves. Label the charger by indicating its power source.

Label all power and alarm threshold voltage settings on the front panels as applicable per the values in GTE Telephone Operations Practice 205-005-200:

- Float.
- Equalize.
- Low and high voltage shutdown.

If using a modular power board, labeling for these values is on the controller.