Eight-card Shelf, 751109/13

Description and Installation

POSITRON

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1. The Eight-card Shelf

The Eight-card Shelf, model 751109/13, is used indoors to accommodate eight service cards. The shelf is molded from specially treated polyurethane, making it a lightweight, flame retardant product of high dielectric strength. Its polyurethane body limits the possibility of many kinds of infiltration while providing reliable isolation from external ground potentials.

The shelf is equipped with the connectors required for any of the plug-in cards from the Teleline line of products. In addition, the shelf has a separate area to accommodate a Power Supply Card, model 751313 (120 V ac/130 V dc), 751324 (24 V dc), or model 751316 (-48 V dc), and a Battery Backup Card, model 751312 to provide an uninterruptible power supply (UPS). If the Battery Backup is not used, then two Power Supply Cards may be installed for redundancy.

The shelf is shipped with a station cable stub for connection to communications equipment, a Polyolefin Insulated Cable (PIC) stub for connection to the Central Office (CO) incoming cable, and a power cable.

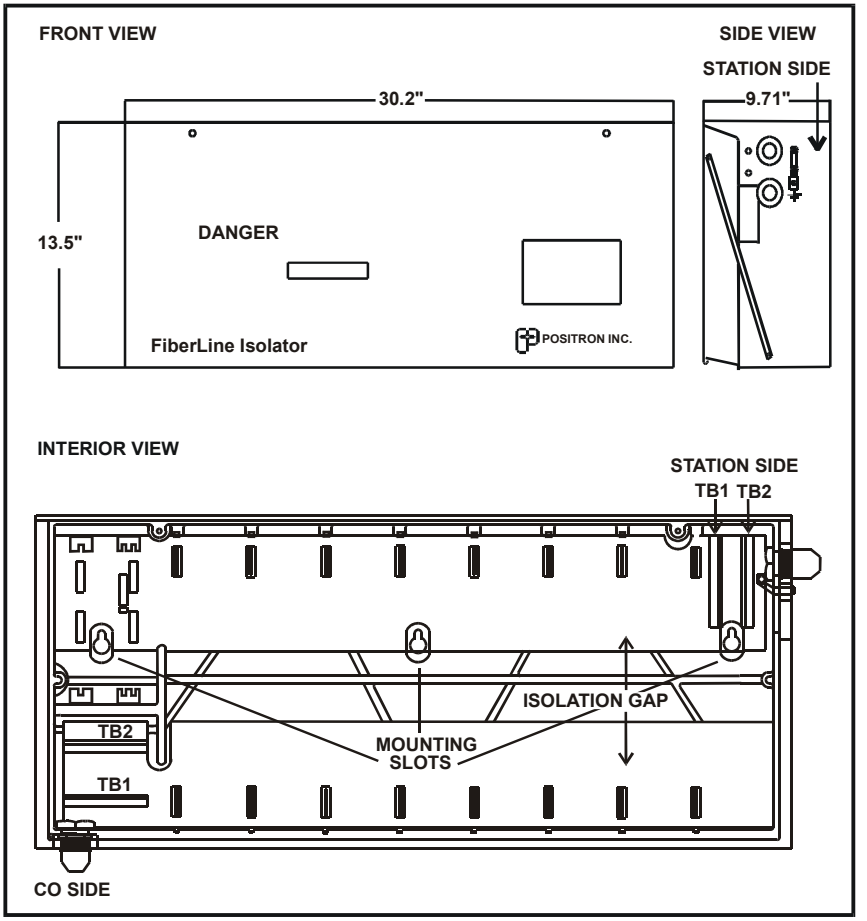
The shelf's features include the following:

- The station and CO cables connect to the shelf via individual printed circuit boards.
- Each of the five card slots can accommodate two Tip and Ring pairs for four-wire AC data applications, four-wire T1 applications, HDSL and ADSL applications.
- The station and CO cables are prewired to male connectors for insertion into the female receptacles mounted on the printed circuit boards inside the shelf. The power cable provided is used to supply 120 V ac to the shelf when an internal Power Supply Card is used. The cable may also be used for V dc applications if the three-prong plug is removed.
- The shelf has been successfully tested for the UL standard (94V0) for flame retardance.
- The unit is lightweight and easy to install. The weight of the shelf with the motherboards is 22 lbs (9.95 kg).
- The enclosure resists the infiltration of dust, mist, and water from sprinklers.

For a view of the Eight-card Shelf, refer to Figure 1.

2 Eight-card Shelf

Figure 1 Model 751109/13



2. Physical Specifications

For a listing of the module's physical specifications, refer to Table 1.

Table 1 Physical Specifications

Parameter	Specifications
Height	13.5" (34.29 cm)
Width	30.2" (76.71 cm)
Depth	9.71" (24.66 cm)
Weight	22.0 lbs (9.95 kg)

3. Cable Options

The Eight-card Shelf is equipped with CO and station color coded cable stubs.

- 10’ CO and station color coded cable stubs are provided with the Eight-card Shelf. For a listing of pin-outs for the CO and the Station side cables color coding, refer to Table 2.

Note

Within the Eight-card Shelf, lines using DX signalling or DC loopback to power a T1 or HDSL Four-wire or Two-wire repeater, can be protected using three Teleline isolator cards per line. Refer to the Holding Coil Unit Description and Installation, model 7501-40, for important wiring information.

Table 2 Pin-Out for CO Cable and Station Cable with Color Coding, 751109/13

			CO Cable with Color Coding		Station Cable with Color Coding	
Shelf Slot	**Label**	**Description**	**Connector Position**	**25-Pair Cable**	**Connector Position**	**25-Pair Cable**
1	T1 R1	TIP 1 RING 1	TB1-17 TB2-17	White Blue	TB1-18 TB2-18	White/Blue Blue/White
2	T2 R2	TIP 2 RING 2	TB1-16 TB2-16	White Orange	TB1-17 TB2-17	White/Orange Orange/White
3	T3 R3	TIP 3 RING 3	TB1-15 TB2-15	White Green	TB1-16 TB2-16	White/Green Green/White
4	T4 R4	TIP 4 RING 4	TB1-14 TB2-14	White Brown	TB1-15 TB2-15	White/Brown Brown/White
5	T5 R5	TIP 5 RING 5	TB1-13 TB2-13	White Slate	TB1-14 TB2-14	White/Slate Slate/White
6	T6 R6	TIP 6 RING 6	TB1-12 TB2-12	Red Blue	TB1-13 TB2-13	Red/Blue Blue/Red
7	T7 R7	TIP 7 RING 7	TB1-11 TB2-11	Red Orange	TB1-12 TB2-12	Red/Orange Orange/Red
8	T8 R8	TIP 8 RING 8	TB1-10 TB2-10	Red Green	TB1-11 TB2-11	Red/Green Green/Red
1	TA RA	TIP 1 (2nd pair) RING 1 (2nd pair)	TB1-2 TB2-2	Red Brown	TB1-3 TB2-3	Red/Brown Brown/Red
2	TB RB	TIP 2 (2nd pair) RING 2 (2nd pair)	TB1-3 TB2-3	Red Slate	TB1-4 TB2-4	Red/Slate Slate/Red
3	TC RC	TIP 3 (2nd pair) RING 3 (2nd pair)	TB1-4 TB2-4	Black Blue	TB1-5 TB2-5	Black/Blue Blue/Black
4	TD RD	TIP 4 (2nd pair) RING 4 (2nd pair)	TB1-5 TB2-5	Black Orange	TB1-6 TB2-6	Black/Orange Orange/Black
5	TE RE	TIP 5 (2nd pair) RING 5 (2nd pair)	TB1-6 TB2-6	Black Green	TB1-7 TB2-7	Black/Green Green/Black
6	TF RF	TIP 6 (2nd pair) RING 6 (2nd pair)	TB1-7 TB2-7	Black Brown	TB1-8 TB2-8	Black/Brown Brown/Black

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			CO Cable with Color Coding		Station Cable with Color Coding	
Shelf Slot	**Label**	**Description**	**Connector Position**	**25-Pair Cable**	**Connector Position**	**25-Pair Cable**
7	TH RH	TIP 7 (2nd pair) RING 7 (2nd pair)	TB1-8 TB2-8	Black Slate	TB1-9 TB2-9	Black/Slate Slate/Black
8	TJ RJ	TIP 8 (2nd pair) RING 8 (2nd pair)	TB1-9 TB2-9	Yellow Blue	TB1-10 TB2-10	Yellow/Blue Blue/Yellow
	RMT GND	REMOTE GROUND	TB1-1 TB2-1	Violet Slate	N/A N/A	N/A N/A
	GND GND RU GEN RU GEN -24V -24V -48V -48V	GROUND GROUND RING-UP GEN RING-UP GEN -24V SUPPLY -24V SUPPLY -48V SUPPLY -48V SUPPLY	N.A. N.A. N.A. N.A. N.A. N.A. N.A. N.A.	N.A. N.A. N.A. N.A. N.A. N.A. N.A. N.A.	TB1-2 TB1-2 TB1-1 TB1-1 TB2-1 TB2-1 TB2-2 TB2-2	Yellow/Green Green/Yellow Violet/Brown Brown/Violet Yellow/Slate Slate/Yellow Violet/Orange Orange/Violet

The pairs labelled from A to J are used only for the four-wire plug-in cards, model 7501-24, 751329 or 751339. The Ring-Up Generator line may be used to supply 130 V dc to the shelf.

4. Shelf Mounting

The Eight-card Shelf should be installed as closely as possible to the point of entry of the CO cable. Power will need to be routed to the shelf (24 V, -48 V, 130 V dc or 120 V ac). A Non-Fragmenting Lightning Arrestor Unit (model 751123 or 751126) is also highly recommended.

Caution

- Stand on a thick rubber mat and wear rubber gloves during the installation procedure. It is preferable to perform these procedures on a clear dry day when a Ground Potential Rise (GPR) or transients are less likely to occur.
- It is strictly forbidden to install any additional hardware inside the shelf or to drill any holes in its surface. Doing so would greatly compromise safety and isolation.

1. Verify that you have the following customer provided tools and hardware which are required to install the unit:

- Center punch
- Electric drill with a 5/32” diameter bit
- 7/16” hex wrench
- 1/8” common blade screw driver
- 1” x 4’ x 8’ plywood sheet and appropriate mounting hardware
- Cable clamps, tie wraps, and mounting hardware for routing cables exterior to the shelf (quantity determined by the cable lengths involved).

2. Unpack the Eight-card Shelf and its installation hardware from its protective box.

3. Check the contents of your Eight-card Shelf kit. For a listing of the items included in the kit, refer to Table 3.

Table 3 Model 751109/13 Kit Contents

Model	Items Included	Qty	Part No. Found on Item
751109/13	Eight-card Shelf	1	244-040007-401
	Description and Installation document	1	924-010040-001
	CO side PIC cable (10')	1	207-751116-401
	Station side cable with alternate color coding (10')	1	207-751115-406
	Eight-card Shelf accessory kit:	1	241-010101-401
	Power Supply cable	1	207-990000-093
	Drilling template	1	220-000040-201
	Connector, cord grip, hub, 3/4"	1	230-990400-025
	Connector, cord grip, hub, 1/2"	2	230-990400-036
	Instruction sheet for strain relief	1	241-010006-001
	Instruction sheet for PIC cable	1	241-010008-001
	Instruction sheet for Station side cable	1	241-010009-001
	Cap rod	1	550-010031-001
	Cable fastener, 0.75"	3	706-990000-010
	Hex nut, 3/4"- 14NPT	1	714-990000-003
	Hex nut, 1/2"- 14NPT	2	714-990000-005
	Wing nut, 10-32 THD	2	714-990000-040
	Hex screw with washer	3	724-990000-026

4. To mount the shelf, install the plywood backboard on the wall to provide the installation with additional isolation from station ground. Then attach the drilling template to the plywood surface where the shelf will be located. As indicated on the template, drill three holes for the #14 screws supplied. Remove the template and install the screws.

5. Before mounting the shelf on the wall, open the cover of the shelf by removing the two wing nuts on the face cover of the shelf.

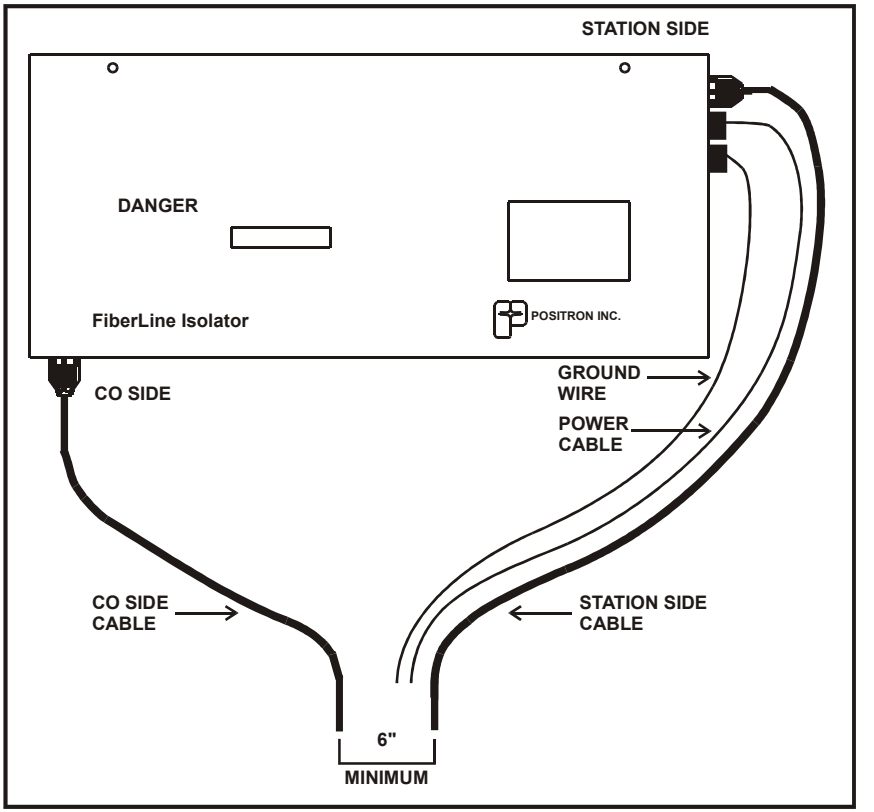
6. With the cover open, mount the shelf using the keyholes as per the instructions given on the drilling template, and then tighten the #14 screws. It is unnecessary to further isolate the screws from station ground.

5. Cable Connections

Caution

The CO cable should be kept at least 6” apart from the station cable and the ground wire in order to prevent an electric arc between the two in the event of damage to, or degradation of, their insulation. For an illustration, refer to Figure 2.

Figure 2 CO and Station Cable Separation



5.1 Station Side Cable Connection

1. Feed the free end of the cable through the upper hole on the upper right-hand side of the shelf, from the inside to the outside.
2. Slide the free end of the station cable through the nut of one of the 1/2” strain reliefs provided.
3. Plug the male connectors into female receptacles TB1 and TB2. For a diagram of the Station side terminal blocks, refer to Figure 3.
4. Take the remainder of the strain relief (gland nut, chuck, neoprene bushing, and body and slide it up the cable from the free end outside the shelf to the shelf opening. Secure the cable by holding the nut inside the shelf and tightening the grip by turning the gland nut.

Danger

The cable wires should be tightly bundled together inside the shelf to minimize the chance of a broken wire touching an adjacent plug-in card, or from sagging into the isolation gap between the Station and CO side motherboards.

5. Connections between the station cable and the site equipment cables can now be made according to the color coding as appropriate.

   For a listing of the standard color codes, refer to Table 2.

   For a view of Station side motherboard interconnections, refer to Figure 4.

Figure 3 Station Side Terminal Blocks

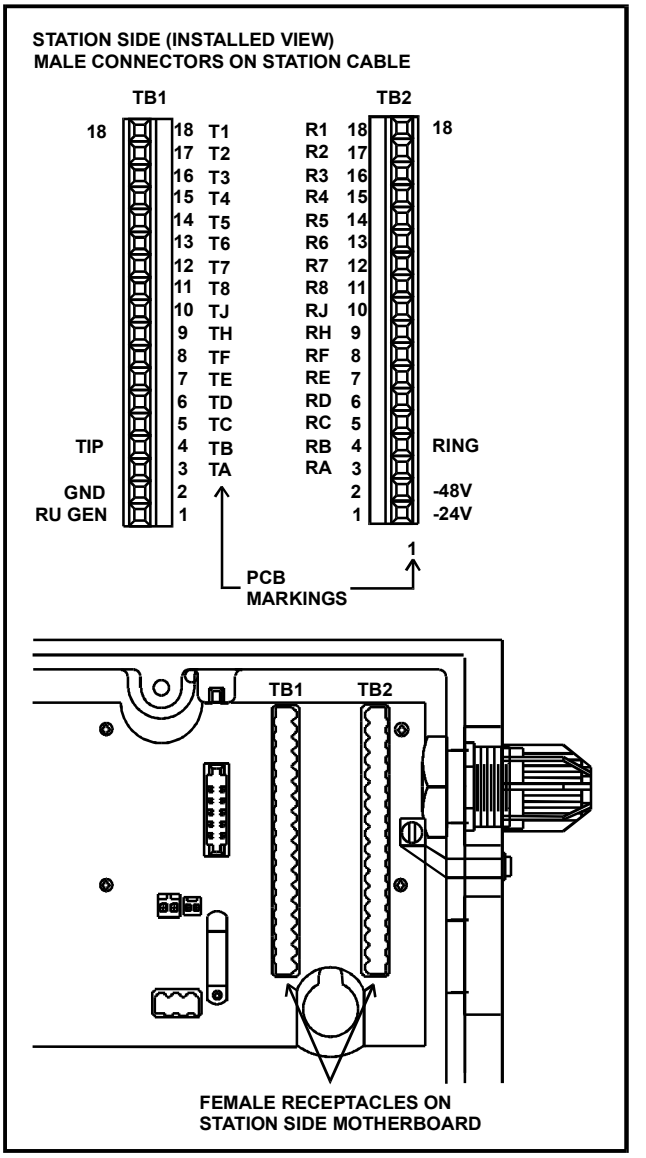
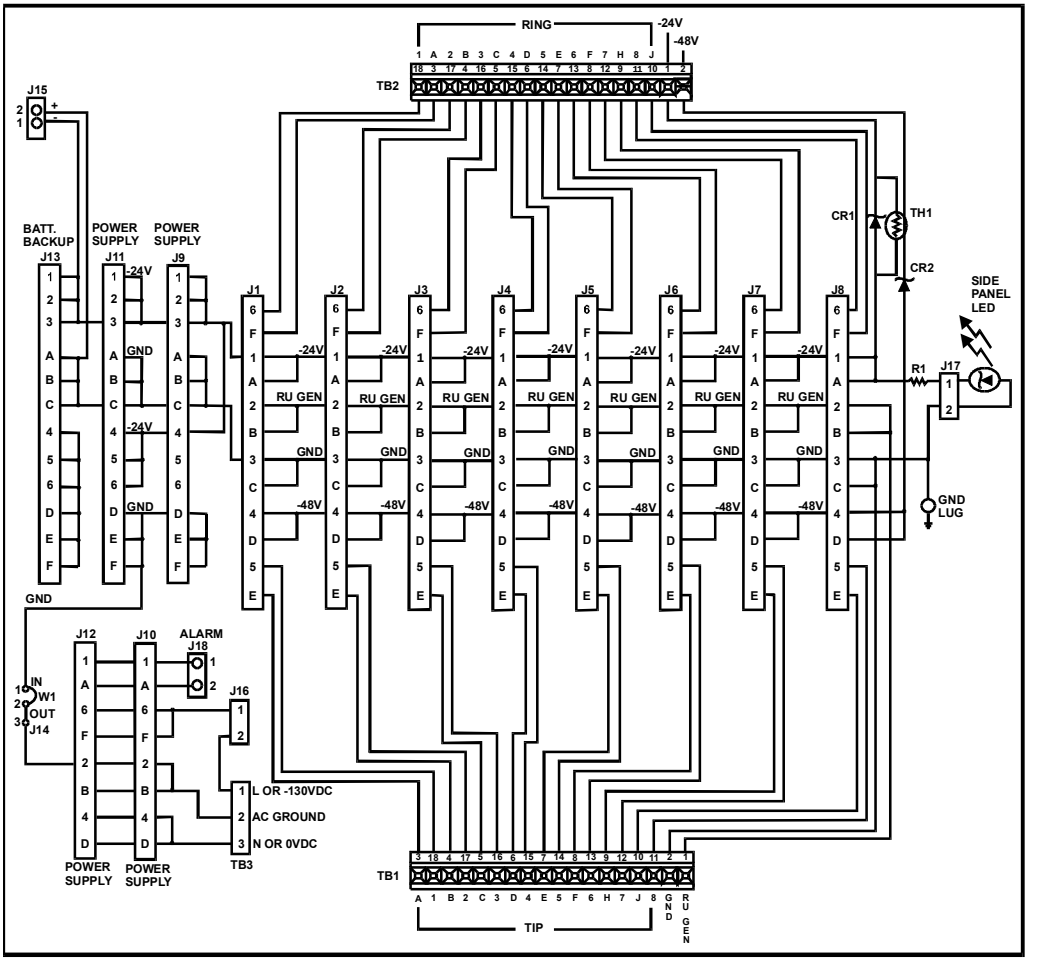


Figure 4 Station Side Motherboard Interconnection Diagram



5.2 CO Side PIC Connection

If you wish to connect the incoming CO cable directly to the shelf without using the PIC stub, refer to Section 5.3 on page 1-18.

To connect the CO side cable using the PIC stub

1. Slide the nut of the 3/4” strain relief supplied up the cable from the free end of the stub.
2. From the inside of the shelf, pass the free end of the cable through the bottom left-hand side.
3. Plug the male connectors into female receptacles TB1 and TB2, mounted in the bottom left-hand corner of the shelf. For a diagram of the CO side terminal blocks, refer to Figure 5.
4. Take the remainder of the strain relief (the gland nut, chuck, neoprene bushing, and body), and slide it onto the cable from the free end, outside the shelf, to the shelf opening. Secure the cable by holding the nut inside the shelf and tightening the grip by turning the gland nut.

5. Connections between the PIC stub and the incoming CO cable can now be made according to the color coding of the station cable.

   For a listing of the standard color codes, refer to Table 2.

   For a view of CO side motherboard interconnections, refer to Figure 6.

   The PIC stub must be spliced to the incoming CO cable using a high-dielectric splice case. All interconnections should be completely isolated from anything that is, or could eventually become, referenced to station ground.

Danger

The sheath of the CO cable must not be connected to station ground. The wires themselves should be tightly bundled together to minimize the chance of a wire extending into the isolation gap.

Figure 5 CO Side Terminal Blocks

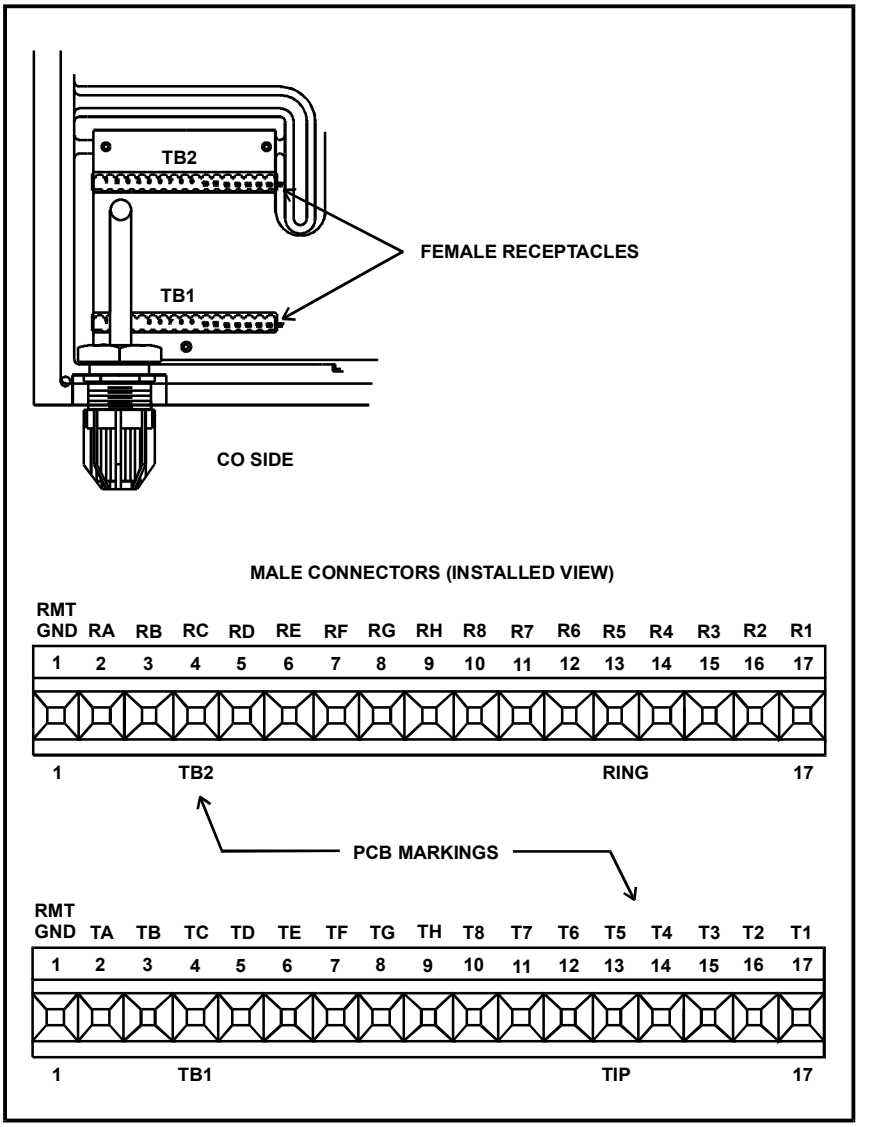
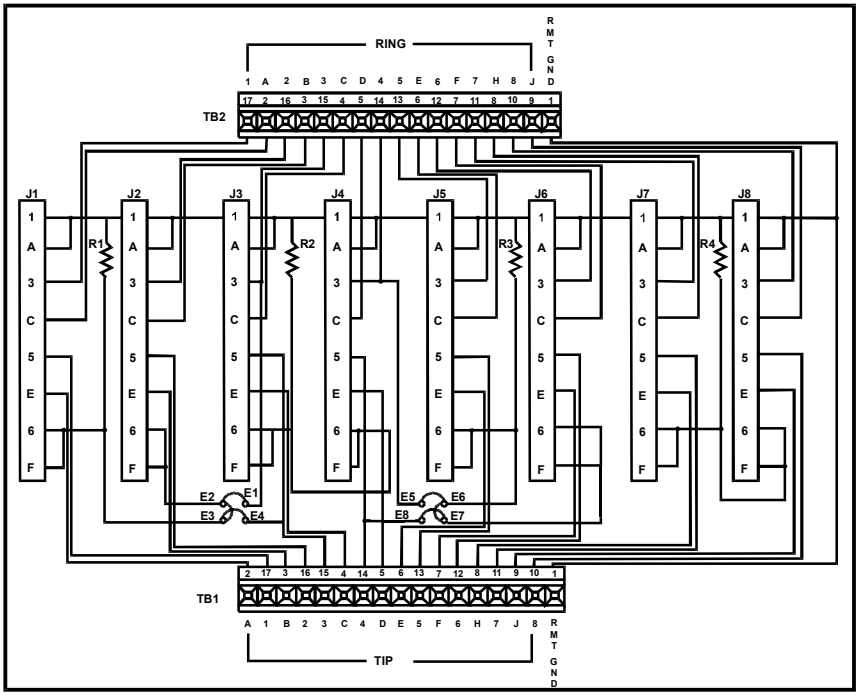


Figure 6 CO Side Motherboard Interconnection Diagram



5.3 CO Side Cable Connection Without the PIC Stub

Caution

A potential difference may develop between the station and CO cables during a ground fault, and it is therefore essential that the cable employed have adequate insulating properties.

The following instructions assume that the cable being employed fits the 3/4” strain relief supplied. If this is not the case, another strain relief fitting both the cable and the 1.115” diameter CO side entrance hole must be selected.

To connect the CO side cable without using the PIC stub

1. Remove the male connectors from the PIC stub supplied using a 1/8” common blade screw driver. These connectors will be required for the installation.
2. Slide the gland nut, chuck, neoprene bushing, and body of the 3/4” strain relief provided onto the free end of the incoming CO cable, outside the shelf.
3. Feed the free end of the cable through the bottom left-hand side of the shelf, from the outside to the inside.
4. Pass the free end of the CO cable through the nut of the strain relief.
5. Connect the cable to the male connectors.

   For a listing of the standard color codes, refer to Table 2.

6. Plug the male connectors into female receptacles TB1 and TB2, located in the bottom left-hand corner of the shelf. For a diagram of the CO side terminal blocks, refer to Figure 5.
7. Secure the cable by holding the nut inside the shelf and tightening the grip by turning the gland nut.

Danger

The sheath of the CO cable must not be connected to station ground. The wires themselves should be tightly bundled together inside the shelf using tie wraps, as shown for the PIC cable in instruction sheet #241-010008-001. This is to minimize the chance of a broken wire touching an adjacent plug-in card.

6. Power Connections

The power for the shelf may be connected using either an external power supply or an internal power supply. These two different options are described below.

6.1 External Power Supply

When connecting power to the shelf using an external power supply, there are two methods, as listed below.

To power the shelf via the station cable

The shelf may be powered via the station cable by an external -24 V dc or -48 V dc supply, or by 130 V dc using the RU GEN line. The unused strain relief should be blocked. For an illustration of this type of external powering, refer to Figure 7.

- Make the cable connections. For a list of the color codes for Station side cables, refer to Table 4.

Table 4 Shelf Powering Via Station Side Cable: Model 751109/13

Station Cable with Color Coding 751109/13			
Label	**Description**	**Connector Position**	**25-Pair Cable**
GND	Ground	TB1-2	Yellow/Green
GND	Ground	TB1-2	Green/Yellow
RU GEN	Ring-up Gen	TB1-1	Violet/Brown
RU GEN	Ring-up Gen	TB1-1	Brown/Violet
-24V	-24V Supply	TB2-1	Yellow/Slate
-24V	-24V Supply	TB2-1	Slate/Yellow
-48V	-48V Supply	TB2-2	Violet/Orange
-48V	-48V Supply	TB2-2	Orange/Violet
Note: For floating 130 V dc, connect the positive lead (0V) to TB1-1 (RU GEN) and the negative lead (130 V dc) to TB2-2 (-48V). For floating 48 V dc, connect the positive lead (0V) to TB1-1 (RU GEN) and the negative lead (-48 V dc) to TB2-2 (-48V).			

Caution

- If an external DC supply is not available, a Power Supply Card (model 751313) will be needed. To connect the power cable, refer to Section 6.2 on page 1-24.
- If an external DC supply is available, and you have decided to add an internal power supply, you must first disconnect the -24 V dc input to TB2. You need to do this because this input is on the same bus as the power supply output and it will load the power supply down since the internal power supplies are adjusted to -27 V dc (enabling the charging of the battery pack, model 751312). Then connect the power cable provided to TB3 (the Power Supply Card itself can only be powered via TB3), refer to Section 6.2 on page 1-24.

To power the shelf via the power cable

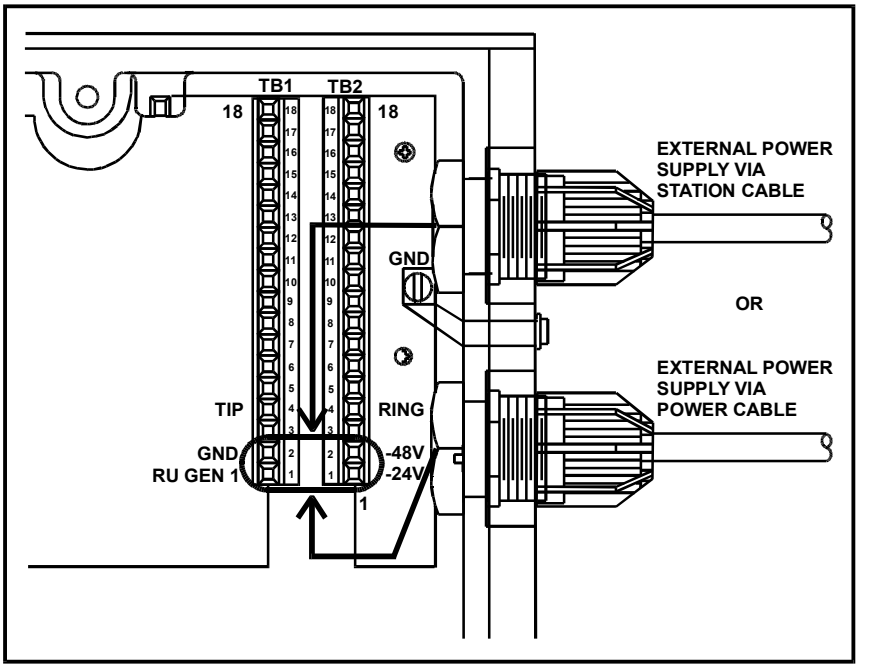
The shelf may be powered via a cable which is fed through the lower hole on the Station side. This will provide a DC supply. For an illustration of this type of external powering, refer to Figure 7.

- Make the cable connections. For a list of the connector positions when using a power cable, refer to Table 5.

Table 5 Shelf Powering Via Power Cable: Models 751109/13

Description	Connector Position
Ground	TB1-2
Ring-up generator	TB1-1
-24V Supply	TB2-1
-48V Supply	TB2-2
Note: For floating 130 V dc, connect the positive lead (0V) to TB1-1 (RU GEN) and the negative lead (130 V dc) to TB2-2 (-48V). For floating 48 V dc, connect the positive lead (0V) to TB1-1 (RU GEN) and the negative lead (-48 V dc) to TB2-2 (-48V).	

Figure 7 External Power Supply



6.2 Internal Power Supply

When an internal Power Supply Card, model 751313 is used, then either 120 V ac or 130 V dc must be supplied to the shelf via the power cable provided. The Power Supply Card itself operates from either AC or DC. For the correct positioning of the ground strap, refer to Section 6, “Ground Connections”.

When an internal Power Supply Card, model 751316 is used, the power cable must supply the -48 V dc (the power supply does not use -48 V dc from TB2).

When an internal Power Supply Card, model 751324 is used, the power cable must supply the 24 V dc (the power supply does not use -24 V dc from TB2).

Note

An internal uninterruptible power supply (UPS) option is also available. It consists of the Power Supply Card, model 751313 in conjunction with the Battery Backup Card, model 751312. If the Battery Backup Card is not necessary, the 751312 can be replaced by another power supply for redundancy.

To install the power cable

1. Slide the remaining 1/2” strain relief (gland nut, chuck, neoprene bushing, and body) onto the cable.
2. Feed the free end of the cable through the lower hole on the right-hand side of the shelf, from the outside to the inside. Slide the strain relief nut over the bare end of the cable inside the shelf.
3. Route the power cable inside the shelf.
4. Connect the power cable to the power and to TB3. For an illustration, refer to Figure 8. For a list of the 120 V ac power cable connections, refer to Table 6. For a list of the 130 V dc and 48 V dc power cable connections, refer to Table 7.

Table 6 Power Cable Connections for 120 V ac

Description	Connector Position	Wire Color
Live	TB3-1	Black
Ground	TB3-2	Green
Neutral	TB3-3	White

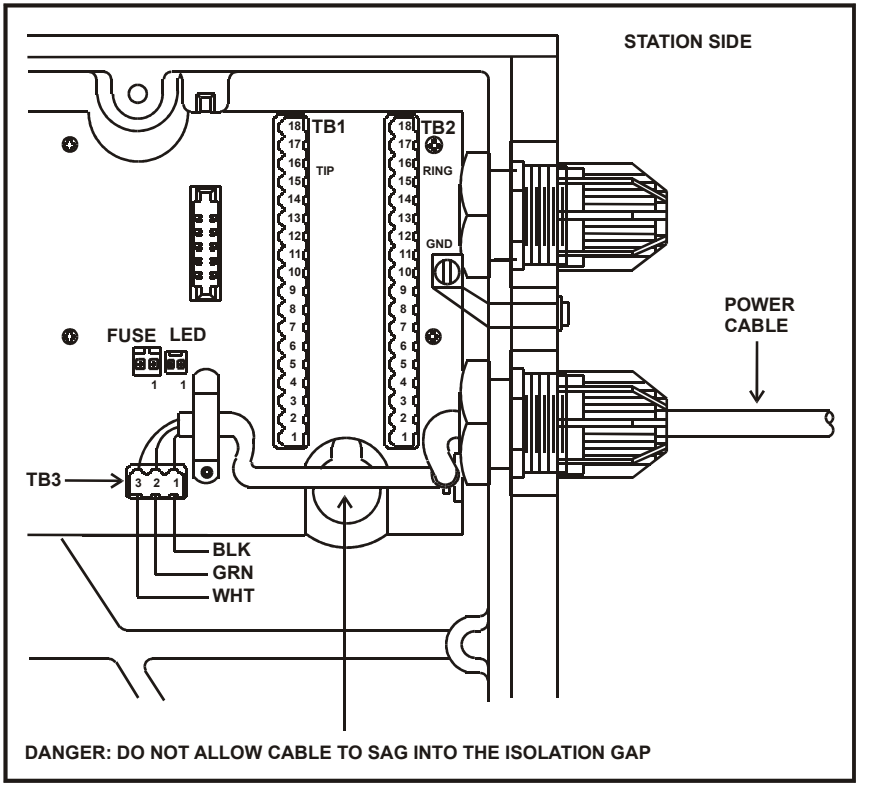
Table 7 Power Cable Connections for 130 V dc or 48 V dc

Description	Connector Position	Wire Color
130 V dc or -48 V dc	TB3-1	White
Ground	TB3-2	Green
0 V dc	TB3-3	Black

Note:

If you are using the power supply card model 751324, you must use a 5A fuse included in the 751324 kit part # 241-010297-401.

Figure 8 Power Cable Connection



5. Secure the power cable by holding the nut inside the shelf and tightening the grip by turning the gland nut.

Attention

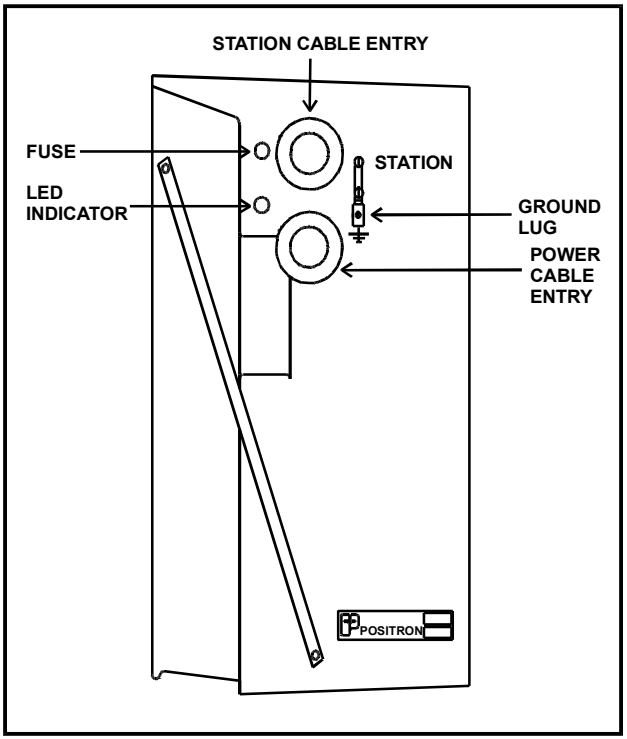
Female receptacle TB3 is intended exclusively for the internal power supply option.

7. Ground Connections

1. Connect the station ground lug to the station ground using a #6 AWG wire. Use of the power cord ground wire is optional.

   For an illustration of the connection, refer to Figure 9.

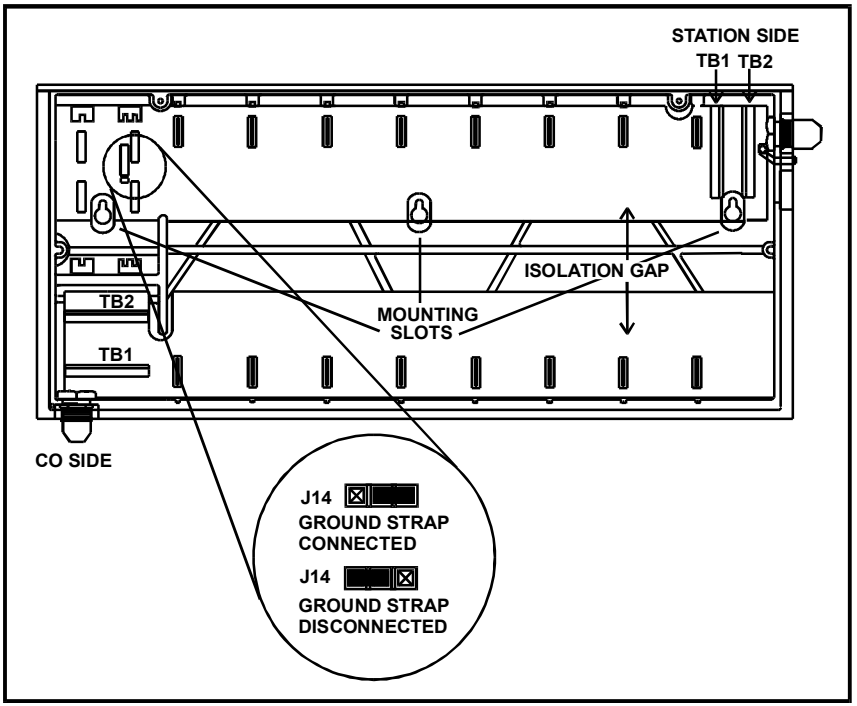
Figure 9 Ground Connections: Side View



The LED indicates the presence of -24 V dc in the shelf, regardless if it is from an external or an internal power supply. The 2-amp, replaceable fast-blow fuse protects the internal power supply (if installed) from excessive currents or overvoltage.

2. If a Power Supply Card, model 751313 is used and is powered from an AC source, the ground strap J14 on the Station side motherboard must be in its "connected" position if the station ground lug is not used. Otherwise, the ground strap must be in the "disconnected" position. For an illustration of the ground strap settings, refer to Figure 10.

Figure 10 Ground Strap Settings



8. Temperature Considerations

The Eight-card Shelf enclosure is made of an insulating material, which under normal operating conditions (i.e., shelf closed) results in a higher temperature internally than externally (room temperature). Therefore, special care must be taken to ensure that the internal temperature never exceeds the operating temperature of each card.

This section provides a procedure for the calculation of the temperature inside the shelf. An example follows the procedure.

For a list of the thermal specifications for all Teleline cards designed for use with the Eight-card Shelf, refer to Table 8.

Table 8 Thermal Specifications

Model No.	Power Consumption	Power Dissipation	Operating Temperature Range
7501-06A	N/A	N/A	-20° to 65° C
7501-15A	N/A	4 W	0° to 50° C
7501-15B	6 W from -24V	5.5 W	0° to 50° C
7501-15C	4.8 W from -48V	4.5 W	0° to 50° C
7501-16A	7 W	6.2 W	0° to 50° C
7501-16B	8.4 W from -24V	8.5 W	0° to 50° C
7501-16C	6 W from -48V	6 W	0° to 50° C
7501-24	N/A	N/A	-20° to 65° C
7501-72	N/A	< 200 mW if loop current is < 80 mA	-20° to 65° C
	N/A	< 5 W if loop current is > 80 mA	-20° to 65° C
751312	270 mA (charging)	N/A	0° to 50° C
751313	N/A	25% of output power	-20° to 65° C

Model No.	Power Consumption	Power Dissipation	Operating Temperature Range
751316	N/A	25% of output power	-20° to 65° C
751317	70 mA avg at -24 V	1 W at (-24 V)	-20° to 65° C
	70 mA avg at -24 V	1.8 W at (-48 V)	-20° to 65° C
751321	200 mA at -24 V	1 W at (-24 V)	-20° to 65° C
	200 mA at -24 V	2.8 W at (-48 V)	-20° to 65° C
751321 & 751321/A	400 mA at -24V	2 W at (-24 V)	-20° to 65° C
	400 mA at -24V	5.6 W at (-48 V)	-20° to 65° C
751321B	200 mA at -24 V	1 W (-24 V)	-20° to 65° C
	200 mA at -24V	2.8 W (-48 V)	-20° to 65° C
751321C	400 mA at -24V	2 W at (-24 V)	-20° to 65° C
	400 mA at -24V	5.6 W at (-48 V)	-20° to 65° C
751324	N/A	25% of output power	-20° to 65° C
751329	N/A	N/A	-20° to 65° C
751333A	440 mA at -24V	3 W (-24V)	-20° to 65° C
	440 mA at -24V	3.5 W (-48V)	-20° to 65° C
751339	N/A	N/A	-20° to 65° C
751340	N/A	N/A	-20° to 65° C

To calculate the temperature inside the shelf

1. Complete the following worksheet.

Table 9 Temperature Calculation Worksheet

Slot No.	Model	Power Consumption	Power Dissipation	Max. Operating Temperature
1				
2				
3				
4				
5				
6				
7				
8				
Internal Power Supply			25% of Total power consumption=	
		Total power consumption =	Total power dissipation =	Highest allowable temperature =
Temperature inside the shelf =(total power dissipation x shelf thermal resistance) + room temp.				

2. Add the power consumption of all cards powered by -24V. This value represents the “Total Power Consumption”. This value is required for the calculation of the power dissipation of the internal power supply. If an external power supply is being used, omit this step.

3. Add the power dissipation of all cards. This value represents the “Total Power Dissipation”.

4. The “Maximum Operating Temperature” of a card represents the highest temperature at which a card can remain operational. At the bottom of the maximum operating temperature column, enter the lowest of the maximum operating temperatures. This temperature is referred to as the “Highest Allowable Temperature”.

5. The temperature inside the shelf is calculated using the following equation.

   Temperature inside the shelf = (Total Pwr Dissipation ¥ Shelf Thermal Resistance) + Room Temperature

   Shelf Thermal Resistance = 0.31° C/W

6. Compare the “Calculated temperature inside the shelf” with the “Highest Allowable Temperature”. The “Temperature inside the shelf” should not exceed the “Highest Allowable Temperature”.

   If the calculated temperature is higher than the highest allowable temperature, the following can be done:

- Reduce the number of cards in the shelf by distributing the cards among other available shelves.
- Move the cards between shelves to replace a card that dissipates heat with one that does not, for example, model 7501-24.
- Lower the temperature of the room where the equipment is installed.
- Use an external power supply to power the shelf. This will reduce the internal power dissipation.

  For an example of the temperature calculation for an Eight-card Shelf, refer to Table 10.

Table 10 Temperature Calculation Example

Slot No.	Model	Power Consumption	Power Dissipation	Max. Operating Temperature.
1	751339	N/A	N/A	65° C
2	751339	N/A	N/A	65° C
3	7501-06A	N/A	N/A	65° C
4	7501-06A	N/A	N/A	65° C
5	7501-15B	6W	5.5W	50° C
6	7501-16B	8.4W	8.5W	50° C
7	751321	4.8W	1W (-24v)	65° C
8	751321	4.8W	1W (-24v)	65° C
Internal Power Supply	751313	N/A	25% of Total power consumption=6W	65° C
		Total power consumption =24W	Total power dissipation = 22W	Highest allowable temperature = 50° C
Temperature inside the shelf = (total power dissipation x shelf thermal resistance) + room temp.				

If the room temperature = 22° C

Temperature inside the shelf = (22W x 0.31°C/W) + 22° C
= 28.82° C

9. Card Insertion

After all thermal considerations have been taken into account, insert the cards into the shelf and close and secure the cover with the nuts supplied. To close the cover properly, you must first secure the bottom of the cover before joining the holes with their respective screws. This procedure is very important in order to prevent damage to the cover.

Once the temperature of the shelf has been calculated, the desired cards can be inserted, and the cover replaced with the supplied nuts. For information relevant to any card, refer to their respective documentation.

Danger

The cover must be kept closed and secured at all times in order to protect personnel from potentially hazardous voltages, and to prevent damage to the cover.

Note

Although the shelf is physically capable of accepting any combination of plug-in cards; cards should not be installed without first calculating the internal temperature of the shelf.

10. Service and Support

Technical Customer Support

Positron is committed to providing excellent ongoing technical support to its customers. A team of specialists is always available at our Technical Support Center in Montreal for either telephone consultations or on-site visits, to assist Field Technical personnel in the maintenance and troubleshooting of Positron equipment. During normal business hours, (8:30 a.m to 5:00 p.m. EST), any one of our Technical Customer Support (TCS) staff may be reached by dialing 1-888-577-5254 from anywhere in the continental United States or from Canada. Customers outside North America should dial 1-514-345-2200. Staff may also be contacted via fax at 514-345-2271 or e-mail at powerdivision@positron.qc.ca.

Positron TCS staff are available to provide technical assistance and/or to supervise the installation of Positron equipment. Assistance in the planning, configuration, and implementation of the installation will be provided as requested. Arrangements and pricing information regarding field assistance may be obtained by contacting the Technical Customer Support department. Please contact Positron for scheduling at least four weeks prior to the actual requested visit date.

Customer Training

Positron offers full customer training courses, as requested. Seminars are also available on High Voltage Interface (HVI). For more information, contact a customer representative by dialing 1-888-577-5254 or use our e-mail address, powerdivision@positron.qc.ca.

Warranty

Positron warrants that all equipment shall perform in accordance with Positron's specifications. The warranty remains valid for five (5) years from the date of shipment. The warranty will be honored provided that the equipment has not been abused and provided that the equipment has been installed and used in accordance with Positron's installation instructions and specifications. The warranty fully covers workmanship, materials and labor.

This warranty is in lieu of all other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose. Positron guarantees that all equipment shall perform in accordance with Positron's specifications. Positron disclaims any warranty that Positron

equipment will meet customer requirements beyond the product specification. Positron disclaims any warranty that operations will be uninterrupted or error free.

Repair Service

Positron Inc. offers repair services by which customers can count on timely and quality repairs, regardless of customer location.

All warranty repairs are performed at no cost. Positron reserves the right to repair or replace any equipment which has been found to be defective.

For information about out-of-warranty repairs, contact Positron's Repair department at 1-800-661-4911 (from anywhere in the continental United States or from Canada) or dial 514-345-2228. Due to the varied nature of repairs, no one time frame for turnaround can be guaranteed. However, average turnaround time is two weeks from date of receipt. In emergency situations, special arrangements can be made by contacting our Repair department. All repaired items are warranted for a period of 90 days. Bulk repairs (more than five items) will require additional processing time, therefore, please take this into consideration when requesting a Return Material Authorization (RMA) number.

Before returning any items to Positron for repair, warranty repair or replacement, call the Repair department to obtain an RMA number. Parts returned without RMA numbers cannot be accepted. The RMA number must always be clearly marked on all boxes and crates and on all shipping documents.

Items under warranty are to be shipped prepaid to Positron and will be returned prepaid to the customer. Items that are not under warranty are to be shipped prepaid to Positron and will be returned prepaid with freight charges included on the invoice. Positron cannot accept items shipped collect. A purchase order number is required for all repairs.

To accelerate the repair process, whenever possible, customers should include a report detailing the reason for return with the unit(s) being returned. Also, please include the name and phone number of a person who can be contacted should our Repair department need further information.

When packing items being returned for repair, please ensure that the item(s) is properly packed to avoid further damage. Teleline Isolator cards should never be shipped while installed in a shelf; this will cause damage and will almost invariably extend the repair period.

Ordering Information

Positron's Teleline equipment can be ordered by telephone, facsimile, or by mail. All orders should be directed to the Positron Inside Sales department. Ordering by telephone, or facsimile will eliminate any delays arising from postal services. However, a hard copy purchase order is required as a confirmation. In addition to the model numbers of the items being ordered, the following information is required:

- Company name, contact name and telephone number
- Purchase order number
- "Ship To" address
- "Bill To" address
- Date required on site

All orders must be followed by a confirming order. Equipment will not be shipped until such confirmation is received.

For a list of our contact information, refer to Table 11.

Table 11 Positron Contact Information

Address	Positron Inc.
	5101 Buchan St.
	Montreal, Quebec, Canada
	H4P 2R9
Main telephone number	514-345-2200
Customer Service department telephone number	514-345-2200, 1-888-577-5254
General e-mail address	powerdivision@positron.qc.ca
Customer Service department fax number	514-345-2271
TCS department toll-free number	1-888-577-5254
TCS department fax number	514-345-2271
TCS department e-mail address	scarbonaro@positron.qc.ca
Repair department telephone numbers	514-345-2228 or 1-800-661-4911
Customer representative e-mail address	customerservicepower@positron.qc.ca

11. Appendix

This sheet should be detached and photocopied since it must be filled-in when first installing the shelf, and for every reconfiguration thereafter. Attach the completed sheet to the shelf for future reference.

Table 12 Eight-card Shelf Temperature Calculation Worksheet

Slot No.	Model	Power Consumption	Power Dissipation	Max. Operating Temperature.
1				
2				
3				
4				
5				
6				
7				
8				
Internal Power Supply			25% of Total power consumption=	
		Total power consumption =	Total power dissipation =	Highest allowable temperature =
Temperature inside the shelf =(total power dissipation x shelf thermal resistance) + room temp.				

The temperature inside the shelf must be lower than the “Highest Allowable Temperature”, including the internal power supply (if used).

Shelf Thermal Resistance = 0.31° C/W