

3609-22 24 VDC Power Supply Unit-Redundant (PSU-R)

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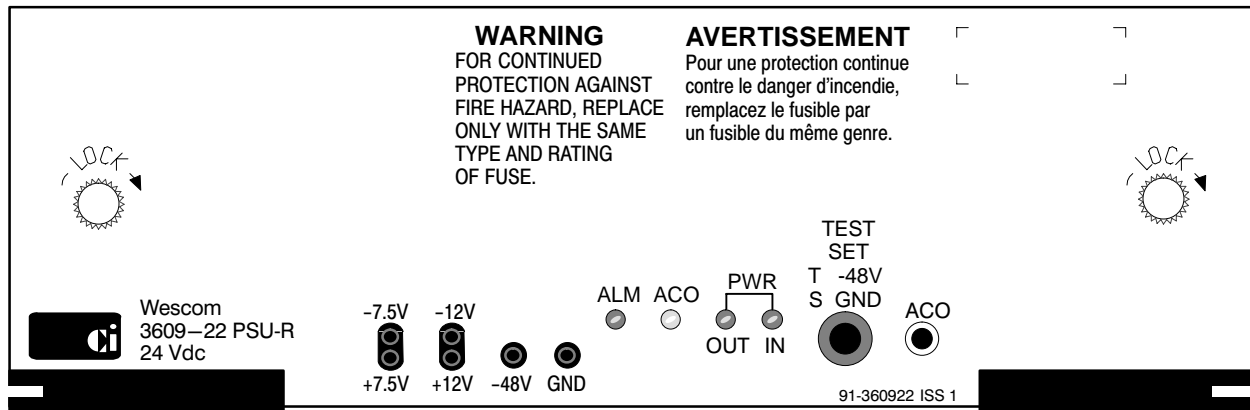


Figure 1. 3609-22 PSU-R Front Panel

1. GENERAL

1.1 Document Purpose

This document provides information for the Charles Industries 3609–22 Power Supply Unit-Redundant (PSU-R), shown in Figure 1.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function

The 3609–22 PSU-R is part of the common equipment for the 360–22 D4 Digital Carrier Terminal (channel bank). One PSU-R derives all the necessary dc voltages, including talk battery, to operate an entire 360–22 digital carrier terminal from a ± 24 Vdc input. The 3609–22 PSU-R is also designed to provide redundant operation. When used in a redundant configuration, two PSU-Rs are required, which work together in a power-sharing configuration. If one PSU-R fails, power will be completely and solely supplied by the second PSU-R.

1.4 Equipment Location/Mounting

1.5 Equipment Features

The 3609–22 PSU-R features include the following:

- Soft-start circuit
- Output over-voltage sensing/clamping
- Primary current limiting and overload shutdown with automatic recovery
- Fault isolation of all outputs
- LEDs to signify power-in, power-out, and system alarm conditions
- System alarm contacts
- Pin-jack test points to monitor -48 Vdc, ± 12 Vdc, and ± 7.5 Vdc outputs and GND
- Bantam jack -48 Vdc output for powering external test equipment
- Terminal strip peel-off label attaches to the rear of the 360–22 channel bank at TB4 to mark the power connections to the 360–22 channel bank

2. INSPECTION

2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.



STATIC-SENSITIVE

This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:

- Use approved static-preventive measures (such as static-conductive wrist straps and static-dissipative mats) at all times whenever touching units outside of their original, shipped, protective packaging.
- Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.
- Always use the original static-protective packaging for shipping or storage. Return a tested unit to its original protective packaging for storage.

3. APPLICATION GUIDELINES

The 3609–22 Power Supply Unit-Redundant (PSU-R) can only be used with the 3603–02 (LIU–3E) and the 3608–04 (DIU–R) as a common equipment set for the 360–22 D4 Digital Carrier Terminal (channel bank). Refer to Figure 2.

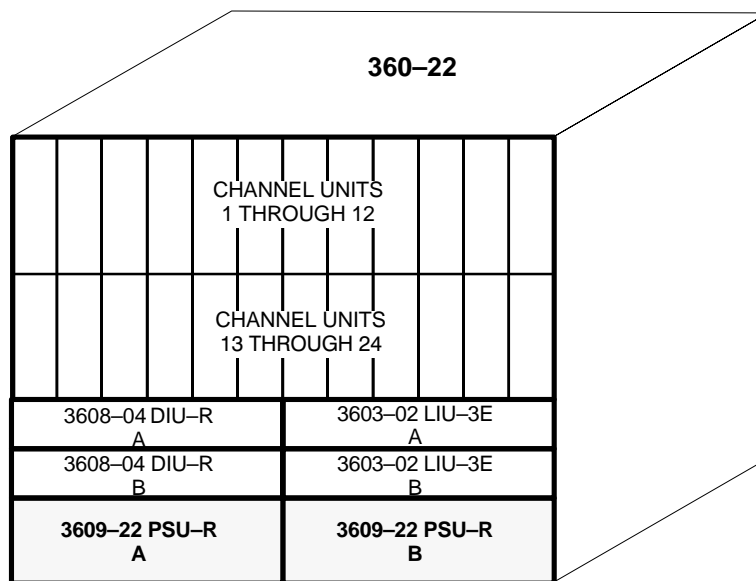


Figure 2. 3609–22 Mounting Location within the 360–22 Channel Bank

Application-specific alarm features are available via the front panel ACO switch and the PCB-mounted screw options on the 3609–22, as described in Part 5.

4. CIRCUIT DESCRIPTION

The 3609–22 Power Supply Unit-Redundant (PSU-R) utilizes 80 KHz and 300 KHz switching regulators to generate regulated output voltages of ± 7.5 , ± 12 , and -48 Vdc. The following paragraphs describe the circuit and alarm features. Refer to Figure 3, the 3609–22 PSU-R Block Diagram, as needed.

4.1 Circuit Features

The 3609–22 PSU-R contains the following circuit features.

4.1.1 Soft Start

A soft start feature limits the inrush current into the card when the PSU-R is first plugged in.

4.1.2. ± 24 Volt Operation

The 3609–22 PSU-R employs a bridge rectifier that allows either plus (+) or minus (–) 24 volts to be applied. See Figure 4.

4.1.3. Output Over-Voltage Sensing and Clamping

An output over-voltage sensing and clamping feature protects the channel bank system against excessive regulated output voltage.

4.1.4. Overload Shutdown with Automatic Recovery

The overload shutdown with automatic recovery feature protects the PSU-R against output short circuits.

4.1.5. Fault Isolation of All Outputs

A fault isolation of all outputs feature prevents a faulty power supply output from damaging or inhibiting a second (redundant) power supply if a power supply fault occurs.

4.2 Alarm Relay Features

The following describes the operation of the alarm relays. The block diagram shows all relay contacts in the de-energized state.

4.2.1. PAA Relay

The PAA relay is normally operated in the non-alarm state and will release under red or yellow alarm conditions. The PAA relay alarms the entire digital carrier terminal.

4.2.2. MAJ Relay

The MAJ relay is normally operated in the non-alarm state and will release in the alarm state. The MAJ relay is placed in the alarm state when a service-affecting alarm condition has been detected.

4.2.3. ACO Relay

The ACO (Alarm Cut Off) relay is normally released and is used to disable office audible (and optional visual and major alarms). Operation is accomplished, after an alarm condition exists, either by depressing the front-panel-mounted ACO switch or by a contact closure, from a remote ACO switch, across pins 21 and 23. When all alarm conditions in both common equipment sets are cleared, the ACO relay is automatically released.

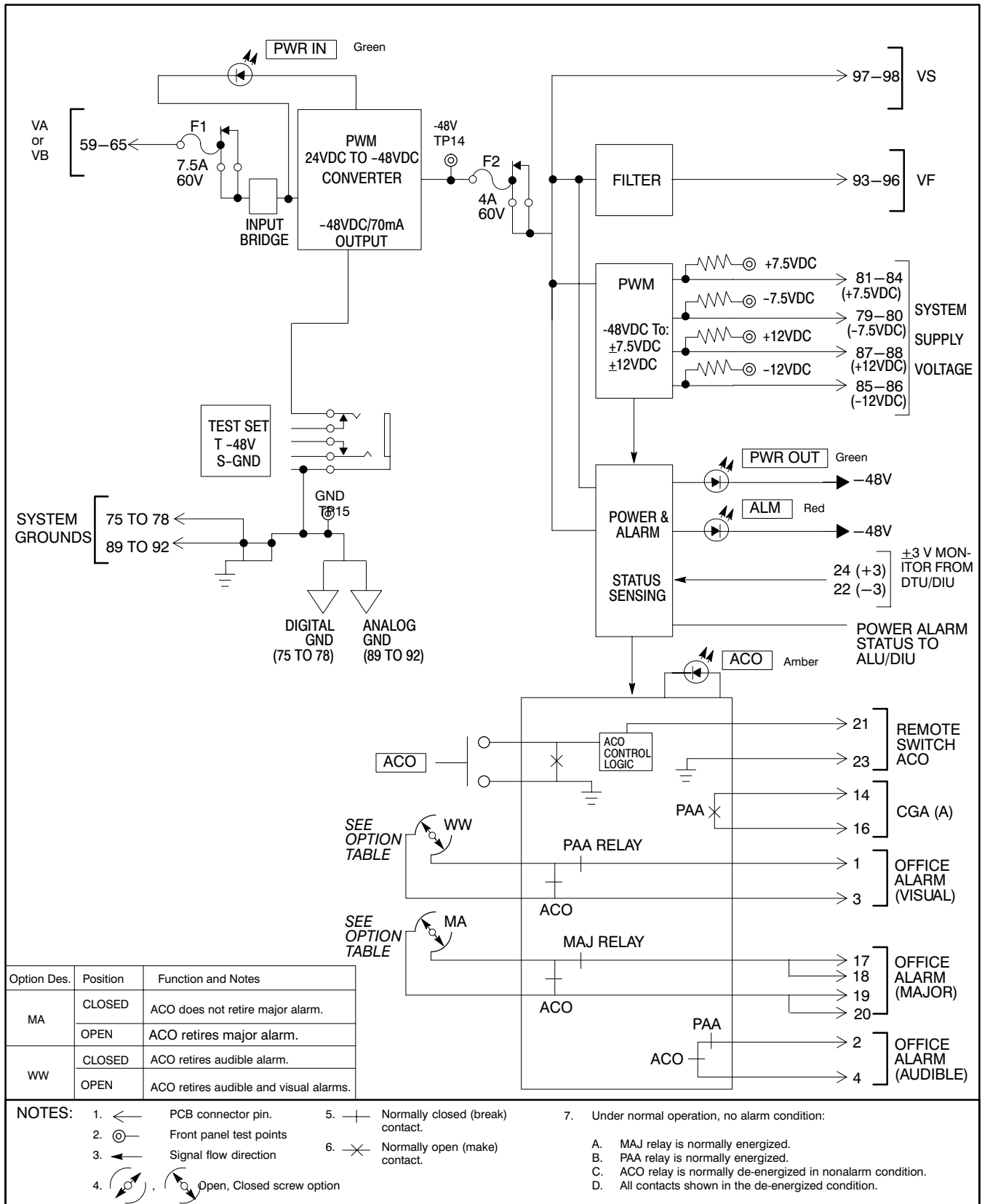


Figure 3. 3609-22 Block Diagram

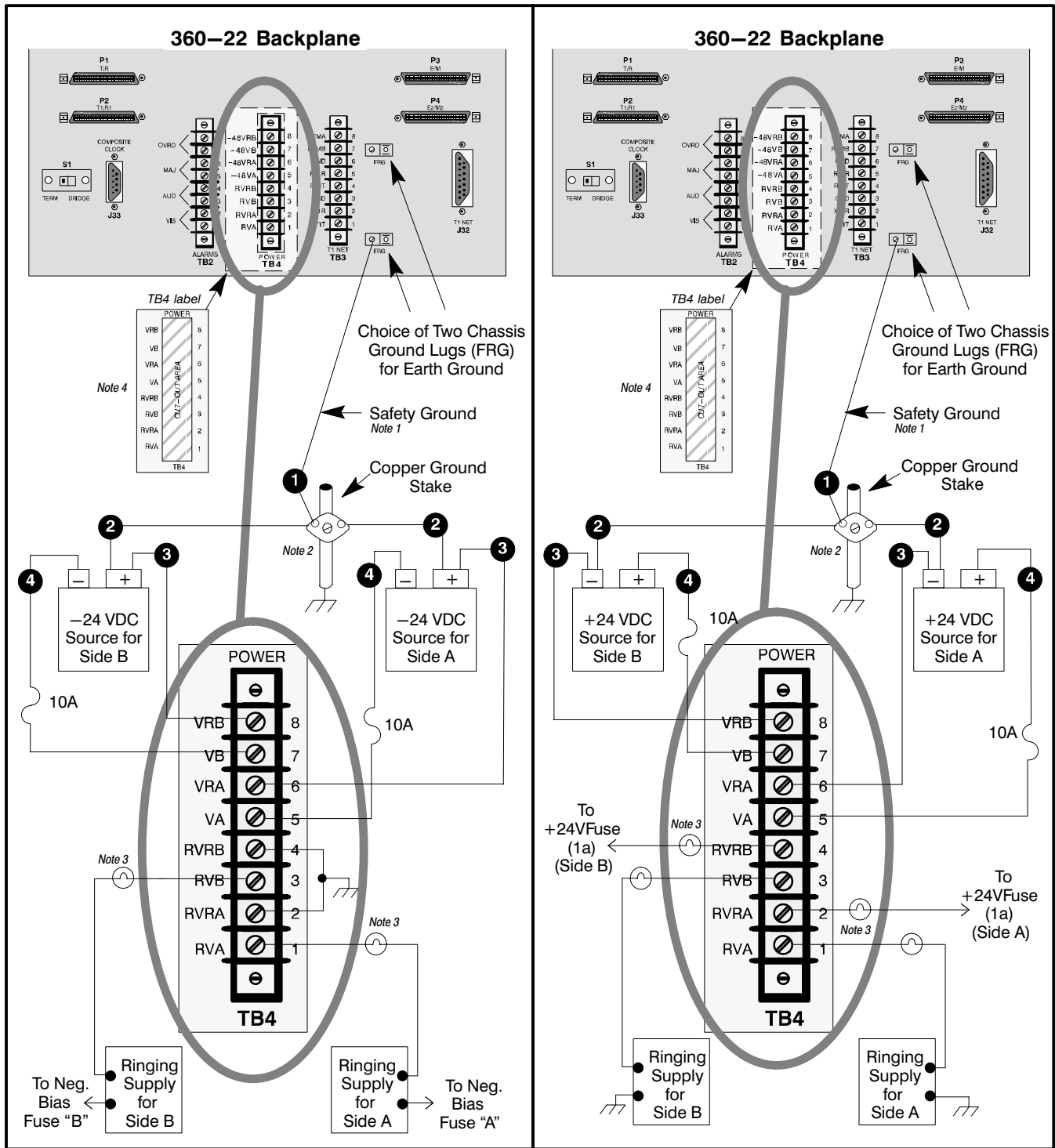


Figure 4a. Power Connections For –24 Volt Input Operation

Figure 4b. Power Connections For +24 Volt Input Operation

Notes:

- ① Numbered circles correspond with numbered steps in the installation procedure.
- 1. Safety ground MUST BE a non-current carrying wire.
- 2. Earth ground must always be connected to voltage return.
- 3. 13C Ballast Lamp or equivalent.
- 4. Peel and place the provided label over the TB4 power terminal strip on the rear of the 360–22.

Figure 4. 3609–22 Power Connections at rear of 360–22 Channel Bank

5. OPTIONS & FEATURES

The 3609–22 PSU-R contains options and features on the printed circuit boards (PCBs) and on the front panel. The PCB options are described in Table 1, and shown in Figure 5. The front panel features are described in the paragraphs that follow and are shown in Figure 6.

Note: When opening a screw option, rotate the screw counterclockwise two full turns to ensure that the connection is open. When closing a screw option, rotate the screw clockwise until it seats.

5.1 Front Panel Features

The front panel of the 3609–22 contains four LEDs, an ACO push button, a bantam jack, and pin-jack test points, as described below.

5.1.1. ALM LED (Red)

An illuminated ALM LED on the front panel is caused by one of the following:

- +7.5 Vdc, –7.5 Vdc, +12 Vdc, or –12 Vdc regulated output voltages low
- Blown secondary fuse F2
- $\pm 3\text{V}$ system voltage low or respective DIU-R not installed
- Output over-current and over-voltage conditions

5.1.2. PWR IN and PWR OUT LEDs (Green)

Illuminated PWR OUT and PWR IN LEDs on the front panel indicate that regulated output voltages are within their tolerances and the presence of 24 Vdc input, respectively.

5.1.3. ACO LED (Yellow)

An illuminated ACO LED during a system alarm condition is caused by either a depressed front-panel-mounted ACO switch or a contact closure, from a remote ACO switch, across pins 21 and 23 of the PSU connector.

5.1.4. ACO Push Button Switch

During a system alarm condition, the ACO switch can be depressed to disable the audible alarm contacts and optionally can disable the visual and major alarms, depending on the settings of screw options WW and MA. When the ACO push button is depressed, the ACO LED will illuminate during an alarm condition.

5.1.5. Bantam Jack “TEST SET T –48V S GND”

The front panel bantam jack, labelled “TEST SET T –48V S GND”, provides a –48 Vdc, 70 mA output for powering external test equipment. The “T” stands for Tip, and “S GND” stands for Sleeve Ground.

5.1.6. Pin-jack Test Points

Pin-jack test points are provided for the –48 V, +12 V, –12 V, +7.5 V, and –7.5 V outputs. A GND (ground) pin-jack test point is also provided.

Table 1. 3609–22 Options & Features

| Item Label | Type | Location | Position | Function |
|--|--------------|-------------|----------|---|
| WW | Screw Option | Baby Board | Closed | ACO retires audible alarm only. Close screw option WW to allow the Alarm Cut Off (ACO) button on the PSU-R, or the remote ACO, to disable only the office audible alarm. |
| | | | Open | ACO retires audible and visual alarms. Open screw option WW on the baby board to allow the Alarm Cut Off (ACO) button on the PSU-R, or the remote ACO, to disable both the office <u>audible</u> and <u>visual</u> alarms. |
| MA | Screw Option | Baby Board | Closed | ACO does not retire major alarm. Close screw option MA to prevent the major alarm from being de-activated when the ACO is activated. |
| | | | Open | ACO retires major alarm. Open screw option MA on the baby board to allow the Alarm Cut Off (ACO) button on the PSU, or the remote ACO, to disable the <u>major</u> alarm. |
| F1 | Fuse (GMT) | PCB | | 7.5 amp fuse, for 24 volt input (field replaceable). This main PSU fuse provides a fused input to the switching regulators. A blown fuse will result in loss of all regulated outputs and none of the LEDs will illuminate. Also, all relays will be in the alarm state. An excessive input voltage or damaged PSU will cause the fuse to blow. |
| F2 | Fuse (GMT) | PCB | | 4 amp fuse, for 48 volt supply (field replaceable). This secondary PSU fuse provides fusing to the switching regulator, PS1, –48VF and –48VS. A blown secondary fuse will cause the ALM LED to illuminate and the PWR OUT LED to extinguish. If main power is present, the PWR IN LED will illuminate. A shorted –48VS or a –48VF may blow this fuse. |
| ACO | Push-button | Front Panel | | Alarm cut-off switch. During a system alarm condition, the ACO switch can be depressed to disable the audible alarm contacts and optionally can disable the visual and major alarms, depending on the settings of screw options WW and MA. |
| –7.5V, +7.5V, –12V, +12V, –48V, GND | Pin-Jacks | Front Panel | | Enables monitoring of all input and output voltages referenced to ground. |
| TEST SET T -48V S GND | Bantam-Jack | Front Panel | | Provides a –48 Vdc, 70 mA output for powering test equipment such as a 3616–00 Voice Transmission Test Unit. |

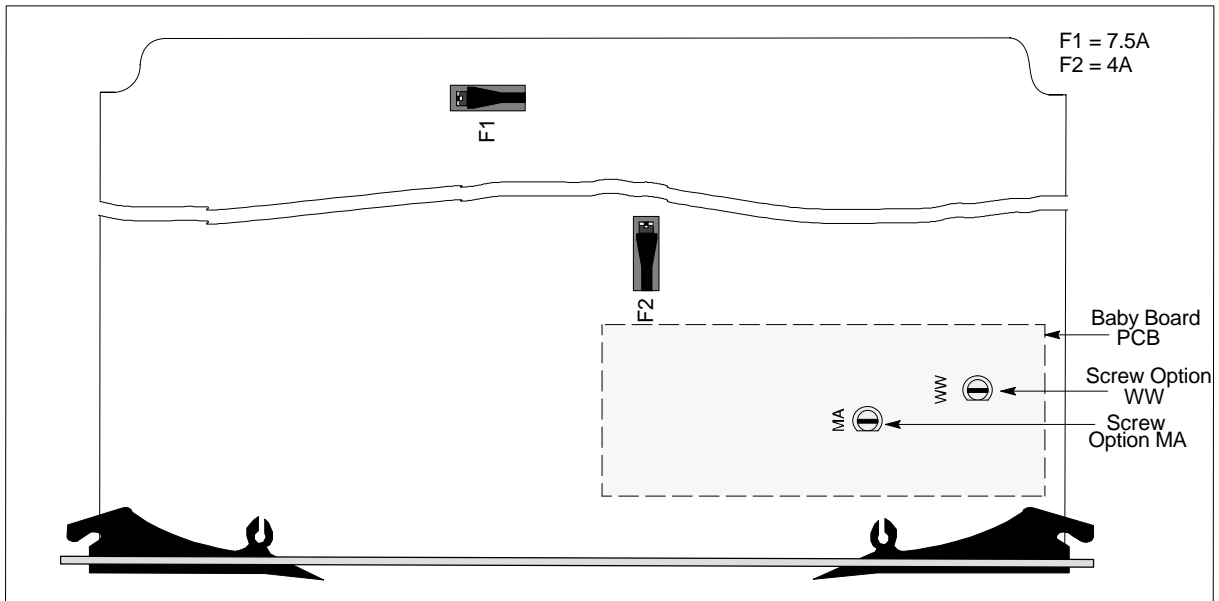


Figure 5. 3609–22 PCB Option/Feature Locations, Top View

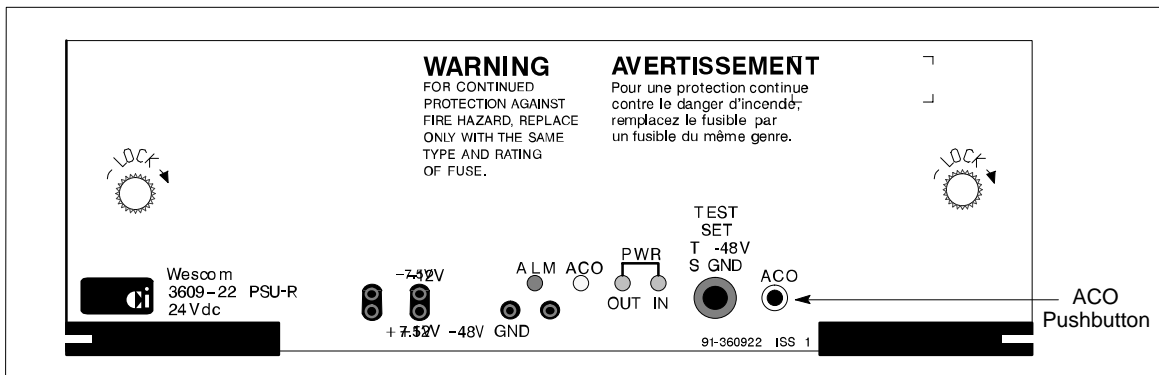


Figure 6. 3609–22 Front Panel Feature Locations

6. MOUNTING

Two 3609–22 PSU-Rs mount in the dedicated common equipment slots of a 360–22 D4 digital carrier terminal (channel bank), as shown in Figure 2.

CAUTION

Installation and removal of modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector to verify proper alignment and remove any foreign material.

7. INSTALLATION

Use the following steps to install the 3609–22 PSU-R. Steps 1 through 4 are also shown in Figure 4. Care must be taken during installation: an improper installation might result in damage to equipment or personnel. Locate the label shipped with the unit and apply it over the TB4 terminal strip on the rear of the 360–22 channel bank prior to making connections.

Before making connections, remove all modules from the bank and disconnect any pre-existing power connections.

Note: RINGING VOLTAGE NOTE

The 3609–22 supplies all voltages needed to make the 360–22 channel bank work, with the exception of the bias for the external ring generator. When using FXS or PLARD, the loop signaling range will be half the normal operating range.

| Step | Action |
|------|--|
| 1. | Connect EARTH GROUND to one of the terminal lugs labelled “FRG” on the back of the channel bank |
| 2. | Connect EARTH GROUND to the proper ground terminal on the 24 VDC power source (see Figure 4). |
| 3. | <p>If the application requires a MINUS (–) 24 volt input source (see Figure 4a), connect the PLUS lead of the Side A power source to the terminal labelled “VRA” on the back of the channel bank. Do the same thing for the Side B source: connect the PLUS lead of the Side B power source to the terminal labelled “VRB”.</p> <p>If the application requires a PLUS (+) 24 volt input source (see Figure 4b), connect the MINUS lead of the Side A power source to the terminal labelled “VRA” on the back of the 360–22 channel bank. Do the same thing for the Side B source: connect the MINUS lead of the Side B power source to the terminal labelled “VRB”.</p> |
| 4. | <p>If the application requires a MINUS (–) 24 volt input source (see Figure 4a), connect the MINUS lead of the Side A power source through a 10-amp fuse to the terminal labelled “VA” on TB4 on the back of the 360–22 channel bank. Do the same thing for the Side B source: connect the MINUS lead of the Side B power source through a 10-amp fuse to the terminal labelled “VB”.</p> <p>If the application requires a PLUS (+) 24 volt input source (see Figure 4b), connect the PLUS lead of the Side A power source through a 10-amp fuse to the terminal labelled “VA” volt on the back of the channel bank. Do the same thing for the Side B source: connect the PLUS lead of the Side B power source through a 10-amp fuse to the terminal labelled “VB” volt on the back of the channel bank.</p> |
| 5. | Insert the 3609–22 PSU-R into the proper location. See Figure 2. |
| 6. | On the front panel of the 3609–22 PSU-R, only the PWR IN and PWR OUT LEDs should be illuminated. Check the presence of all voltages (± 7.5 Vdc, ± 12 Vdc and -48 Vdc referenced to GND). If all voltages check as indicated, go to Step 7 below. If one or more of the voltages are missing, refer to the troubleshooting procedure. |
| 7. | Insert all the common equipment units. |
| 8. | Insert all channel units. Refer to section number 360–022–600 for turn-up and acceptance testing. |

Note: Make ringing generator connections as shown in Figure 4.

8. TESTING AND TROUBLESHOOTING

Refer to section number 360–022–600 for turn-up and acceptance test procedures for common equipment and section number 360–022–700 for troubleshooting information.

9. TECHNICAL ASSISTANCE

9.1 Technical Assistance — U.S.

If technical assistance is required, contact Charles Industries’ Technical Services Center at:

- 847–806–8500
- 847–806–8556 (FAX)
- 800–607–8500
- techserv@charlesindustries.com (e-mail)

9.2 Technical Assistance — Canada

Canadian customers contact:

905–821–7673 (Main Office)

905–821–3280 (FAX)

10. WARRANTY & CUSTOMER SERVICE

10.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles Industries. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.
5600 Apollo Drive
Rolling Meadows, Illinois 60008–4049
847–806–6300 (Main Office)
847–806–6231 (FAX)

10.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

10.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an “advanced replacement” service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided. Call your customer service representative at the telephone number above for more details.

10.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries for either repair and quality testing or exchanged for a replacement unit, as determined by Charles Industries. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217–932–5288 (FAX 217–932–2943).

Repair Service Procedure

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.
2. Include the following information:
 - Company name and address
 - Contact name and phone number
 - Inventory of equipment being shipped
 - Particulars as to the nature of the failure
 - Return shipping address
3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.

CI Service Center
 Route 40 East
 Casey, IL 62420–2054

4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

11. SPECIFICATIONS

11.1 Electrical Specifications

The electrical characteristics of the 3609–22 PSU-R are as follows:

- (a) OPERATING VOLTAGE RANGE: –24 to –35 Vdc or +24 to +35 Vdc.
- (b) TYPICAL CURRENT (DRAIN AT ±24 VDC INPUT FOR FULLY LOADED CHANNEL BANK): 4.0 A.
- (c) MAXIMUM OUTPUT POWER: 110 watts.

11.2 Physical Specifications

The physical characteristics of the 3609–22 PSU-R are shown in Table 2.

Table 2. 3609–22 Physical Specifications

| Feature | U.S. | Metric |
|----------------|--------------------------|------------------|
| Height | 2.4 inches | 6.1 centimeters |
| Width | 8.5 inches | 21.6 centimeters |
| Depth | 10.6 inches | 27 centimeters |
| Weight | 3 lb. 6 ounces | 1.5 kilograms |
| Temperature | 32 to 122°F | 0 to 50°C |
| Humidity | To 95% (no condensation) | |

12. REFERENCES

Refer to the following documents for additional information:

- 360–022–501** 360–22 D4 Digital Carrier Terminal General Description, Application & Installation Procedures
- 360–022–600** 360–22 D4 Digital Carrier Terminal Turn-Up and Acceptance Test Procedure for Common Equipment and Channel Units
- 360–022–700** 360–22 D4 Digital Carrier Terminal Troubleshooting Procedures
- 360–302–202** 3603–02 And 3603–32 Line Interface Units (Mode 3 ESF (LIU-3E))
- 360–804–201** 3608–04 Digroup Interface Unit - Redundant (DIU-R)

