

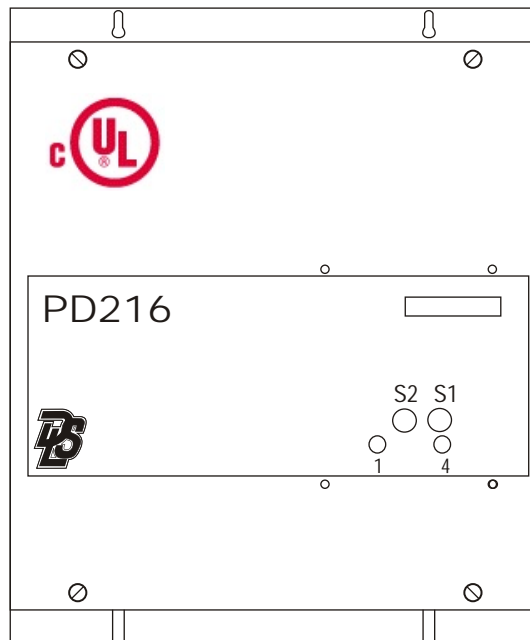


# Digital Lighting Systems, Inc.

## PD216

Two Channel Dimmer  
and Switch Packs

# PROTOCOL



# USER'S MANUAL

## GENERAL DESCRIPTION

The PD216 is a 2-channel dimmer pack for the PROTOCOL lighting control system. The PD216 dimmer pack contains 2 solid-state dimmers. Power is fed to the PD216 from two 20 Amp. breakers on the same electrical phase. Each breaker feeds one dimmers and each dimmer is rated for a maximum output current of 16 amperes ( 1920 Watts at 120 VAC ). The PD216 contains two printed circuit boards, the load driver module (LDM) and an INT04 control modules. The dimmers are triggered by the firing board (INT04).

### THE INTO4 - (See diagram on Page 2)

The INTO4 is a microprocessor based control board with a nonvolatile memory chip, a communications chip, and a regulated DC power supply. The INTO4 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 INTO4 holds all of the PD216's pertinent information and settings which include low and high trim levels for both of the outputs it controls.

The PD216 does not rely on any shared data source and functions independently of any other system component and without a central system controller. The PD216 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 PD216 dimmers to be installed close to their loads and/or service panels.

### THE LDM (LOAD DRIVER MODULE) - (See Diagram on Page 2)

The LDM is equivalent to two solid-state relays (SSR's) assembled on a single circuit board. The LDM is mounted at the bottom of the PD216's enclosure which also serves as a heat sink. The relays are triggered by low-voltage signals generated by the INTO4 module. These signals are optically-isolated by the LDM circuitry from all line voltage elements. A step-down 9 VAC- transformer on the LDM board supplies power to the INTO4 module described above.

### OTHER INFORMATION- (See diagram Page 4)

Several PD DIMMERS (PD804, PD216 and PD216 dimmer packs) may be daisy-chained together in any combination, up to a maximum of 63 individually addressed INTO4's (each PD216 and PD408 has 1x INTO4 each, each PD804 has two INTO4's). PD Dimmers are daisy-chained using the RJPD-6 cables (cat5 network cables) supplied with the units. Each PD216 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 PD216 dimmer pack.

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

Through the PROTOCOL's "SOFTPRO" configuration software, both of the PD216's outputs may be independently configured not to dim. APD216 may control any combination of dimmed and switched loads.

There is also a HARDWARE lock to ensure circuits do not dim. Both outputs controlled by the INTO4 may be configured not to dim by the installation of a small jumper on the back of the INTO4 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 PD216 may be ordered as a SWITCH-ONLY unit, the PD216-S. This unit has all the same features as the PD216 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 PD216 and the PD216-S.

## PD216 Load Driver Module Information

Figure 1 - PD216 LDM Detail

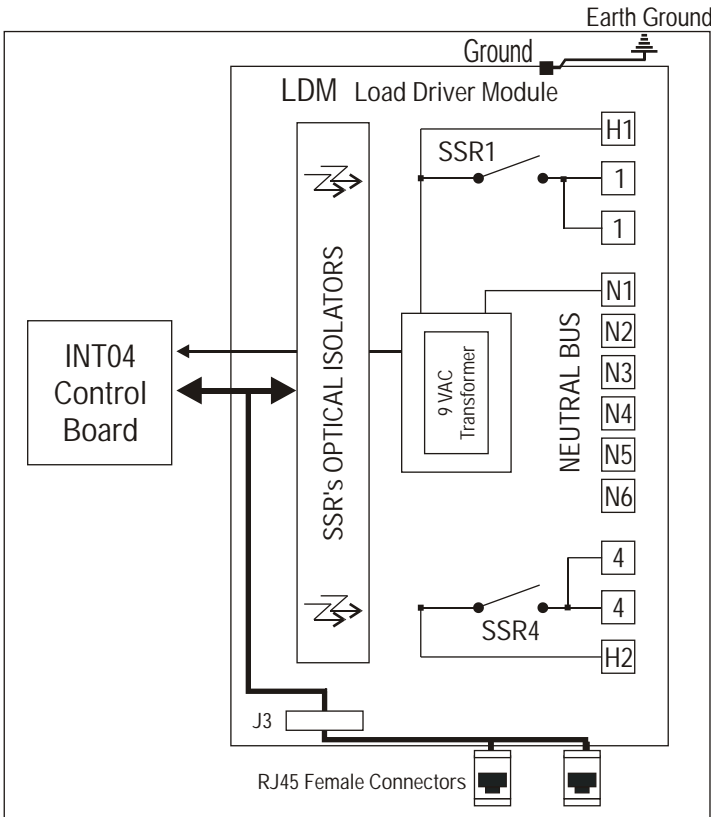


Table 1 - Terminal s Definition

NAME	DESCRIPTION
1	Output Of Solid-State Relay #1
4	Output Of Solid-State Relay #4
H1	Hot Line Feed For Relay 1.
H2	Hot Line Feed For Relay 4.
N1-N6	Neutral Bus Connections.

Table 2 - Absolute Maximum Electrical Ratings

Electrical Characteristic	Terminal	Maximum
Relay Load Current	1 & 4	16 Amps.
Input Current For Relay 1	H1	20 Amps.
Input Current For Relay 4	H2	20 Amps.
Input Voltage	H1-H2	120 VAC, 1-Phase.

## PD216- INT04 Detail

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.

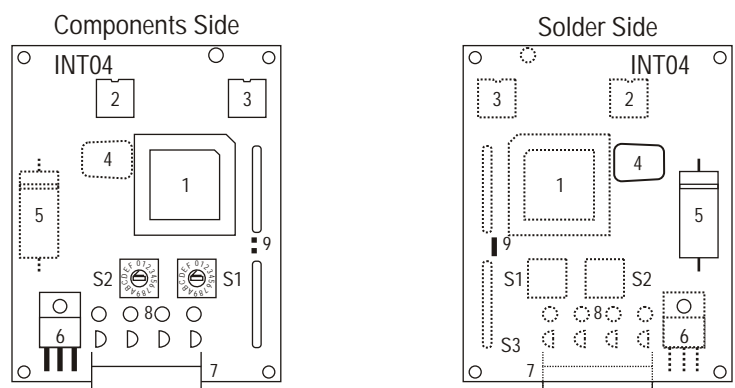


Figure 2 - PD216 / INT04  
PROTOCOL Firing board Detail

**NOTE:**  
PD216 has one INT04 control 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 PD216 may create a slight buzzing noise and should not be located where this is objectionable.

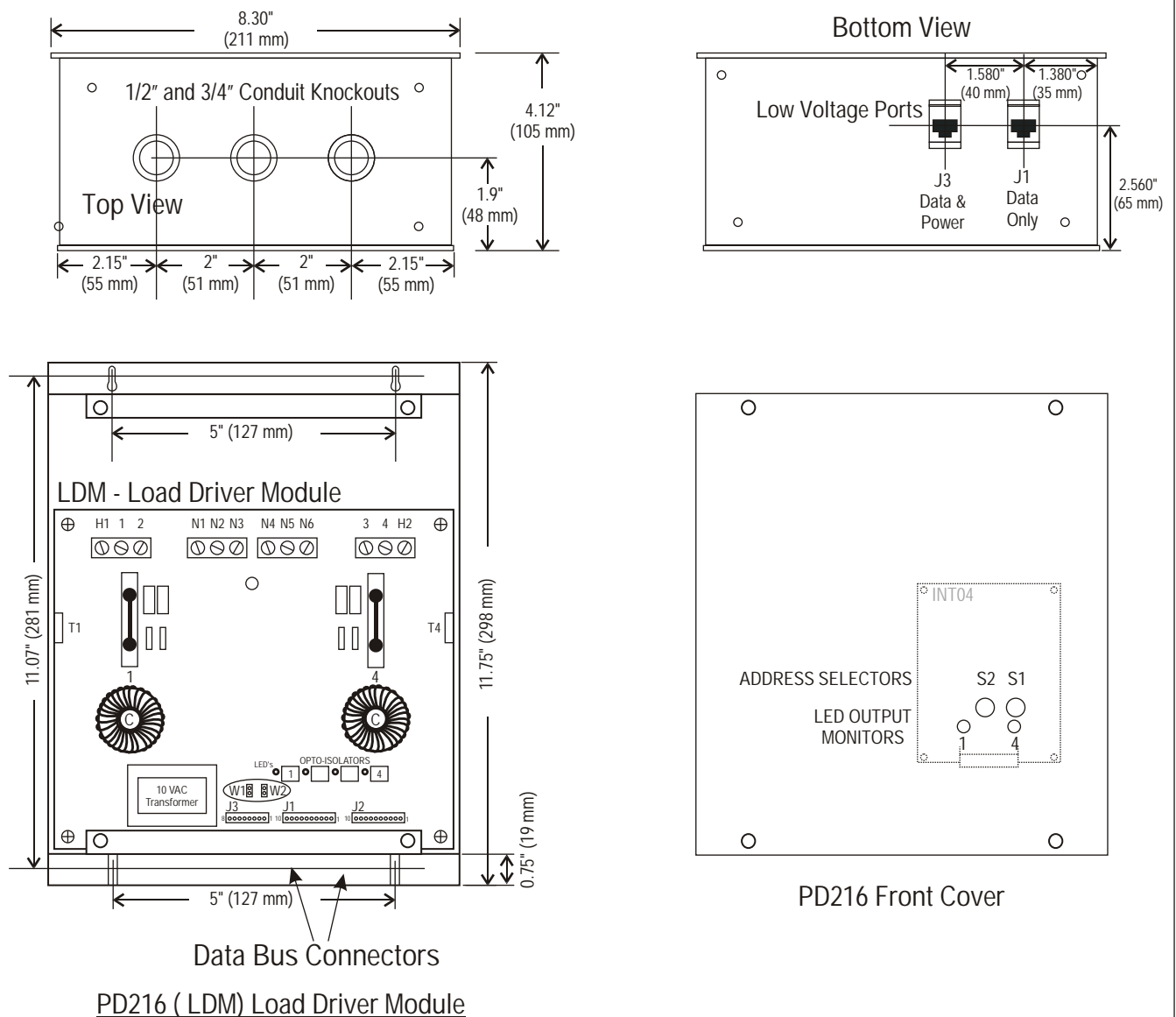


Figure 3 - PD216 Dimensional Diagram

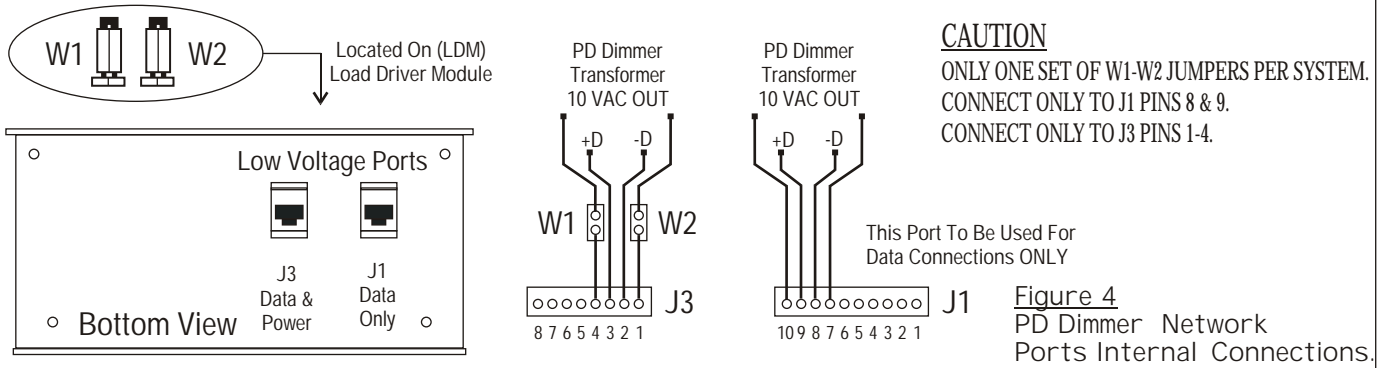
## PD216 Low Voltage Wiring Methods

### W1-W2 Shunt Jumpers

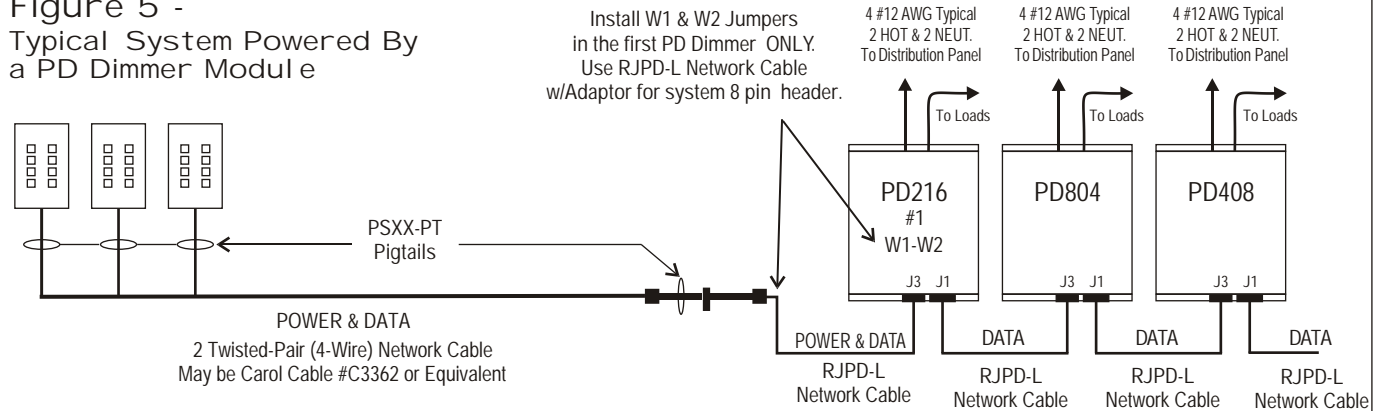
Protocol systems with 3 control nodes or less (PS Series stations, DCO, DCI or RAU) do not require an external power supply transformer. Power for these components can be supplied by one of the PD DIMMER packs. *Figure 4* shows the PD216's network ports with its pin assignments. Installing W1 and W2 connects the 9 VAC transformer output to the network bus via J3. The 9 VAC output is permanently connected to J1. *Figure 5* shows a typical small system with one PD Dimmer supplying power to the network. *Figure 6* shows a typical system with an external transformer. System accessories such as extension cables and jumper boards are available from DLS and can simplify network bus connections.

#### TO AVOID PARALLELING THE OUTPUTS OF SEVERAL TRANSFORMERS IN A PROTOCOL SYSTEM:

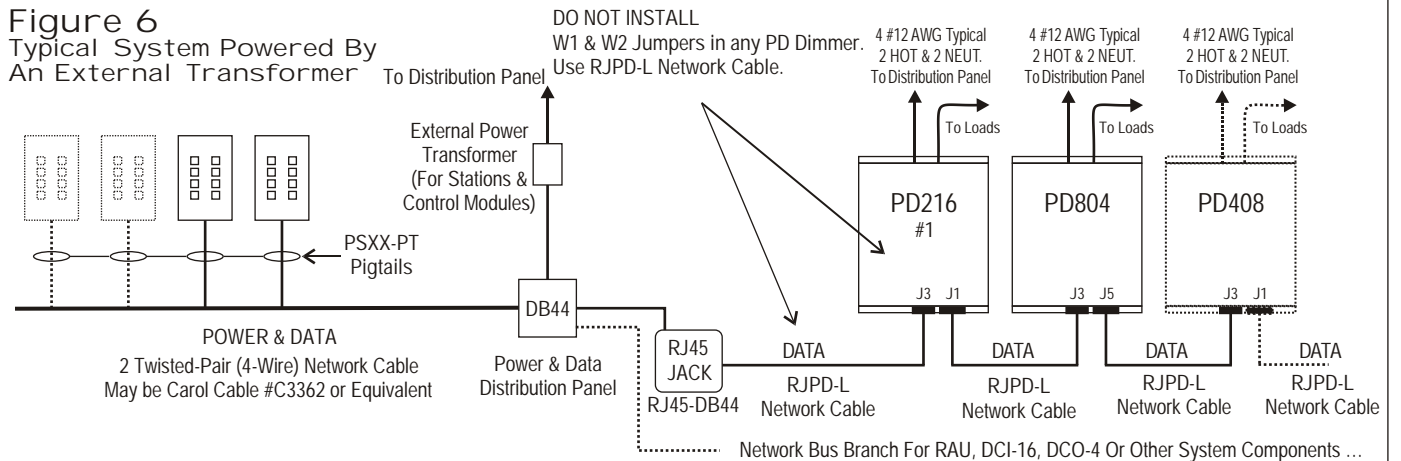
- ⊗ Do not install the jumpers in any of the PD Dimmers when a DB44 panel with an external transformer is used in a system.
- ⊗ Do not install jumpers in more than one PD Dimmer per system when no external transformer is used.



**Figure 5 -**  
Typical System Powered By  
a PD Dimmer Module



**Figure 6**  
Typical System Powered By  
An External Transformer

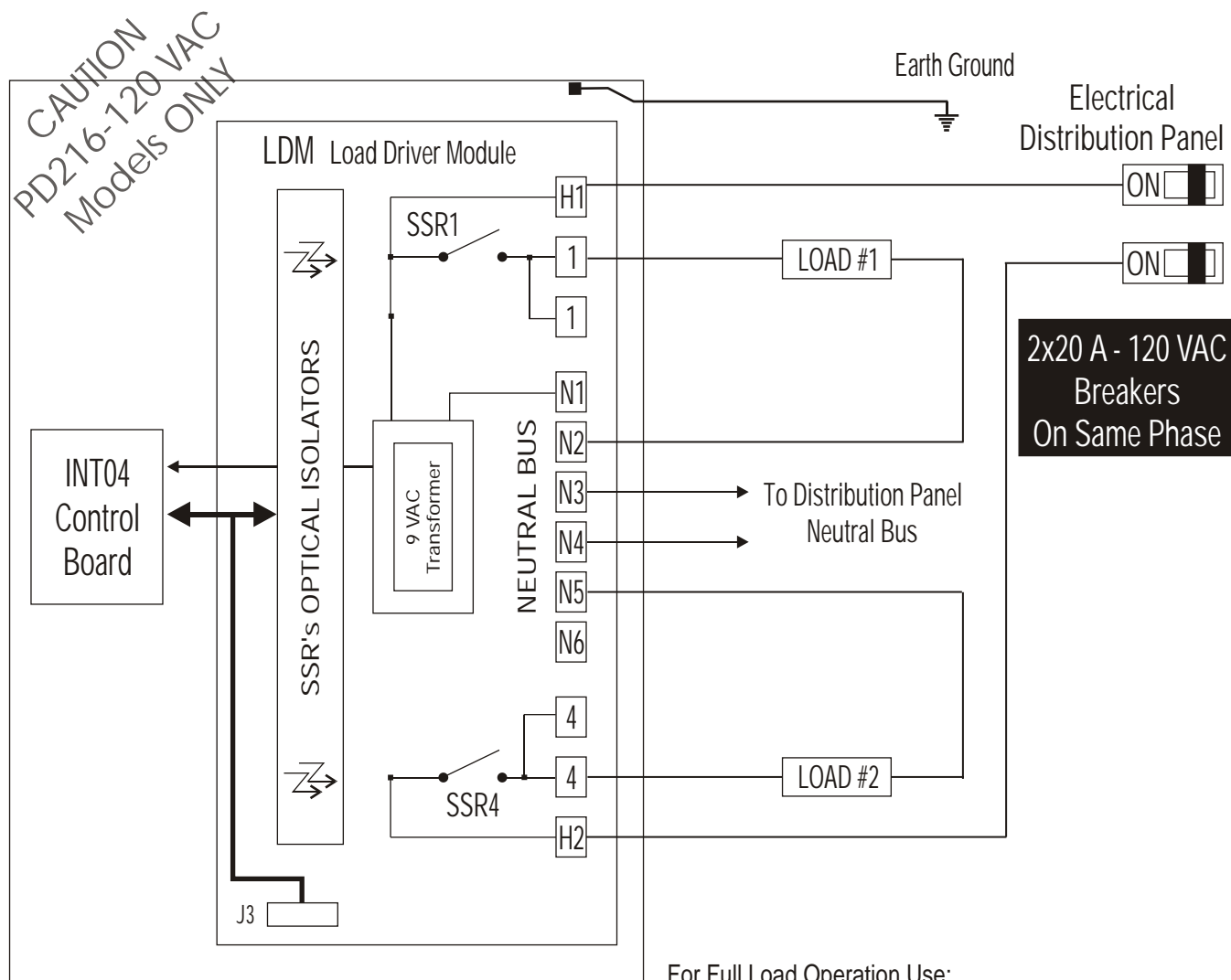


## PD216 General Wiring Instructions

### Wiring Notes

- ❑ DO NOT EXCEED 1920 W (16 Amps. ) per dimmer output @ 120VAC.
- ❑ 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.
- ❑ PD216 dimmer packs may be fed by one or two 20 A (maximum) branch circuits and may have up to two separately dimmed loads.
- ❑ Both breakers must be on the same power phase.
- ❑ 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 PD216 TO ENSURE PROPER WIRING.

Figure 7 - PD216 Typical 120 VAC Wiring.



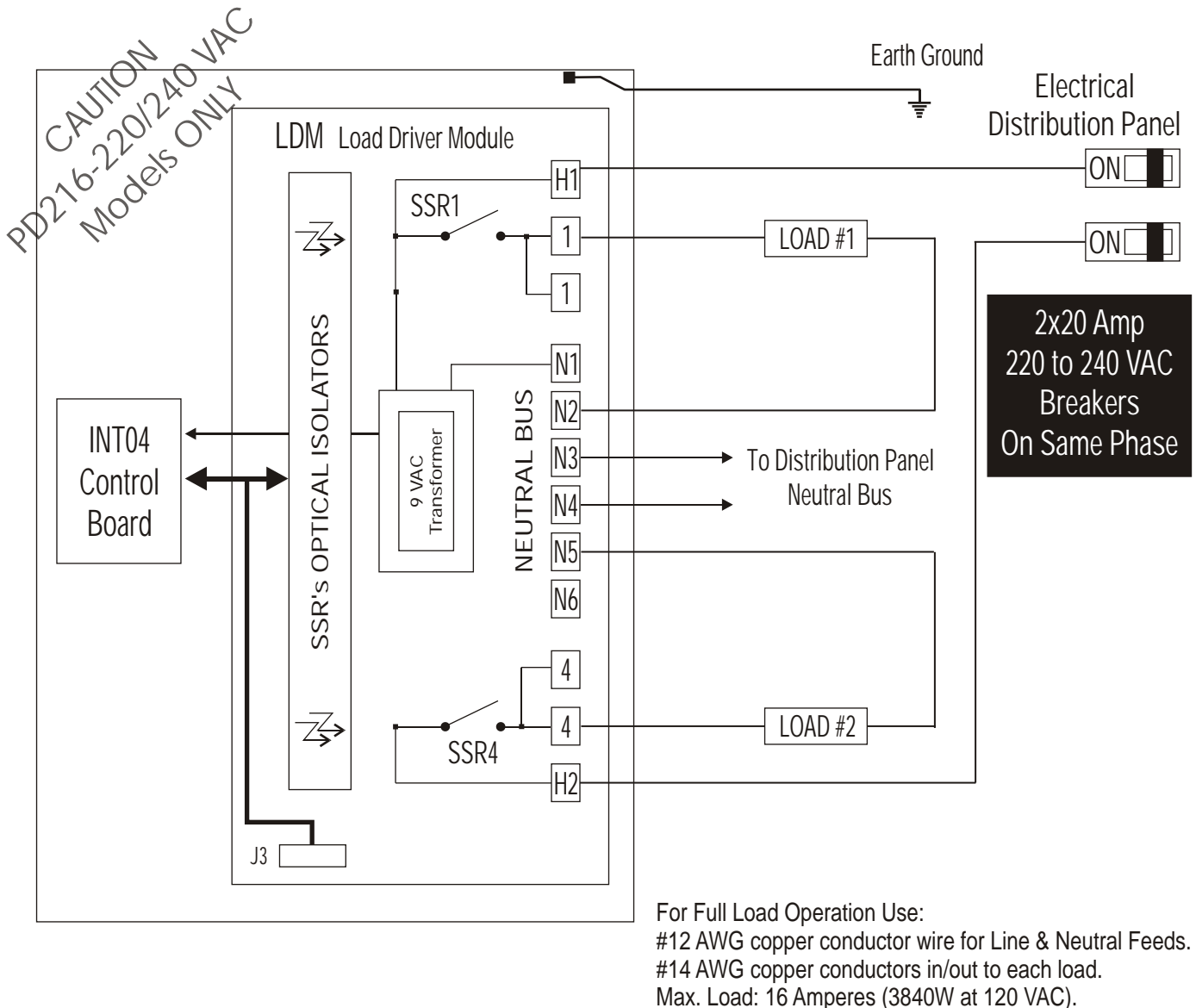
For Full Load Operation Use:  
#12 AWG copper conductor wire for Line & Neutral Feeds.  
#14 AWG copper conductors in/out to each load.  
Max. Load: 16 Amperes (1920W at 120 VAC).

## PD216-220 General Wiring Instructions

### Wiring Notes

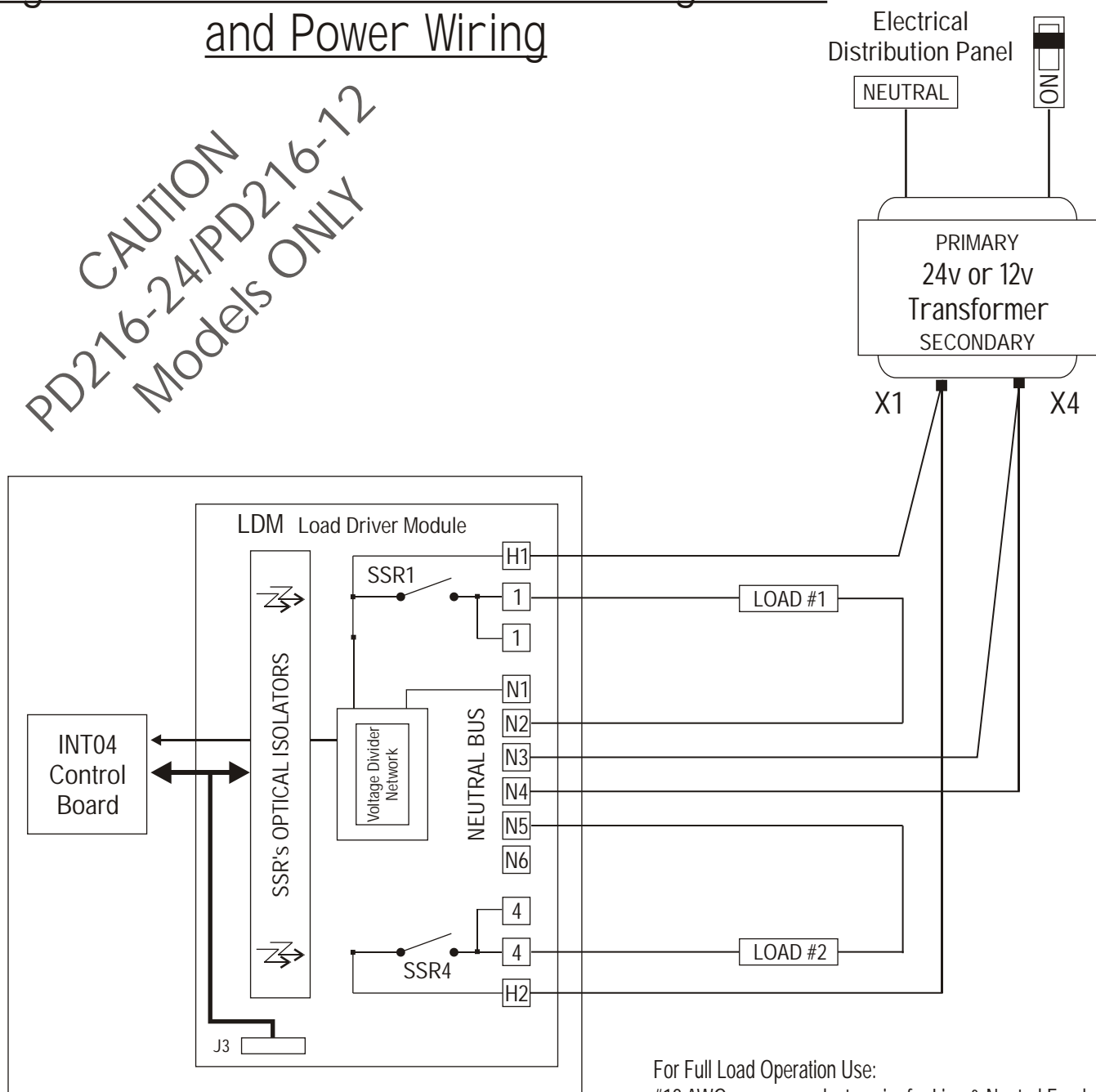
- ❑ DO NOT EXCEED 3840 W (16 Amps. ) per dimmer output @ 240VAC.
- ❑ All wiring between the control stations, dimmers, and other system controllers (network bus) is low voltage (NEMA Class 2) and may be run with two, twisted pair, shielded #18 AWG wire. Control network bus may be Carol Cable #C3362 unless otherwise required. Consult the PROTOCOL Hardware Installation Manual, Appendix E, for maximum wire length.
- ❑ PD216 dimmer packs may be fed by one or two 20 A (maximum) branch circuits and may have up to two separately dimmed loads.
- ❑ Both breakers must be on the same power phase.
- ❑ 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 PD216, TO ENSURE PROPER WIRING.

Figure 8 - PD216 Typical 220/240 VAC Wiring.



## Figure 9 - PD216-24/12 Low Voltage Load and Power Wiring

**CAUTION**  
PD216-24/PD216-12  
Models ONLY



For Full Load Operation Use:  
#12 AWG copper conductor wire for Line & Neutral Feeds.  
#14 AWG copper conductors in/out to each load.  
Max. Load per circuit : 16 Amperes (384W at 24 VAC).

### NOTES

- 1 With PD216-24 you may use a single 24 VAC-800 VA or better transformer or two separate 24 VAC-400 VA or better transformers.
- 2 With PD216-12 you may use a single 12 VAC-400 VA or better transformer or two separate 12 VAC-200 VA or better transformers.
- 3 Follow transformer's installation & wiring instructions from manufacturer.
- 4 Maximum Load Per Output: 192 Watts at 12 VAC.
- 5 Maximum Load Per Output: 384 watts at 24 VAC.



## PROTOCOL Address Setting

Up to 63 uniquely addressed INT04 boards (two in each **PD804**, one in each **PD216** and **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 ((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 **PD216**.

**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, the two outputs of **PD216** # 26 are referred to as **26.1** and **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:**

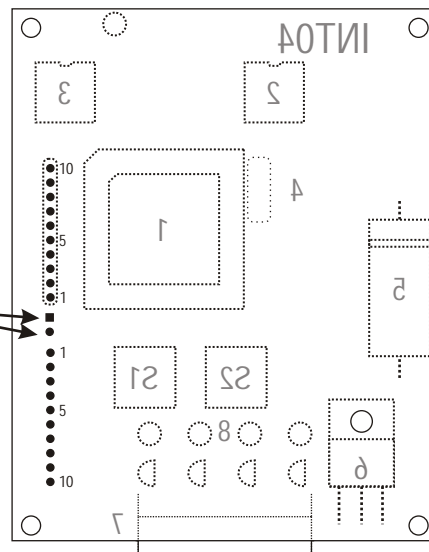
It is also possible to quadruple the maximum number of outputs on a system up to 1004 circuits. An **INT04** may have a decimal address of up to, and including, 252. Please contact factory for more details. For a complete Decimal to Hexadecimal conversion chart, please refer to **Appendix A** in the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

## Non-Dim Output Setting

Whilst both outputs may be programmed to dim or not dim through the "SOFTPRO" configuration software, in some circumstances it may be preferable for both outputs in the **PD216** 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.

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



INT04 Solder (Back) Side

Figure 10 - PD216 INT04 DETAIL

## PD216 Installation Check List

BEFORE ENERGIZING THE PD216 MAKE SURE:

- Loads are tested before connecting to dimmers.
- Breaker feed lines are on same electrical phase.
- PD216 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 PD216's INT04 is set to the right addresses.
- ALL KNOCKOUT HOLES MUST BE COVERED WHEN UNIT IS INSTALLED

**Table 4 - PD DIMMER Address Selection Information**

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

**NOTES:**

00 Decimal (S2,S1 = 0,0) is not allowed on any device.

Max PD216 Address: 63 Decimal (S2,S1 = 3,F)



---

## 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.  
Attn: Customer Service Department  
7588 NW 8th Street  
Miami, FL 33126  
(305) 264-8391

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.





Digital Lighting Systems, Inc.  
7588 NW 8th Street  
Miami, FL 33126  
[www.digitallighting.com](http://www.digitallighting.com)

Tel 305-264-8391  
Fax 305-261-6637  
e-m [info@digitallighting.com](mailto:info@digitallighting.com)

Printed in U.S.A.  
February 2003