



# TOPAZ 96™ DIMMER RACK

## INSTALLATION & MAINTENANCE GUIDE (Part # LIT-29133-1A)



Contractor: Please read these instructions before starting installation. After installation, please forward this guide to the user for operation and maintenance instruction.

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# TOPAZ 96 RACK

## INSTALLATION INSTRUCTIONS

The TOPAZ 96 dimmer racks are easy-to-install front-wired electrical distribution racks and are connected similarly to a circuit breaker panel. These instructions will tell you how to set, wire, assemble, test and maintain TOPAZ 96 racks. The instructions in this manual are provided in the order of installation.

In the U.S.A. this equipment is intended to be installed in accordance with the National Electrical Code and local electrical regulations. In Canada, installation shall be in accordance with the Canadian Electrical Code.

### Step 1 - Unpack rack(s)

With each rack you will find two keys, two sets of circuit numbers, and one installation manual (this document). Dimmer modules and the two Rack control modules ship separately. Leave control modules and dimmer modules in their packing and store in a clean, dry place until ready to perform Step 12.

After unpacking, please inspect the rack for any possible shipping damage. Document any shipping damage, and contact the freight company and Leviton.

### Step 2 - Assemble racks

If you have one rack, or factory-assembled racks shipped in one section, or individual racks at various locations, no assembly is required. Go on to the next section titled "**Set Rack(s)**".

All multiple rack systems will be factory assembled. If system contains more than two racks it will be disassembled for shipment.

If you have rack sections to be joined together follow the instructions below:

- Line up the sections in the order shown on the custom assembly drawings shipped with the racks.
- Verify that any protruding bussing lines up with its mating part and that the foam gasket is completely in place to seal the opening between the sections.
- Slide the sections together.
- Bolt the racks together with six keps nut, toothed lockwasher and bolt sets (supplied), making sure the lockwasher is under the head of the bolt.
- If the sections contain lateral bussing, line up the mating parts including any spacers and stiffeners provided. See Figure 1 (on next page) for proper assembly order.
- Bolt the bus bars together with bolts, flat washers (one per side), Belleville spring washers and nuts supplied.

**Note:** Belleville spring washers look similar to flat washers except that they are cup-shaped. These washers must be installed before unit is energized.

### Step 3 - Set rack(s)

Racks must have 12" (305mm) minimum clearance above fan and 36" (914mm) minimum clearance in front for proper cooling and access. Racks should be located in a clean, dust free environment within proper operating temperature range. See Specifications - Table IV, page 13. If conduit access is to be through the bottom, skip to Step 4 for additional instructions and then return to this step.

- Place rack(s) and adjust leveling feet so that racks are level and plumb.
- If no conduit is to enter the top of the rack, secure the rack at the top to the building structure.

- |                            |                    |
|----------------------------|--------------------|
| A. Nut                     | G. Flat Washer     |
| B. Bellville Spring Washer | H. Bolt            |
| C. Glastic Stand-Off       | I. Phase Bus Plate |
| D. Bus Spacer              | J. Support Channel |
| E. Lateral Bus Bar         | K. Lug             |
| F. Phase Bus Back-up Plate | L. Lock Washer     |

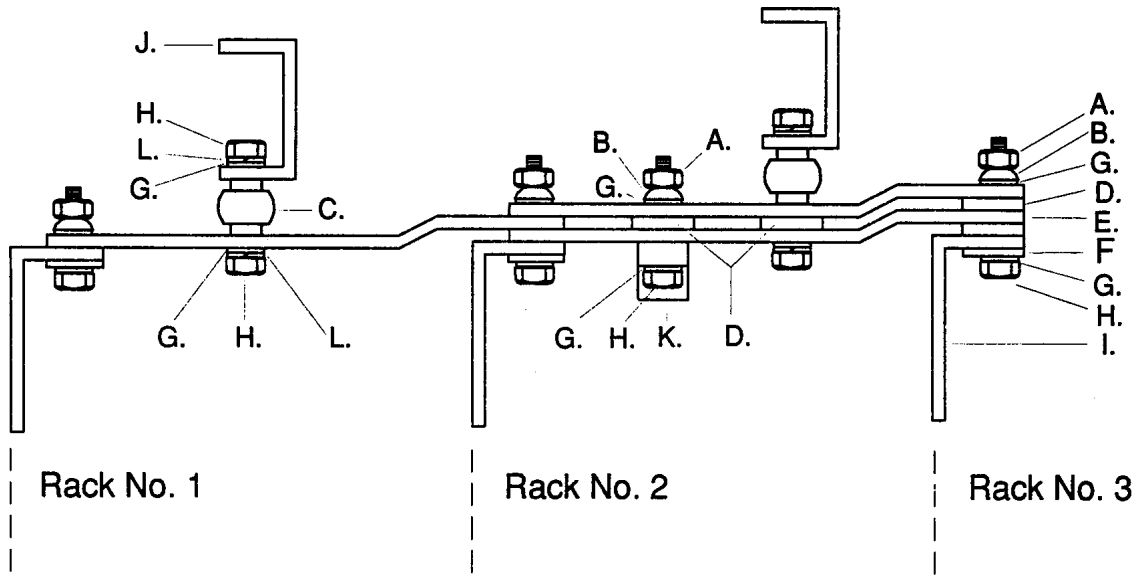


Figure 1 - Typical lateral bus assembly

## Step 4 - Terminate conduits

- Terminate the feeder conduit at the top or bottom conduit entry panel of the rack(s) containing the feeder lugs.
- Terminate load conduits at top and/or bottom conduit entry panels of the rack to which the loads will be connected. In most cases this means the first 96 loads should connect to the first rack, the next 96 loads should connect to the second rack and so on.
- Terminate the control conduits at the top or bottom conduit entry panels of the rack containing the control terminals. In most cases, this will be the rack to the extreme left. Since bottom entry is preferable, it is also acceptable to punch the lower gray side wall below the black extrusion to accept a control conduit, 1/4" pilot knockout provided.

The conduit entry panels can be removed for ease of making conduit entry holes. See Figure 2. If this is done, they both must be reinstalled or the rack will leak air and shut down.

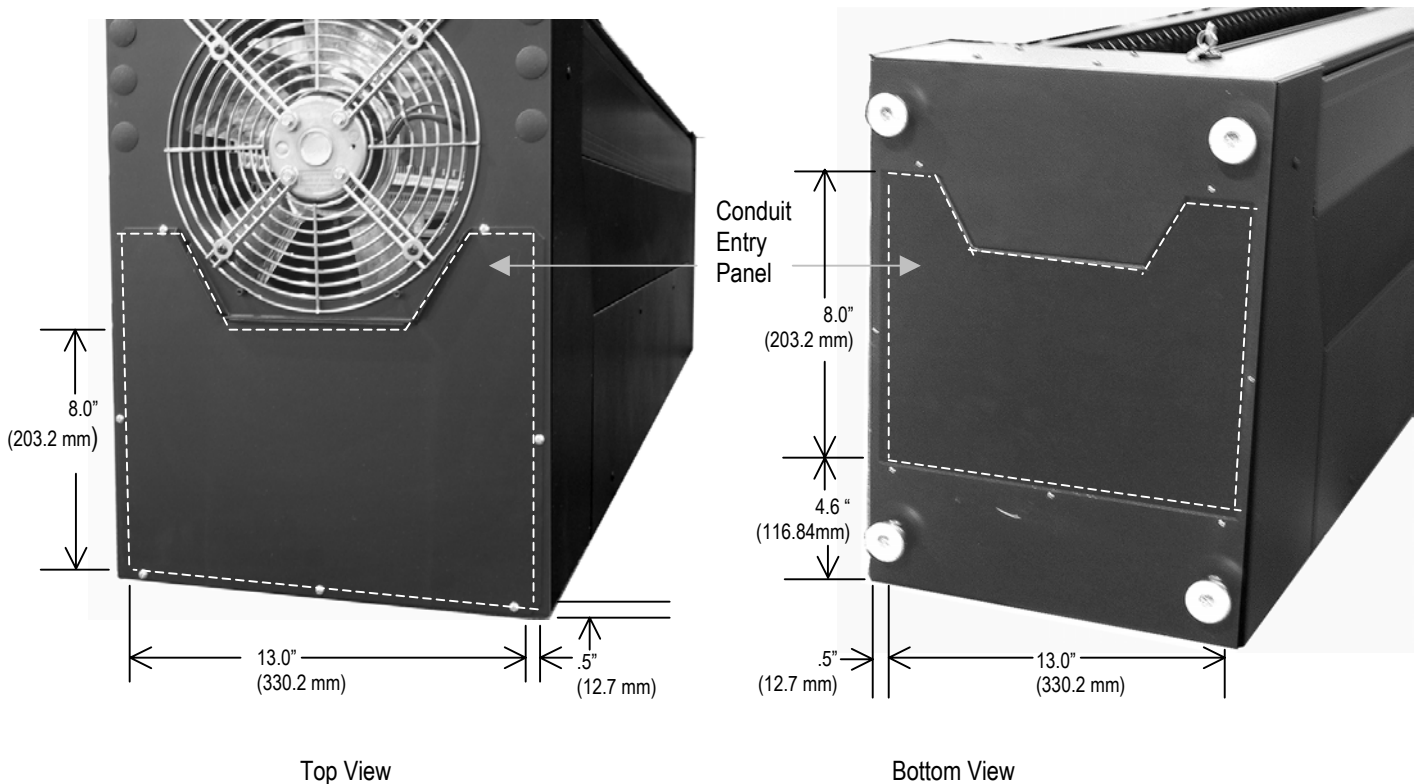


Figure 2 – Conduit Entry

## Step 5 - Pull power, load and control conductors to the racks

- Pull all conductors into the racks. Feeder and load conductors must be copper, rated for operation at 90°C, and sized for 75°C ampacity. Control conductors must be rated for operation at 85°C and are all Class 2. All control conductors must be routed so that they are not likely to come in contact with feeder or load conductors.

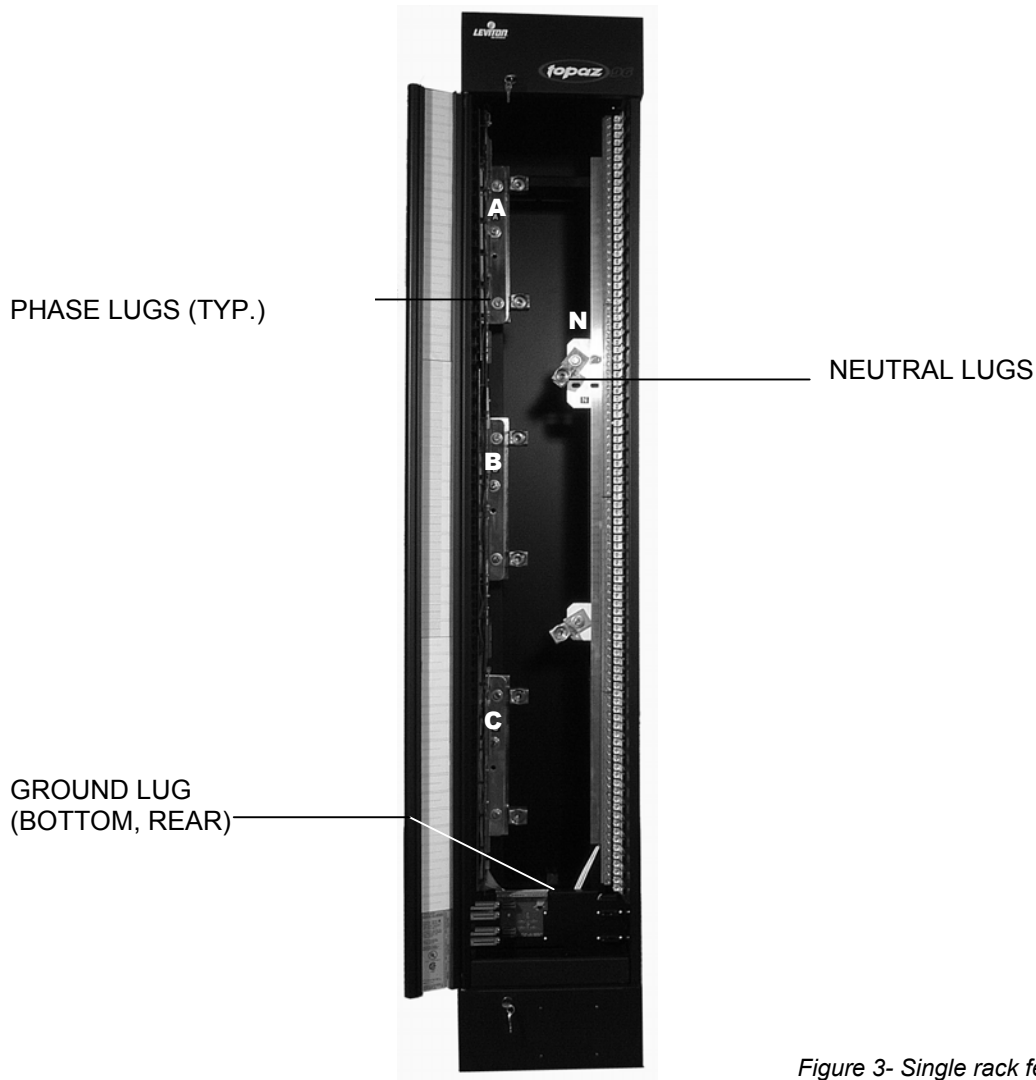


Figure 3- Single rack feeder lug location.

### Step 6 - Connect power feeders

- Connect the feeders at the phase, neutral and ground lugs and tighten according to Table I. Refer to Figure 3 for typical single rack lug location. (If rack has been converted to single-phase, only lugs at A and C will be terminated.)

**Table 1 – Line Terminal Torque Ratings**

LINE TERMINALS (rated for 90°C copper only at 75°C ampacity)	Single 1/0 AWG – 600 kcml (50-304mm <sup>2</sup> )	375 in.-lbs.
	Dual 1/0 – 4/0 AWG (50-100 mm <sup>2</sup> )	
GROUND LUG(S) (rated for copper only)	6 AWG – 300 kcml (16-152 mm <sup>2</sup> )	275 in.-lbs.

Note: Multi-rack feeders may have lugs installed for bottom access which cannot be repositioned due to insulator installed in upper hole. Insulator can be moved to bottom hole, and lug reinstalled in top hole for top access. If for any reason lugs must be moved they must be reinstalled with the cup-shaped Belleville spring washers supplied. Refer to Figure 1.

## Step 7 - Label Circuits

• A sheet of labels, with vertical sequentially numbered circuit numbers, P/N 29260, has been supplied to number the circuits in the circuit directory on the door of the rack if the part number 166-390 or 166-391 sequential control module is used. A second sheet of labels with circuit numbers in pairs horizontally and then vertically, P/N 29679, has also been supplied if the part number 166-392 or 166-393 phase - balanced control module is used. It is important to number these circuits as they also, by association, number the load terminals inside. Usually, the left-most cabinet begins with circuits 1 thru 96, and on from left to right. If your racks have been factory assembled and custom numbered, skip to the next step (8).

## Step 8 - Connect load conductors

• Follow the instructions here for each dimmer type you are installing. Note that fluorescent loads are only dimmable when using external power extenders and factory specified fluorescent dimming ballasts.

### 15/20 AMP INCANDESCENT AND LOW-VOLTAGE LOADS:

Referring to Figure 4, connect the load wire for the first (upper) dimmer to the upper load terminal, and the load wire for second dimmer to the lower load terminal. Terminate their respective neutral wires to the adjacent neutral terminal located directly behind the load lug. Tighten according to Table II.

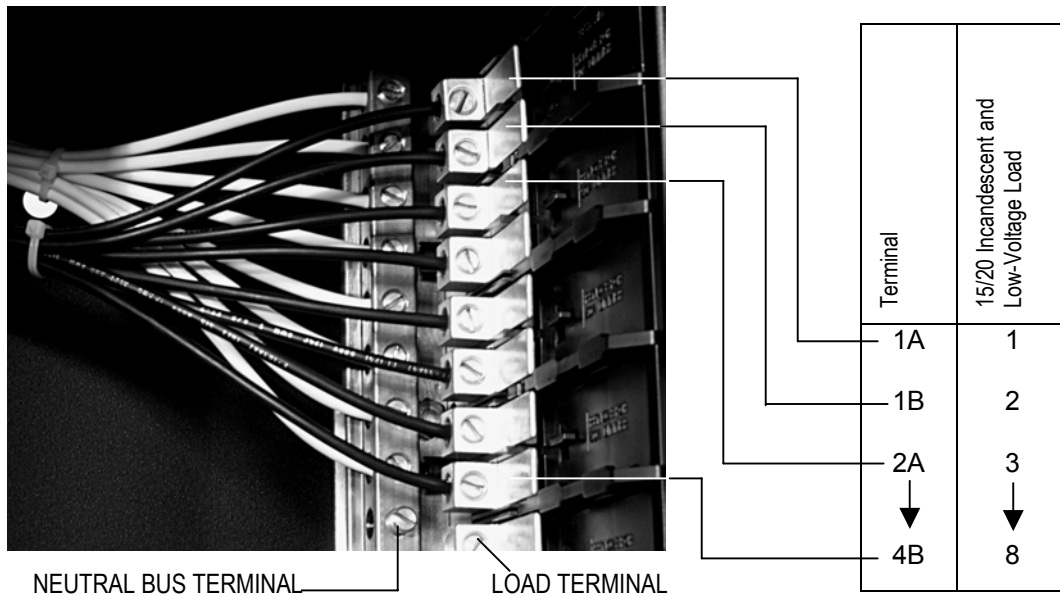


Figure 4 – Load Terminal Wiring

Table II – Load Terminal Torque Ratings

LOAD TERMINALS (rated for 90°C copper wire only at 75°C ampacity)	
14 AWG – 2 AWG (2 – 6 mm <sup>2</sup> )	50 in.-lbs.

Note: If 15 Amp and 20 Amp, 120V dimmers are intermixed on the premises they must both be wired as 20 Amp branch circuits as the modules are not separately keyed.

### LOW-VOLTAGE APPLICATION NOTES:

When using TOPAZ dimmer modules with transformer loads, the kW rating becomes the kVA rating. VA ratings are found by multiplying the input voltage (120V) by the current flowing in the transformer primary (120V side) for all transformers connected to the dimmer module. When calculating VA load keep in mind that transformer losses add many VA to the published VA load rating of the transformer. When current cannot be measured, derate the kW rating of the dimmer module by 25% and add up the kW ratings of the lamps involved.

**Caution:**

Operation of a dimmed transformer-loaded circuit with all lamps inoperative or removed may result in current flow or voltage in excess of normal levels. To avoid possible transformer overheating and possible premature transformer failure, Colortran strongly recommends the following:

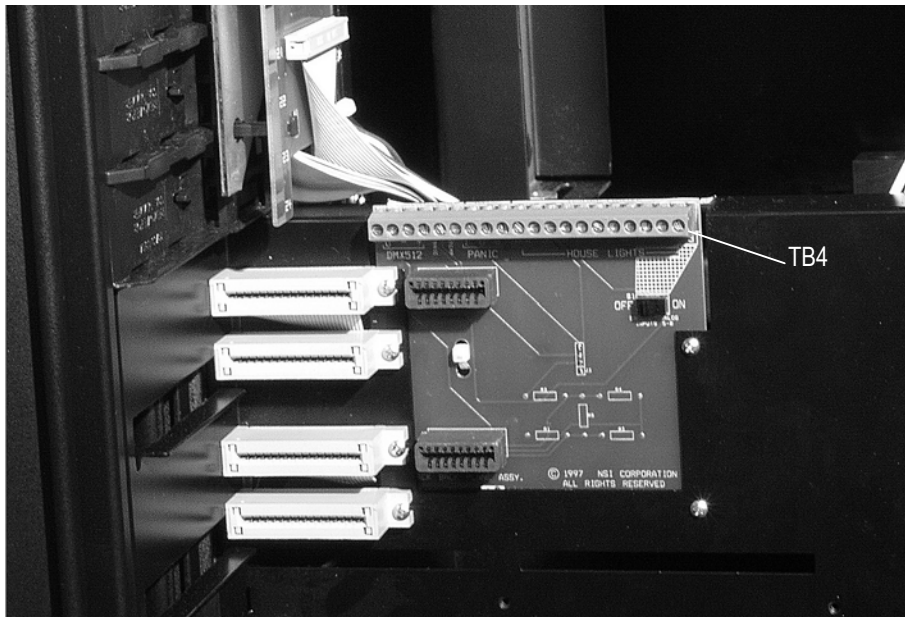
- a. Do not operate dimmed transformer-loaded circuits without operative lamps in place; and
- b. Replace burned out lamps as quickly as possible; and
- c. Use transformers which incorporate thermal protection or fuse transformer primary windings to prevent transformer failure due to over-current.

For best results transformers employed in transformer-loaded dimmed circuits should be high-quality units well varnished and with an extra margin of magnetic material.

**Step 9 - Connect control conductors**

Follow the instructions below to terminate DMX512 OR CMX control wiring. Refer to Figure 5 for control terminal locations.

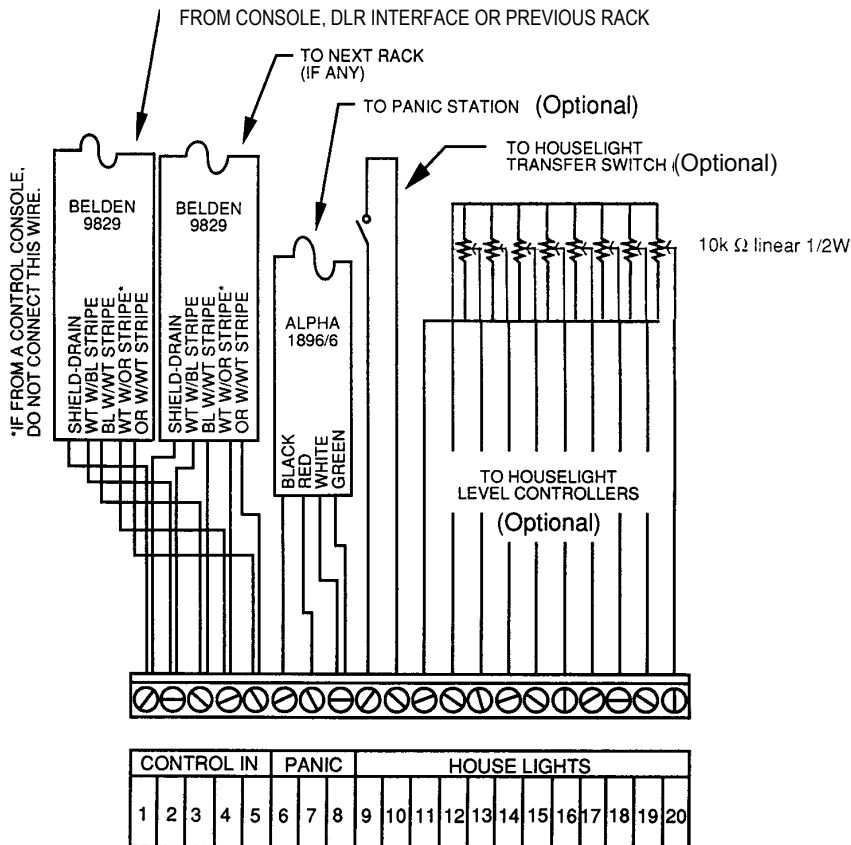
All control terminals accept 24 AWG-14 AWG (2-6mM<sup>2</sup>) wire. All cable shielding and all drain wires (wires connected to cable shielding) must be insulated.





Two TOPAZ "Rack" control modules are provided for each rack connected to a common set of terminals. These control modules are located in the two slots directly under the last dimmer module slot.

- Connect the control wires to the 20-pin terminal block (TB4) in each rack. Refer to Figure 6.



**TB4**

Figure 6 – Stage Control Terminations

### Step 10 - Seal unused openings

- Seal any unused mounting and conduit access holes in the rack. If conduits are large and relatively empty or if they connect to a gutter nearby, they must be sealed as well. Verify that the bottom conduit access panel is installed.

This is necessary to maintain proper ventilation while the rack is operating.

## Step 11 - Set Non-Dim Switches

- Unpack the control modules.

*Note: All modules are shipped with all dimmers in the dimming mode. If non-dims (circuits that are either on full or off completely) are not required, skip to Step 12.*

- On an TOPAZ 96 control module locate the 48 non-dim switches on the top printed circuit board. Note that they are numbered 1 thru 48 and 49 thru 96. If this module were to be placed in the upper control module slot of the Rack it would control dimmer locations 1 thru 48. In the lower slot it would control the lower locations numbered 49 thru 96. Also note that these numbers correspond to dimmer locations in the Rack and not necessarily dimmer numbers. The switches are tied to the dimmer module's physical space or slot sequentially from 1 to 96 starting at the top of the rack.
- Select the circuit or circuits to be converted to non-dims in the Rack location the control module will be inserted, and move the corresponding switches to the right (on).
- Proceed to Step 12 and install the module before returning to Step 11 for the next module.

## Step 12 - Install control modules

- Install two TOPAZ "Rack" control modules, part Number 166-390 or 166-392 for 120V systems; 166-391 or 166-393 for 240V systems (foreign electrical service only) in the two slots toward the bottom of each rack directly under the last dimmer module slot by sliding it in until it is fully seated.



Figure 7 – Control Module Installation

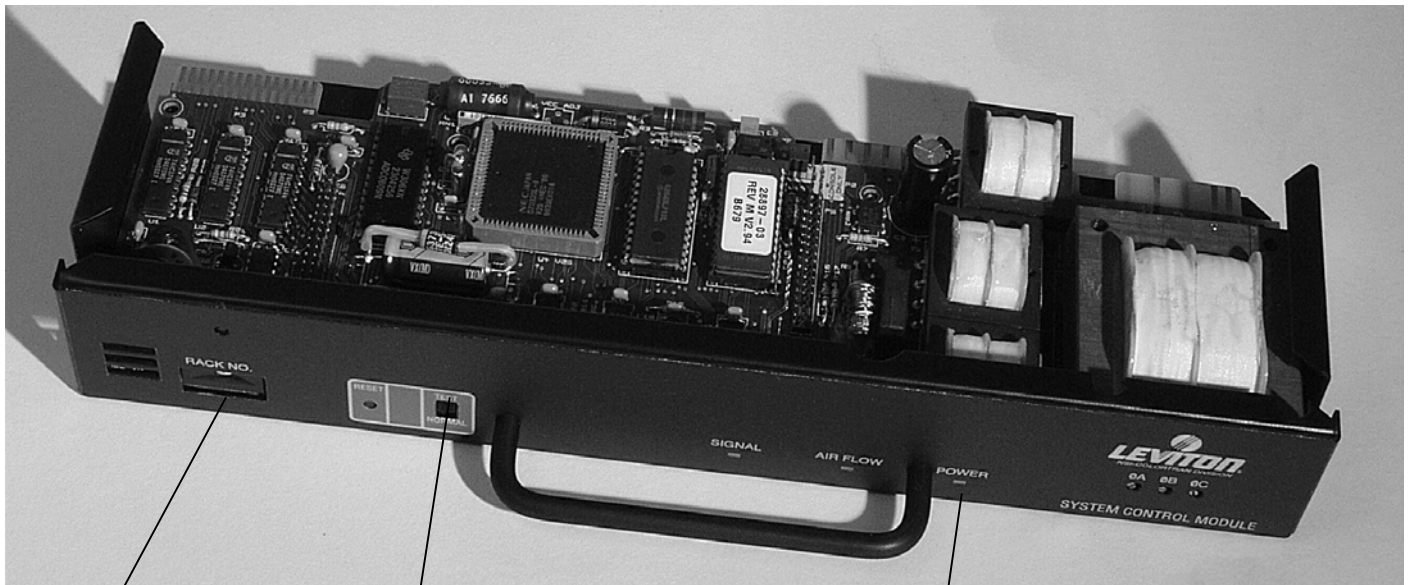
### Step 13 - Set thumbwheel switches

- Set the thumbwheel switches on all TOPAZ 96 control modules according to Table III. See Figure 8. (Rack 1 is usually the left most rack.)

**Note: Both control modules in the same rack must have the same switch setting.**

Table III

TOPAZ Rack Control Module Thumbwheel Settings:	
RACK NUMBER	THUMBWHEEL SWITCH NUMBER
1	0
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
10	9
11	10



THUMBWHEEL SWITCH

TEST SWITCH

POWER INDICATOR

Figure 8 – Control Module

## Step 14 - Set panic switches

Note: If system does not contain a Panic station, skip to the next step (Step 15)

Caution: Do not operate these switches while rack is energized.

- Switch PANIC switches to select which dimmers will go on when the rack is put into Panic mode. The Panic switches are located on the printed circuit boards along the left side of the rack. See Figure 9.

*Note: The switches are numbered 1 thru 24 in 4 groups. These numbers are possible dimmer locations, not necessarily dimmer numbers. If this is confusing, the corresponding number is printed on the dimmer control connector contact for reference.*

When a PANIC switch is ON, the associated dimmer will be energized when the rack is in Panic mode. Any dimmer with its Panic switch off will be turned off in the Panic mode.

- While setting Panic switches verify that the low-voltage switches located below are all in the "on" position. This is necessary even if none of the loads are "low-voltage".

## Step 15 - Apply power and check

- Apply power to the rack. Power indicator LED should be lit on each control module. If the LED is not lit or is flashing, at least one control fuse is blown or one power leg has no voltage present. See Figure 8.

**Caution: High voltage** - All measurements with a meter and other operations within the rack must be with the rack de-energized, or by a qualified electrical installer exercising extreme care.

Check the control fuses on the rear of the control modules. Check the feeder wiring with a meter, correct the problem and restore power to the rack.



Figure 9 - Panic Switch Location (typical)

Model No.	Max Load	Voltage	Circuit Breaker
166-361	1.8kW	120	15A
166-362	2.4kW	120	20A
166-364	2.5kW	220/240	15A

\*(foreign electrical services only)

**Step 16 - Install dimmers**

- Unpack all dimmers.
- Slide a dimmer module into each dimmer slot in the rack beginning with the bottom dimmer slot first and building upward. Push the dimmers in until they are seated firmly.

**Step 17 - Install filler modules**

- If there are less than 48 dimmer modules for a rack, unpack and install filler modules (Part Number 166-360) in slots where there are no dimmers. This must be done to insure proper cooling while the rack is in operation.

Filler modules look the same as dimmer modules, but have no circuit breakers and are installed the same way.  
*Note: Rack should not be operated without all spaces filled, this insures proper cooling.*

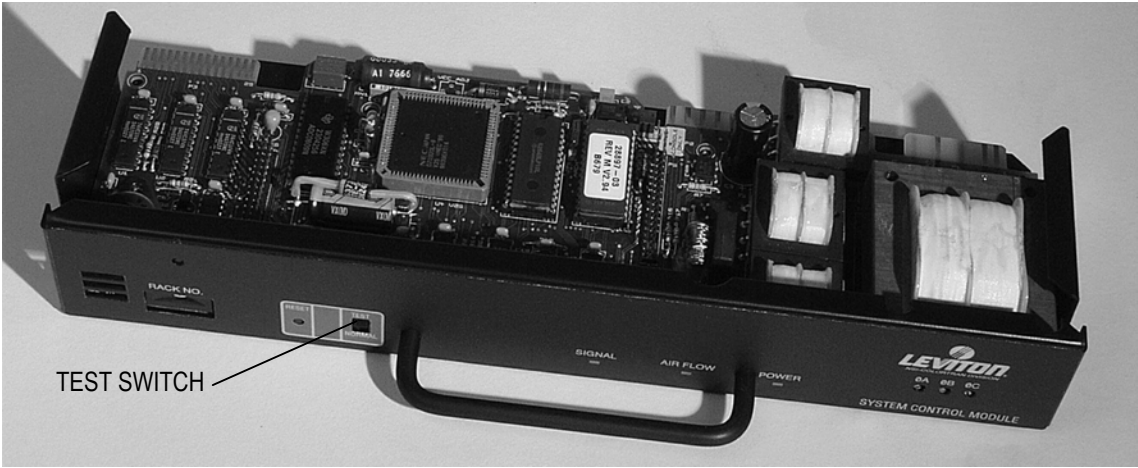


Figure 10 - Control Module Test Switch

**Step 18 - Test loads**

- Switch all dimmer circuit breakers off. (to the right)
- Switch the test switch on each TOPAZ "Rack" control module to the TEST position. This will turn on the fan and all dimmers. See Figure 10.
- Switch the circuit breaker of each dimmer on one at a time by moving the breaker handle to the left. Verify that the load is on and verify that the dimmer is operating.
- When testing is completed, set the test switch on each control module to the NORMAL position. This will turn off the fan and all dimmers.
- Verify that all circuit breakers are in the ON position (switched to the left).

## Step 19 - Close door

- If desired, label circuits for easy identification later.
- Close the front access door. This will restrict access to the dimmer circuit breakers and prevent removal of modules. See Figure 11.



*Figure 11 - Assembled Rack*

## Maintenance

**Caution:** Do not perform maintenance with the rack energized.

Every 6 months (or more often, if the environment is particularly dusty) clean any accumulation of dust from the fan grills, dimmer module air intake openings, control module front and any other place dust may have accumulated. This may be done with compressed air or a vacuum. Also check all wire terminations for tightness- bus to bus, bus to lug, and lug or terminal to wire. Refer to Tables I & II for torque ratings on wire terminations.

**Table IV**

Specifications (per single rack section)		
Rack Capacity:	96 Circuits, 20 Amp max. per circuit	
Dimensions:	80" H x 14" W x 19" D (2032mm H x 356mm W x 483mm D)	
Weight:	Empty – 167 lbs. (75.8 Kg.) Full - 305 lbs. (138.4 Kg.)	Add 12 lbs. (5.5 Kg.) for each 800 Amps of lateral bussing.
Conduit Entry Areas:	Top or Bottom – 140 sq. in. Removable Panel	
Maximum Fan Noise Rating:	60 dba	
Ambient Operating Temperature:	0°C (32°F) to 40°C (104°F)	
Maximum Operating Humidity:	90% without condensation	
Maximum Feeder Size:	800Amp	
Nominal Input: 120V Circuits:	120/208V, 3Ø, 4W, 60 Hz or 120/240V, 1Ø, 3W, 60 Hz	
240V Circuits: (Foreign electrical service only)	240/415V, 3Ø, 4W. 50/60Hz or 240/480V, 1Ø, 3W, 50/60Hz	
Phase-to-Neutral Operating Voltage:	120V ± 10% or 220/240V ± 10%	
Operating Frequency:	50 ± 5Hz or 60 ± 5Hz	
Rack Enclosure:	NEMA type 1 for indoor use only (utiliser dans un endroit a l'arbi)	

For further information on the operation of the TOPAZ 96 Rack refer to the User Guides and Operation Manuals of the control console or architectural control stations that will be used in conjunction with this product. For additional assistance please contact the NSI Technical Support line, Monday thru Friday, 8 AM to 5 PM PST. 1-800-864-2502

## **LEVITON-NSI DIVISION TWO-YEAR LIMITED WARRANTY**

Leviton-NSI warrants new Leviton-NSI electronic control and dimmer products to be free from defective materials and workmanship for a period of two years from the date of purchase to the original owner when purchased from an authorized Leviton-NSI dealer.

Fixtures, lamps and gel material are not covered under this warranty.

The purchaser is encouraged to complete and mail to Leviton-NSI the product registration card enclosed with each product. Leviton-NSI products that have been subjected to accident, alteration, abuse or defacing of the serial number are not covered by this warranty. The normal wear and tear of items such as knobs, jacks and switches are not covered under this warranty.

If your Leviton-NSI product requires service during the warranty period, Leviton-NSI will repair, at its option, defective materials provided you have identified yourself as the original owner of the product to Leviton-NSI or any authorized Leviton-NSI dealer. Transportation charges to and from an authorized dealer or the Leviton-NSI factory for repair shall be the responsibility of the owner. All products returned to Leviton-NSI must have a factory return authorization number issued prior to shipping.

Leviton-NSI is not liable for any incidental or consequential damages resulting from defect or failure other than repairs of the Leviton-NSI product subject to the terms of this warranty. This warranty gives you specific legal rights, and you may have other rights which vary from state to state. This warranty is expressly in lieu of all other agreements and warranties expressed or implied except as may be otherwise required by law.



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