Digital Lighting Systems, Inc.

PROTOCOL
PD404

4 x 4 A. outputs

PD404-120 : 4 x 500 Watts @ 120 VAC
PD404-277 : 4 x 1100 Watts @ 277 VAC

USER'S MANUAL

PD404
09/25

GENERAL DESCRIPTION

The **PD404** is a 4-channel dimmer pack for the PROTOCOL lighting control system. The **PD404** dimmer pack contains four **solid-state** dimmers. Power is fed to the **PD404** from one **20 Amp.** breaker. The breaker feeds four dimmers, each rated for a maximum output current of **4 amperes** (**500 watts** at 120 VAC). The **PD dimmer** contains two printed circuit boards: the **LDM** load driver module, and the **INT04** control module. The dimmers are triggered by the firing board (**INT04**).

The INT04 - (See diagram on Page 2)

The **INT04** is a microprocessor based control board with a nonvolatile memory chip, a communications chip, and a regulated DC power supply. The **INT04** also contains: address selectors, LED output monitors and other support circuitry. The microprocessor is driven by powerful distributed intelligence software which handles all control and communications functions. The memory chip on the **INT04** holds all of the **PD** dimmer's pertinent information and settings which include low and high trim levels for each of the outputs it controls.

The **PD** dimmer does not rely on any shared data source and functions independently of any other system component and without a central system controller. The **PD** communicates with Protocol system stations and controllers over a single **twisted-pair** of wires and can be connected anywhere on the **system network bus**. This adds convenience and versatility by allowing **PD** dimmers to be installed close to their loads and/or service panels.

The LDM (Load Driver Module) - (See Diagram on Page 2)

The **LDM**: (**PD404-OM**) is equivalent to four solid-state relays (SSR's) assembled on a single circuit board. The **LDM** is mounted at the bottom of the **PD**'s enclosure which also serves as a heat sink. The relays are triggered by low-voltage signals generated by the **INT04** module. These signals are optically-isolated by the **LDM** circuitry from all line voltage elements. A step-down 10VAC-transformer on the **LDM** board supplies power to the **INT04** module described above.

OTHER INFORMATION - (See diagram Page 4)

Several **PD** dimmer packs (**PD804** / **PD404** / **PD104** / **PD408** / **PD216**) may be daisy-chained together in any combination, up to a maximum of 63 individually addressed **INT04**s (each PD104 / PD404 / PD408 / PD216 has **one** INT04, and each PD804 has **two** INT04s). **PD** dimmers are daisy-chained using the RJPD-6 cables (CAT5 network cables) supplied with the units. Each **PD** has a set of **address selectors** which must be set to a **unique address**. Please see Table 4 on Page 9 of this manual or the PROTOCOL SOFTWARE MANUAL for more information on addressing the **PD** dimmer pack.

DIMMING / SWITCHING - (See Page 8 for more information)

Through the PROTOCOL's "**SOFTPRO**" configuration software, each of the **PD** dimmer's outputs may be independently configured not to dim. A **PD** dimmer may control any combination of dimmed and switched loads.

There is also a HARDWARE lock to ensure circuits do not dim. All outputs controlled by each **INT04** may be configured to **NOT DIM** by the installation of a **small jumper** on the back of the **INT04** circuit board. This may be done at the factory or in the field. This jumper may be removed to allow the future dimming of those outputs. Please see Page 8 for location of this jumper.

Alternatively, the **PD404** may be ordered as a SWITCH-ONLY unit: the **PD404-S**. This unit has all the same features as the **PD404** except that there is no dimming, and there are no chokes installed inside the unit. All other information in this manual is the same for both the **PD404** and the **PD404-S**.

PD404 Load Driver Module Information

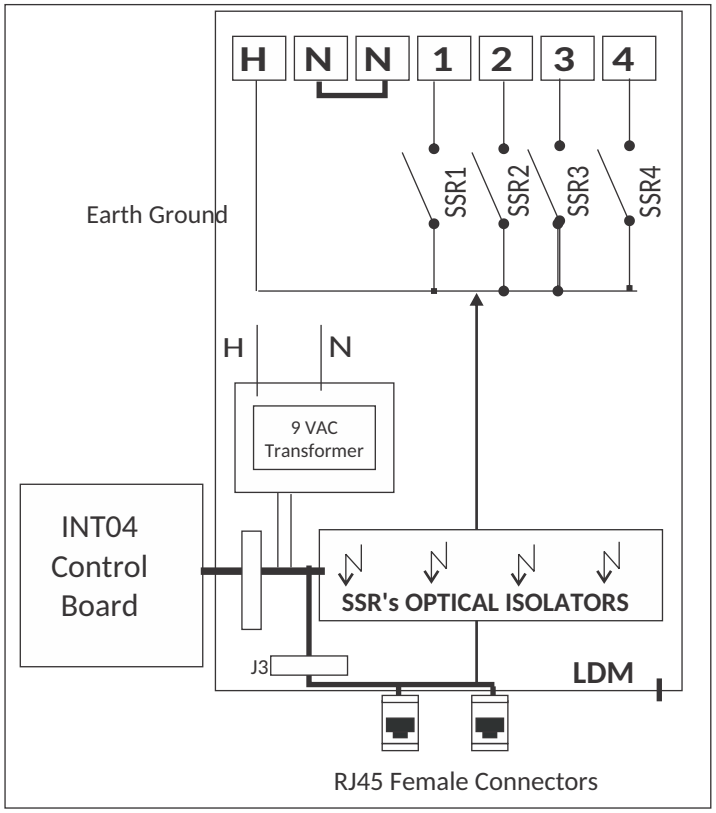


Table 1 - Terminals Key

NAME	DESCRIPTION
1	Output Of Solid-State Relay #1
2	Output Of Solid-State Relay #2
3	Output Of Solid-State Relay #3
4	Output Of Solid-State Relay #4
H1	Hot Line Feed For Relays # 1 - 4
N1 - N2	Neutral Bus Connections.

Table 2 - Absolute Maximum Electrical Ratings

Electrical Characteristic	Terminal	Maximum
Relay Load Current	**1 - 4**	4 Amps.
Input Current: Relays 1 - 4	**H1**	20 Amps.
Input Voltage	**H1**	120 VAC: **1-Phase**

Figure 1 - PD404 LDM Detail

PD404 INT04 Information

Table 3 - INT04 Circuit Legend

1	Microprocessor.
2	Nonvolatile Memory.
3	Communications Chip.
4	Quartz Crystal.
5	Power Supply Capacitor.
6	Voltage Regulator.
7	Signal & Power Connector.
8	Output LED Monitors.
9	Jumper for switches only
S1 - S2	Address Selectors.

NOTE:
PD404 has one INT04 control board

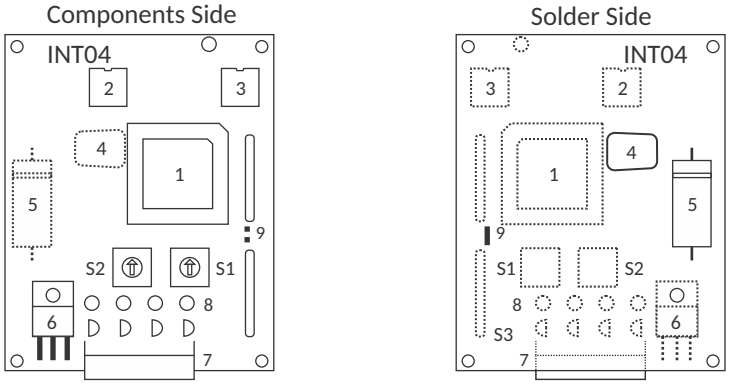


Figure 2 - PD404 INT04 Detail Protocol Firing Board

Enclosure Installation

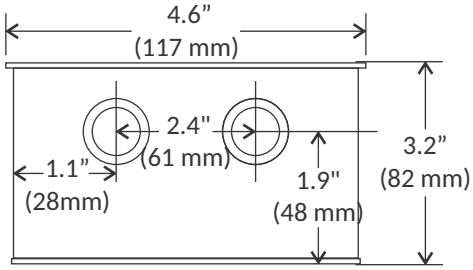
Surface mount the dimmer pack in a well ventilated area where the ambient temperature does not exceed **104° F** for full load operation.

Allow **2"** of side clearance for proper air circulation and servicing. Installation clearance shall meet local and/or NEC code requirements. Enclosures may be attached to the wall or other mounting surface by holes in the heat sink flanges. Refer to the drawings below (Figure 3) for the correct dimensions. Conduit shall be pulled to the top of the dimmer packs.

NOTE: The **PD404** may create a slight buzzing noise and should not be located where this is objectionable.

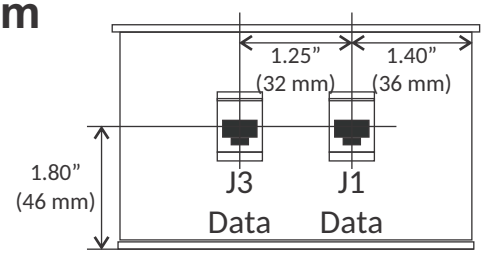
Figure 3 - PD408 Dimensional Diagram

Top View



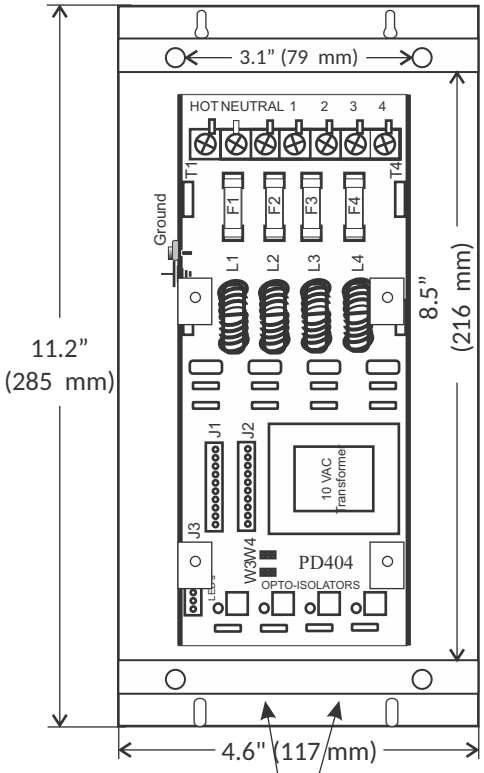
1/2” and 3/4” Conduit Knockouts

Bottom View



Low Voltage Ports

PD404 LDM View



RJ45 Data Bus Connectors

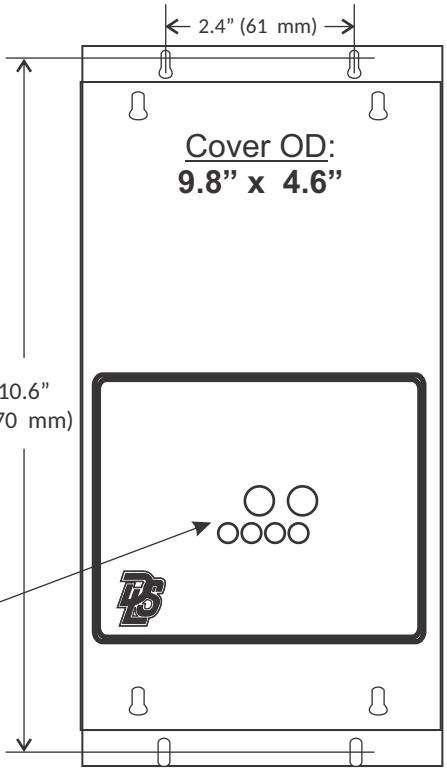
Enclosure Dimensions:

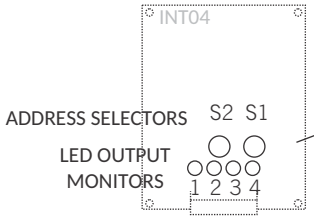
11.2” x 4.6” x 3.2”

Mounting Holes:

10.8” x 2.4”

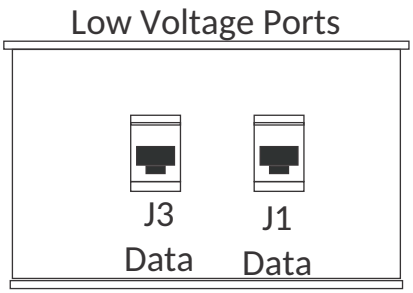
PD404 Front Cover



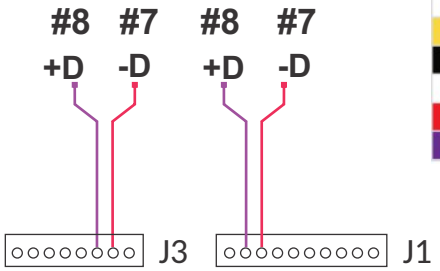


INT04

PD Dimmer Low Voltage Wiring Methods



PD Dimmer Bottom View

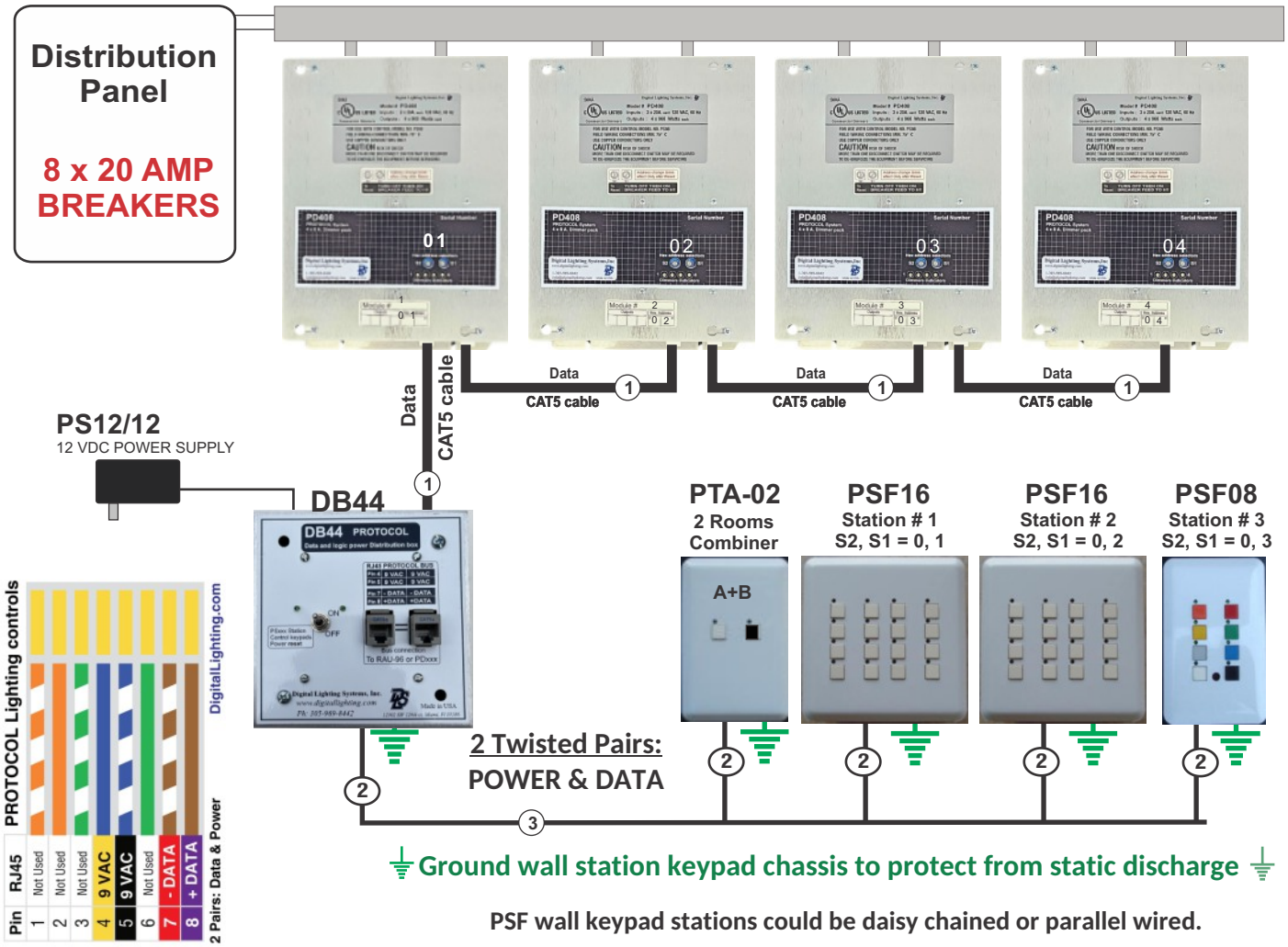


Connectors J1 & J3 are inside PD-LDM

Pin	RJ45	PROTOCOL Lighting controls
1	Not Used	
2	Not Used	
3	Not Used	
4	Not Used	
5	Not Used	
6	Not Used	
7	- DATA	
8	+ DATA	

Figure 4 - PD Dimmer Network Ports & Pin Assignments

Figure 5 - Typical PROTOCOL Installation



Ground wall station keypad chassis to protect from static discharge

PSF wall keypad stations could be daisy chained or parallel wired.

PD404 General Wiring Information: 120 VAC

DO NOT EXCEED 500 W. (4 Amps. @ 120 VAC) per dimmer output.

All wiring between the control stations, dimmers, and other system controllers (network bus) is low voltage (NEMA Class 2) and may be run with two, twisted pair, shielded #18 AWG wire. Control network bus may be Carol Cable #C3362 unless otherwise required. Consult the PROTOCOL Hardware Installation Manual, Appendix E, for maximum wire length.

PD404 dimmer packs may be fed by one 20 A. (maximum) branch circuit and may have up to **four** separately dimmed loads.

CAUTION: **DO NOT** attempt to parallel outputs to increase capacity.

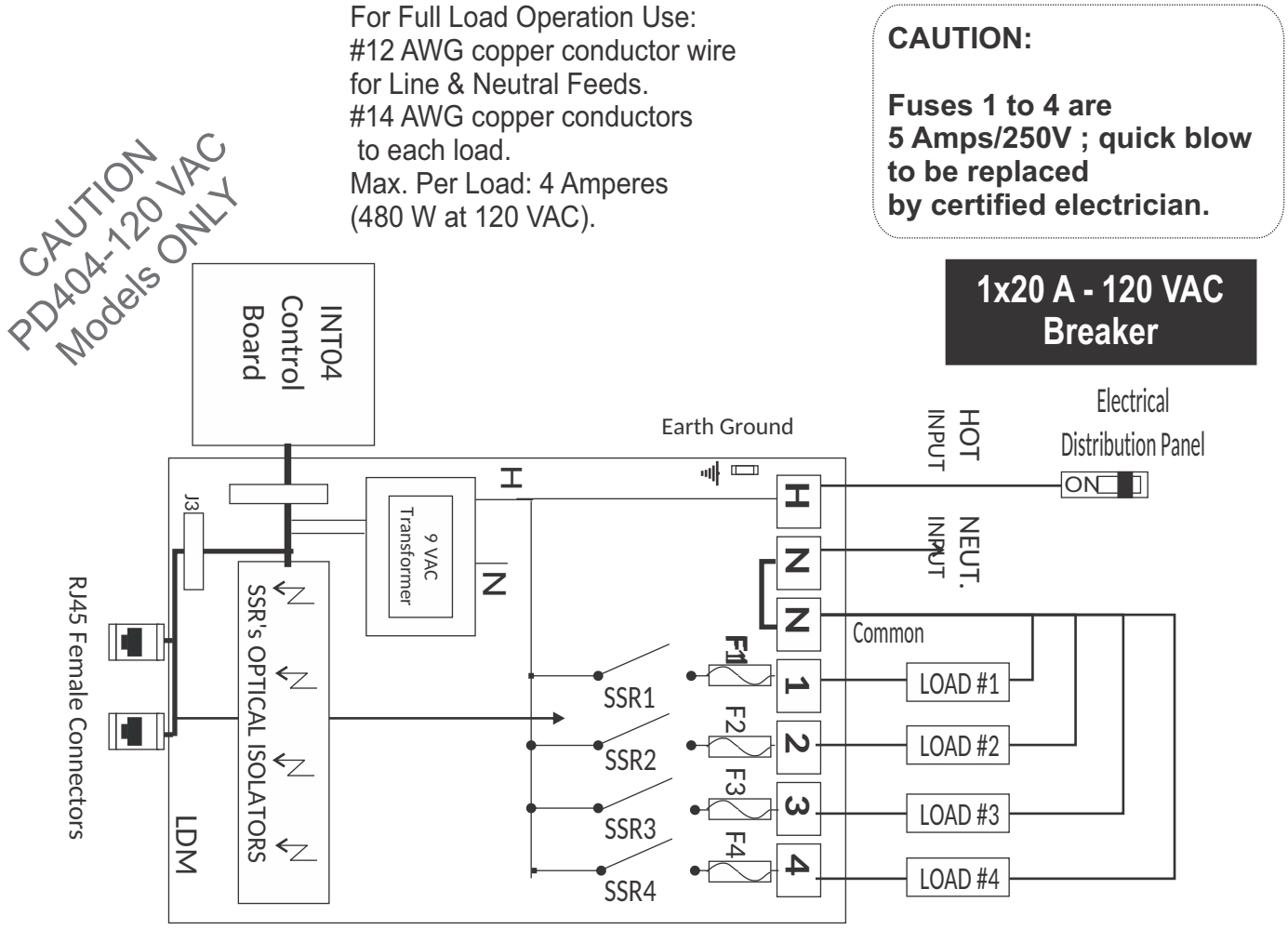
Installations must conform to local and/or NEC code requirements.

Each load must have its own Neutral wire for full load operation.

All line voltage wires must have copper conductors of adequate Gauge with 90° C wire insulation.

POWER EACH LOAD DIRECTLY BEFORE CONNECTING IT TO THE **PD404** TO ENSURE PROPER WIRING.

Figure 8 - PD404 Typical Wiring 120 VAC



PD404 General Wiring Information: 220-240 VAC

DO NOT EXCEED 1000 W. (4 Amps. @ 240 VAC) per dimmer output.

All wiring between the control stations, dimmers, and other system controllers (network bus) is low voltage (NEMA Class 2) and may be run with two, twisted pair, shielded #18 AWG wire. Control network bus may be Carol Cable #C3362 unless otherwise required. Consult the PROTOCOL Hardware Installation Manual, Appendix E, for maximum wire length.

PD404 dimmer packs may be fed by one 20 A. (maximum) branch circuit and may have up to **four** separately dimmed loads.

CAUTION: **DO NOT** attempt to parallel outputs to increase capacity.

Installations must conform to local and/or NEC code requirements.

Each load must have its own Neutral wire for full load operation.

All line voltage wires must have copper conductors of adequate Gauge with 90° C wire insulation.

POWER EACH LOAD DIRECTLY BEFORE CONNECTING IT TO THE **PD404** TO ENSURE PROPER WIRING.

Figure 8 - PD404 Typical Wiring 220-240 VAC

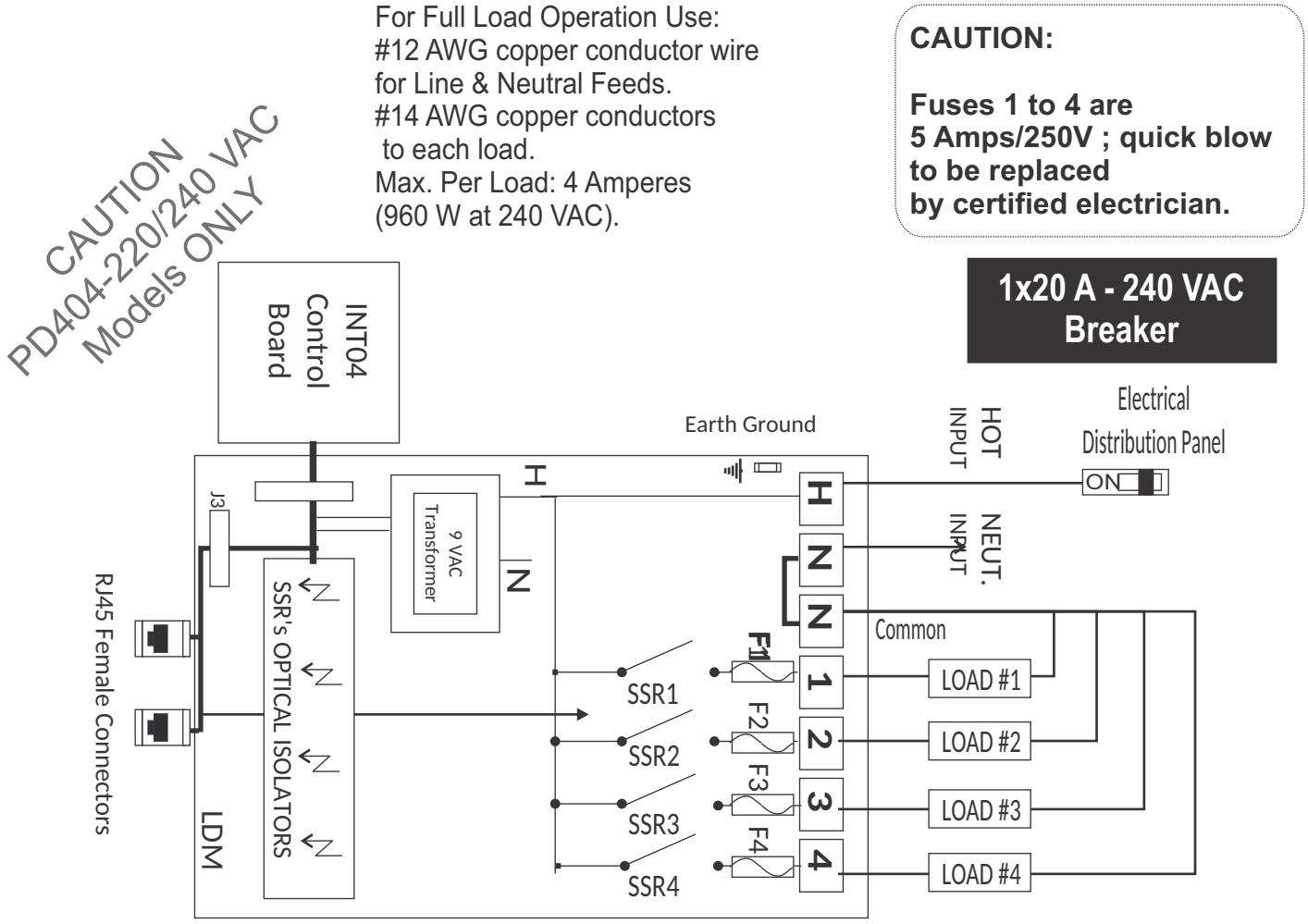
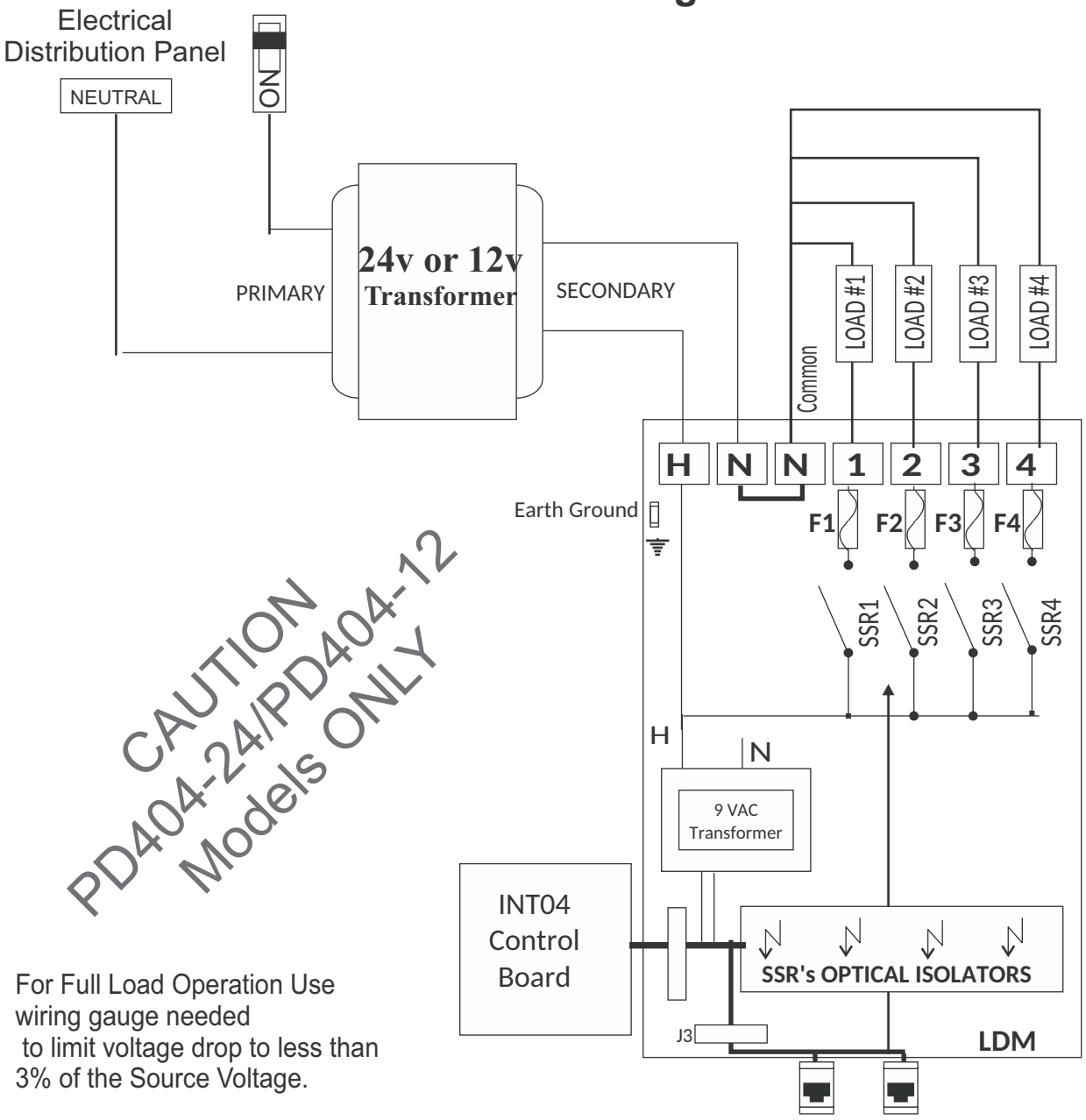


Figure 9 - PD404-12 / PD404-24
Low Voltage Load & Power Wiring



CAUTION
PD404-24/PD404-12
Models ONLY

For Full Load Operation Use
wiring gauge needed
to limit voltage drop to less than
3% of the Source Voltage.

NOTES

1. With PD404-24 you may use a single 24 VAC-800 VA or better transformer.
2. With PD404-12 you may use a single 12 VAC-400 VA or better transformer.
3. Follow transformer's installation & wiring instructions from manufacturer.
4. MAX Load Per Output: 50 Watts @ 12 VAC
5. MAX Load per Output: 100 Watts @ 24 VAC

PROTOCOL Address Setting

Up to 63 uniquely addressed INT04 boards (two in each **PD804**, one in each **PD104 / PD404 / PD408 / PD216**) may be installed in any one system. Each **INT04** must be set to a unique decimal address between 1 and 63. (**INT04** #63 output 4 is not available for use) Total number of zones: **251**. ((63 x 4) - 1 = 251) Refer to ***TABLE 4*** On ***Page 9*** of this manual for proper setting of the address selectors S1 and S2 on the **PD** dimmer.

Example: S2 & S1 should be set respectively to **1 & A** if the desired address is 26 (1 x 16 + A = 26, A =10). In this example, outputs 1 - 4 of **PD404** # 26 are referred to as 26.1, 26.2, 26.3, & 26.4 when configuring buttons on PROTOCOL stations, using the PROTOCOL **SOFTPRO** programming software. Address used must not be an address already used elsewhere in the system).

NOTE: It is also possible to quadruple the maximum number of outputs on a system up to 1004 circuits. An **INT04** may have a decimal address of up to, and including, 252. Please contact factory for more details. For a complete Decimal to Hexadecimal conversion chart, please refer to ***Appendix A*** in the PROTOCOL ***Hardware*** and ***Software Manuals***.

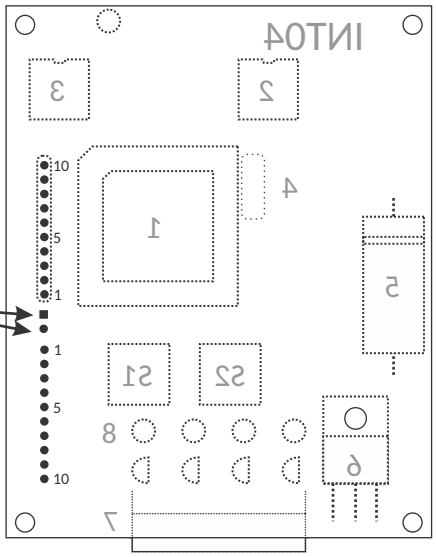
Non-Dim Output Setting

Whilst outputs may be programmed to dim or not dim through the "SOFTPRO" configuration software, in some circumstances it may be preferable for all outputs in the **PD** dimmer to be configured for non-dim (switch only) operation by a hardware lock. This prevents inadvertent dimming, or damage, of loads that cannot be dimmed, such as contactors, mechanical relays, motors, non-dim fluorescent, etc...

Since this procedure involves adding a jumper to the **INT04** board, it is preferable to have it performed by the factory, at time of order. However, any qualified electronic technician can perform the procedure in the field when necessary. ***Figure 10*** shows the location for installing the non-dim (ND) jumper.

Figure 10 - PD Dimmer INT04 Detail

Jumper to Ensure Non-Dim function of INT04 to be installed here.



INT04 Solder (Back) Side

PD Installation Checklist

BEFORE ENERGIZING THE **PD** DIMMER, MAKE SURE:

Loads are tested before connecting to dimmers.
Breaker feed lines are on same electrical phase.
PD dimmer has been properly grounded.
All line voltage screw terminals are properly tightened to prevent hot spots.
Low voltage data lines connections are properly insulated.
Low voltage data lines polarity is observed throughout the system.
The **PD** dimmer's **INT04** is set to the right addresses.
ALL KNOCKOUT HOLES MUST BE COVERED.

Table 4 - PROTOCOL PD Dimmer Address Selection

00 INVALID ADDRESS	
01 set S2,S1 to **0 , 1**	**32** set S2,S1 to **2 , 0**
02 set S2,S1 to **0 , 2**	**33** set S2,S1 to **2 , 1**
03 set S2,S1 to **0 , 3**	**34** set S2,S1 to **2 , 2**
04 set S2,S1 to **0 , 4**	**35** set S2,S1 to **2 , 3**
05 set S2,S1 to **0 , 5**	**36** set S2,S1 to **2 , 4**
06 set S2,S1 to **0 , 6**	**37** set S2,S1 to **2 , 5**
07 set S2,S1 to **0 , 7**	**38** set S2,S1 to **2 , 6**
08 set S2,S1 to **0 , 8**	**39** set S2,S1 to **2 , 7**
09 set S2,S1 to **0 , 9**	**40** set S2,S1 to **2 , 8**
10 set S2,S1 to **0 , A**	**41** set S2,S1 to **2 , 9**
11 set S2,S1 to **0 , B**	**42** set S2,S1 to **2 , A**
12 set S2,S1 to **0 , C**	**43** set S2,S1 to **2 , B**
13 set S2,S1 to **0 , D**	**44** set S2,S1 to **2 , C**
14 set S2,S1 to **0 , E**	**45** set S2,S1 to **2 , D**
15 set S2,S1 to **0 , F**	**46** set S2 S1 to **2 , E**
16 set S2,S1 to **1 , 0**	**47** set S2,S1 to **2 , F**
17 set S2,S1 to **1 , 1**	**48** set S2,S1 to **3 , 0**
18 set S2,S1 to **1 , 2**	**49** set S2,S1 to **3 , 1**
19 set S2,S1 to **1 , 3**	**50** set S2,S1 to **3 , 2**
20 set S2,S1 to **1 , 4**	**51** set S2,S1 to **3 , 3**
21 set S2,S1 to **1 , 5**	**52** set S2,S1 to **3 , 4**
22 set S2,S1 to **1 , 6**	**53** set S2,S1 to **3 , 5**
23 set S2,S1 to **1 , 7**	**54** set S2,S1 to **3 , 6**
24 set S2,S1 to **1 , 8**	**55** set S2,S1 to **3 , 7**
25 set S2,S1 to **1 , 9**	**56** set S2,S1 to **3 , 8**
26 set S2,S1 to **1 , A**	**57** set S2,S1 to **3 , 9**
27 set S2,S1 to **1 , B**	**58** set S2,S1 to **3 , A**
28 set S2,S1 to **1 , C**	**59** set S2,S1 to **3 , B**
29 set S2,S1 to **1 , D**	**60** set S2,S1 to **3 , C**
30 set S2,S1 to **1 , E**	**61** set S2,S1 to **3 , D**
31 set S2,S1 to **1 , F**	**62** set S2,S1 to **3 , E**
	63 set S2,S1 to **3 , F**

NOTES:
Address: **0** Decimal // (S2 , SI = **0 , 0**) Hexadecimal is **not allowed** on any PROTOCOL device.

Minimum PD Dimmer Address: **1** Decimal // (S2 , S1 = **0 , 1**) Hexadecimal
Maximum PD Dimmer Address: **63** Decimal // (S2 , S1 = **3 , F**) Hexadecimal

LIMITED WARRANTY

Digital Lighting Systems, warrants to the purchaser that its products have been carefully manufactured and inspected and are warranted to be free from defects of workmanship and materials when used as intended. Any abuse or misuse contrary to normal operation shall void this warranty.

Digital Lighting Systems' obligation under this warranty shall be limited to replacement or repair of any units as shall within two years of date of invoice from **Digital Lighting Systems**, prove defective; and **Digital Lighting Systems** shall not be liable for any other damages, whether direct or consequential. **The implied warranties of merchantability and fitness for a particular purpose are limited to the duration of the expressed warranty**. Some states do not allow the exclusion of the limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, you may also have other legal rights which vary from state to state.

Defective merchandise may be returned to **Digital Lighting Systems**, prepaid, after prior notification has been given and approval obtained for the return. To obtain prior approval for the return of the defective items, contact your local Digital Lighting Systems distributor, representative, or:

Digital Lighting Systems, Inc.
12302 SW 128 Ct. Bay # 105
Miami, FL 33186

(305) 969-8442
info@digitallighting.com

Upon request, replacement unit(s) will be shipped as soon as available. Unless immediate shipment of replacement merchandise is requested, **Digital Lighting Systems** will not ship replacement merchandise until defective merchandise is received, inspected, and determined to be defective.

No labor charges in connection with warranty problems will be reimbursed by Digital Lighting Systems without prior written approval from the factory.

Digital Lighting Systems distributors and representatives have no authority to change this warranty without written permission.

Digital Lighting Systems reserves the right to determine the best method of correcting warranty problems.

Printed in the USA
2025