

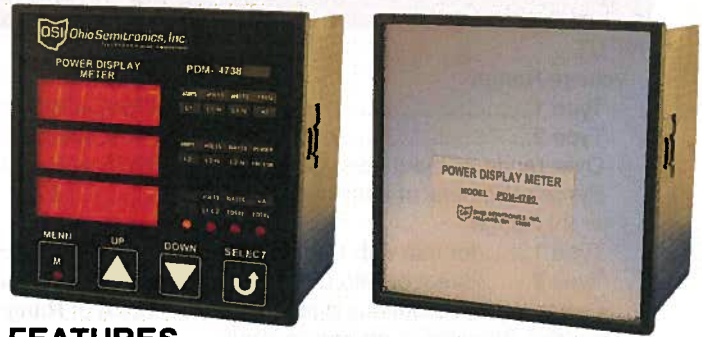
DESCRIPTION

The Model PDM power display meter measures and displays voltage, current, power and energy parameters for single-phase or three-phase systems. Voltages up to 600Vac and currents up to 5Aac are directly connected to the unit. Current Transformers are available in both solid-core (best accuracy) and split-core (most flexible) types to extend the current measurement range.

Local display is provided by three LED displays. Displayable parameters are grouped into four sets of three parameters each with the groups selectable by front panel push-button. Remote display modules may be added as required to provide dedicated display of up to eighteen different parameters.

Analog outputs are provided by adding one or more D/A-4772 converters. Each of these converters provides up to eight output signals which may be assigned to any eight parameters.

Serial communications are provided through either an RS-232C, RS-422 or RS-485 interface, using a simple ASCII protocol.



FEATURES

- High accuracy over a wide range of measurement.
- Suitable for applications with PWM-generated waveforms such as variable-speed motor controls.
- Accommodates a wide variety of current sensors for many applications.
- Serial communication port options: RS-232C, RS-422 or RS-485.
- Simultaneous local display of three parameters on 5-digit, red, high-contrast LED displays.
- Measures true RMS voltage and current even with the presence of harmonics (distortion).
- Remote displays available.
- Analog output converters available.

MODEL SELECTION

PDM - - - - - -

	VOLTAGE INPUT (Nominal)					CURRENT INPUT	SERIAL COMM.	FREQ- UENCY	INST. POWER	OPTIONS (leave blank for standard unit)				
	3Φ 4W	3Φ 3W	1Φ 3W	1Φ 2W										
1	120VL-N/ 208VL-L	120VL-L, 240VL-L	120VL-N/ 240VL-L	120VL-N	1	0 - 0.1A	1	RS-232C	1	50/60Hz, Nominal	1	115Vac	A	Without Local (front panel) Displays
2	277VL-N/ 480VL-L	240VL-L, 480VL-L	N/A	240VL-N	2	0 - 5A	2	RS-422	2	400Hz, Nominal	2	230Vac	B	With Streaming RS-485 Output for Remote Displays or D/A Converter.
							3	RS-485	*3	25-130Hz Variable Frequency Drives			**C	Internal Power Supply for up to 8 Remote Displays

* Available with 0.1A Current Input only.

**Using more than 8 remote displays requires an external power supply.

NOTE: 0.1A Current Inputs may be used only with external CTs. 5A Current Inputs may be direct-connected or used with external CTs.

ORDERING INFORMATION

Example: 3Φ3W, 0-120Vac Input, 0-5A Input, RS-485 Serial Communications, 50/60Hz, 230Vac Instrument Power, with Streaming RS-485 analog output and internal power supply for remote displays.

PDM-1-2-3-1-2-BC

Measured parameters, local display arrangement, communication data strings, etc. may be customized by completing a Configuration sheet (pg 3) at time of ordering

SPECIFICATIONS

INPUT

Voltage Range	
Type 1.....	0-175VL-N/300VL-L
Type 2.....	0-346VL-N/600VL-L
Over-range (without damage)	120% of Range
Burden (Nominal at maximum input).....	0.5mA
Current Range	
Type 1.....(for use with CTs only).....	0-0.1Aac
Type 2.....(direct or with CTs)	0-5Aac
Over-range (without damage)	120% of Range
Burden (Nominal at maximum input).....	0.1VA
Type 1	0.1VA
Type 2	0.5VA
Frequency Range	
Type 1.....	50/60Hz ±10%
Type 2.....	400Hz ±10%
Type 3.....	25-130Hz, Variable
(Available Only with Current Type 1)	
Power Factor.....	Any

INSTRUMENT POWER

Type 1	115Vac ±15%, 50/60Hz, 10VA
Type 2	230Vac ±15%, 50/60Hz, 10VA

SERIAL COMMUNICATIONS

Type 1	RS-232C
Type 2	RS-422
Type 3	RS-485

OPTIONAL ACCESSORIES (consult factory)

1. Current transformers: solid or split-core
2. Remote display (P/N 21967): 5 digit, LED, up to 18 per unit.
3. Analog output converter (P/N D/A-4772): 8 channels each.

ACCURACY (typical setpoint, linearity and repeatability)

Voltage, Current, Volt-Amps and VARs (10% - 100% of range)	
Frequency Type 1 or 2	±0.1% F.S.
Frequency Type 3	±0.25% F.S.
Power and Energy (Wh)	
Frequency Type 1 or 2	±0.1% F.S.
Frequency Type 3	±0.25% F.S.
Power Factor	
Frequency Type 1 or 2	±0.01PF
Frequency Type 3	±0.02PF
Frequency	
Frequency Type 1 or 2	±0.1% Rdg., ±0.02% F.S.
Frequency Type 3	±0.1% Rdg., ±0.1% F.S.

DIELECTRIC TEST

Input/Output/Instrument Power	1800Vac
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TEMPERATURE

Operating Range.....	0°C to 50°C
Effect.....	±0.005%/°C, ±0.05% F.S.

PHYSICAL

Operating Humidity	0-95% non-condensing
Weight.....	2.75lb.

ENCLOSURE

Noryl SE 1, UL94V-1, IP 40, Black

CONFIGURATION

Refer to the Configuration sheet supplied with each unit for specific information regarding the choice of measured parameters, local display arrangement, etc. (sheet is identified by serial number of unit).

OPERATION

Locally displayed parameters are arranged in four groups of three and are identified by the matrix to the right of the displays. Parameter combinations are labeled in the columns above each of the four indicator LEDs. The column being displayed is indicated by a lit LED.

Up/Down arrow buttons select columns to display: Up selects next column to the right, Down selects next one to the left.

Press and hold the front panel SELECT button for approximately two seconds to reset the Wh display to zero.

When configured as a 'Freeze/Unfreeze' control (see communication CF command) the Menu button will 'Freeze' all data values. The Up and Down arrow buttons may be used to display 'Frozen' values. Pressing the Menu button again will 'Unfreeze' data and allow normal updating.

When configured as a Standard/Extended averaging control (this is the default, see also communication command CA) the Menu button will toggle the data update rate between Standard (approximately 2.5 times per second) and Extended (approximately once every 3 seconds). Extended averaging is active when the Menu button LED is lit.

DEFAULT DISPLAY CONFIGURATION

	First LED is lit (pos.)	Second LED is lit (pos.)	Third LED is lit (pos.)	Fourth LED is lit (pos.)
Top Display	= Watts (Sys) 1	= Volts L1-N 4	= Amps L1 7	= Volts L1-L2 10
Middle Display	= Power Factor 2	= Volts L2-N 5	= Amps L2 8	= Volts L2-L3 11
Bottom Display	= Frequency 3	= Volts L3-N 6	= Amps L3 9	= Volts L3-L1 12

GENERAL

Each unit may be configured to measure any 18 parameters from the following list. Any twelve of those eighteen parameters may be selected for local display. Display position is also selectable (see default display config. on pg 2). Any or all of the parameters may be displayed on remote displays, accessed through the serial com port, or sent to a D/A converter (8 channels per converter).

Check the boxes as required to indicate the desired configuration.

PARAMETERS

	MEASURED	DISPLAYED	POSITION #		MEASURED	DISPLAYED	POSITION #		MEASURED	DISPLAYED	POSITION #
VOLTS (L-N)				VOLTS (L-L)				AMPS			
L1-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L1-L2.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L1.....	<input type="checkbox"/>	<input type="checkbox"/>	___
L2-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L2-L3.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L2.....	<input type="checkbox"/>	<input type="checkbox"/>	___
L3-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L3-L1.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L3.....	<input type="checkbox"/>	<input type="checkbox"/>	___
Average L-N....	<input type="checkbox"/>	<input type="checkbox"/>	___	Average L-L.....	<input type="checkbox"/>	<input type="checkbox"/>	___	Average.....	<input type="checkbox"/>	<input type="checkbox"/>	___
WATTS				VOLT-AMPS				VARs			
L1-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L1-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L1-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___
L2-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L2-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L2-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___
L3-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L3-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___	L3-N.....	<input type="checkbox"/>	<input type="checkbox"/>	___
System.....	<input type="checkbox"/>	<input type="checkbox"/>	___	System.....	<input type="checkbox"/>	<input type="checkbox"/>	___	System.....	<input type="checkbox"/>	<input type="checkbox"/>	___
ENERGY (Wh)				FREQUENCY				POWER FACTOR			
System.....	<input type="checkbox"/>	<input type="checkbox"/>	___	System.....	<input type="checkbox"/>	<input type="checkbox"/>	___	System.....	<input type="checkbox"/>	<input type="checkbox"/>	___

SCALING

VOLTAGE Direct Input Only
 Scaled For Use With PTs. Ratio _____ : _____

CURRENT Direct Input Only
 Scaled For Use With CTs. Ratio _____ : _____

UNITS AND RESOLUTION

Units of measure and resolution in general are selected to provide best reasonable resolution.

Example: Full Scale Watts = Volts(L-N) * Current * 3
 346VL-N * 500A * 3 = 519kW = F.S. (the factory default resolution would be 519.0kW)

	UNITS				RESOLUTION			
VOLTS	<input type="checkbox"/> V	<input type="checkbox"/> kV	N/A	N/A	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
AMPS	<input type="checkbox"/> A	<input type="checkbox"/> kA	N/A	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
WATTS (L-N)	<input type="checkbox"/> W	<input type="checkbox"/> kW	<input type="checkbox"/> MW	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
WATTS (SYSTEM)	<input type="checkbox"/> W	<input type="checkbox"/> kW	<input type="checkbox"/> MW	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
Note: Default setup is unidirectional. (see Bidirectional Operation below)								
VOLT-AMPS (L-N)	<input type="checkbox"/> VA	<input type="checkbox"/> kVA	<input type="checkbox"/> MVA	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
VOLT-AMPS (SYSTEM)	<input type="checkbox"/> VA	<input type="checkbox"/> kVA	<input type="checkbox"/> MVA	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
VARs (L-N)	<input type="checkbox"/> VAR	<input type="checkbox"/> kVAR	<input type="checkbox"/> MVAR	<input type="checkbox"/> -X.XXX	<input type="checkbox"/> -XX.XX	<input type="checkbox"/> -XXX.X	<input type="checkbox"/> -XXXX	
VARs (SYSTEM)	<input type="checkbox"/> VAR	<input type="checkbox"/> kVAR	<input type="checkbox"/> MVAR	<input type="checkbox"/> -X.XXX	<input type="checkbox"/> -XX.XX	<input type="checkbox"/> -XXX.X	<input type="checkbox"/> -XXXX	
Note: Leading VARs are displayed with a "-" sign.								
POWER FACTOR	PF	N/A	N/A	N/A	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	N/A	
WATTHOURS (SYSTEM)	<input type="checkbox"/> Wh	<input type="checkbox"/> kWh	<input type="checkbox"/> MWh	<input type="checkbox"/> XX.XXX	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	<input type="checkbox"/> XXXXX	
Note: Watthour operation is unidirectional (forward energy) even if bidirectional Watt operation is selected.								
FREQUENCY	Hz	N/A	N/A	N/A	<input type="checkbox"/> XXX.XX	<input type="checkbox"/> XXXX.X	N/A	

BIDIRECTIONAL OPERATION

WATTS

Note: Reverse power will be indicated with a "-" sign. Resolution must be adjusted to use 4 digits of display only. Otherwise the "-" sign will overwrite the most significant digit. (Watthour operation is unidirectional (forward energy) even if bidirectional Watt operation is selected.)

COMMENTS: _____

GENERAL

TYPE 1

Format: RS-232C, 3-wire interface (without handshaking)
 Parameters: 9600 baud, no parity, 8 data bits, 1 stop bit (N, 8, 1)
 Connector: 9 pin, male (DB-9P), Pin 2 = RX, Pin 3 = TX, Pin 5 = Com
 Configuration: This is a DTE device. To communicate with another DTE device, such as a PC, a null modem (cross-over) cable must be used. Communication with DCE devices (generally anything other than a PC) requires a straight-through RS-232C cable.

TYPE 2

Format: RS-422
 Parameters: 9600 baud, no parity, 1 stop bit (N, 8, 1)
 Connector: 9 pin, male (DB-9P), Pin 4 = TX+, Pin 5 = TX-, Pin 8 = RX+, Pin 9 = RX-.

TYPE 3

Format: RS-485
 Parameters: 9600 baud, no parity, 1 stop bit, (N, 8, 1)
 Connector: 9 pin, male (DB-9P), Pins 4 and 8 = TX/RX+, Pin 5 and 9 = TX/RX-

MESSAGE FORMAT

All commands and responses have the same general format: STX ADDR CMD DATA ETX

STX ASCII start of text character, control B (^B).
 ADDR Unique 4 character address for each meter. Hex characters 0-F are allowed. (Default = 0001)
 CMD A two-character command for which there is a defined response.
 DATA Information associated with the command where required.
 ETX ASCII end of text character, control C (^C).

COMMAND DESCRIPTION

Configuration of communication strings (RD and RR) will vary from unit to unit based on customer requirements. The following examples are based on factory default settings. Refer to the configuration sheet supplied with each unit for specific information (sheet is identified by serial number of unit).

- RD Read Data Meter responds with 9 data values (6 digits ea w/decimal point) as a comma-delineated string: WSYSTEM, PFSYSTEM, Hz, VL1-N, VL2-N, VL3-N, IL1, IL2, IL3
- RR Read Register Meter responds with 9 data values (6 digits ea w/decimal point) as a comma-delineated string: VL1-L2, VL2-L3, VL3-L1, WL1-N, WL2-N, WL3-N, VASYSTEM, VARSYSTEM, WHSYSTEM
- FD Freeze Data All data values are 'Frozen' simultaneously.
 'Frozen' values may still be read using the RD and RR commands.
 'Frozen' values may still be displayed using the front panel push-buttons.
 The CF command may be used to configure the unit so that pressing the front panel Menu button will 'Freeze' data.
- UD Unfreeze Data All data values are 'Unfrozen' and return to normal updating.
 The CA command may be used to configure the unit so that pressing the front panel Menu button while frozen data is displayed will 'Unfreeze' data.
- CE Clear Clears accumulated Watthour values.
 This command has the same effect as pressing the front panel Select button.
- CF Configure Configure the front panel Menu button to act as a Freeze/Unfreeze control.
- CA Configure Configure the front panel Menu button to act as a Standard/Extended Averaging control for data updates.
- WU Write Unit Used to set unit address.
- V1 Verify Meter responds with unit address and firmware version.

NOTE: The rear panel Program Enable jumper must be installed to allow the WU, CA and CF commands to store settings in non-volatile memory. Configuration will revert to the previous setting(s) at the next instrument power ON/OFF cycle if the jumper is not installed.

COMMAND and RESPONSE EXAMPLES

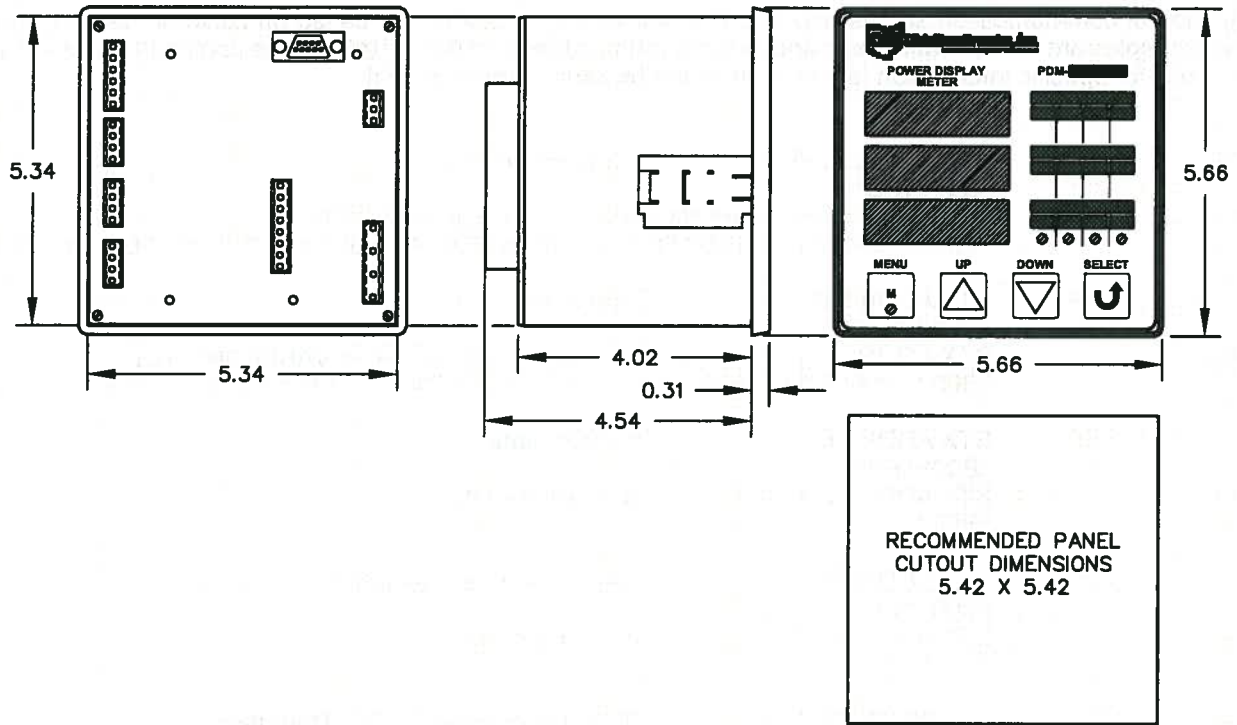
Configuration of communication strings (RD and RR) will vary from unit to unit based on customer requirements. The following examples are for illustration only and assume a unit address of 0001. Refer to the configuration sheet supplied with each unit for specific information (sheet is identified by serial number of unit).

Command:	RD	STX ADDR RD ETX ^B0001RD^C	(Read data string 1)
Response:		STX ADDR,Wsys,PFsys,HZ,VL1-N,VL2-N,VL3-N,IL1,IL2,IL3,ETX ^B0001,05190.0,0001.00,0060.00,00346.0,00346.0,00346.0,005.000,005.000,005.000,^C	
Command:	RR	STX ADDR RR ETX ^B0001RR^C	(Read data string 2)
Response:		STX ADDR,VL1-L2,VL2-L3,VL3-L1,WL1-N,WL2-N,WL3-N,VAsys,VARsys,WHsys,ETX ^B0001,00600.0,00600.0,00600.0,01730.0,01730.0,01730.0,05190.0,05190.0,^C	
Command:	FD	STX ADDR FD ETX ^B0001FD^C	(Freeze data)
Response:		STX ADDR FD ETX ^BFD^C	(Command echo)
Command:	UD	STX ADDR UD ETX ^B0001UD^C	(Unfreeze data - resume normal updating)
Response:		STX ADDR UD ETX ^BUD^C	(Command echo)
Command:	CE	STX ADDR CE ETX ^B0001CE^C	(Reset accumulated Watt-Hour data)
Response:		STX CMD ETX ^BCE^C	(Command echo)
Command	CF	STX ADDR CF ETX ^B0001CF^C	(Configure Menu button for Freeze/Unfreeze control)
Response		STX CF ETX ^BCF^C	(Command echo)
Command	CA	STX ADDR CA ETX ^B0001CA^C	(Configure Menu button for Standard/Extended averaging control)
Response		STX CA ETX ^BCA^C	(Command echo)
Command:	WU	STX ADDR CMD DATA ETX ^B0001WU0009^C	(Change address from 0001 to 0009)
Response:		STX CMD ETX ^BWU^C	(Command echo)
Command:	V1	STX ADDR CMD ETX ^B0000V1^C	(Verify address and firmware version)
Response:		STX ADDR Version ETX ^B00090301^C	(Address is 0009, firmware version is 0301)

NOTES

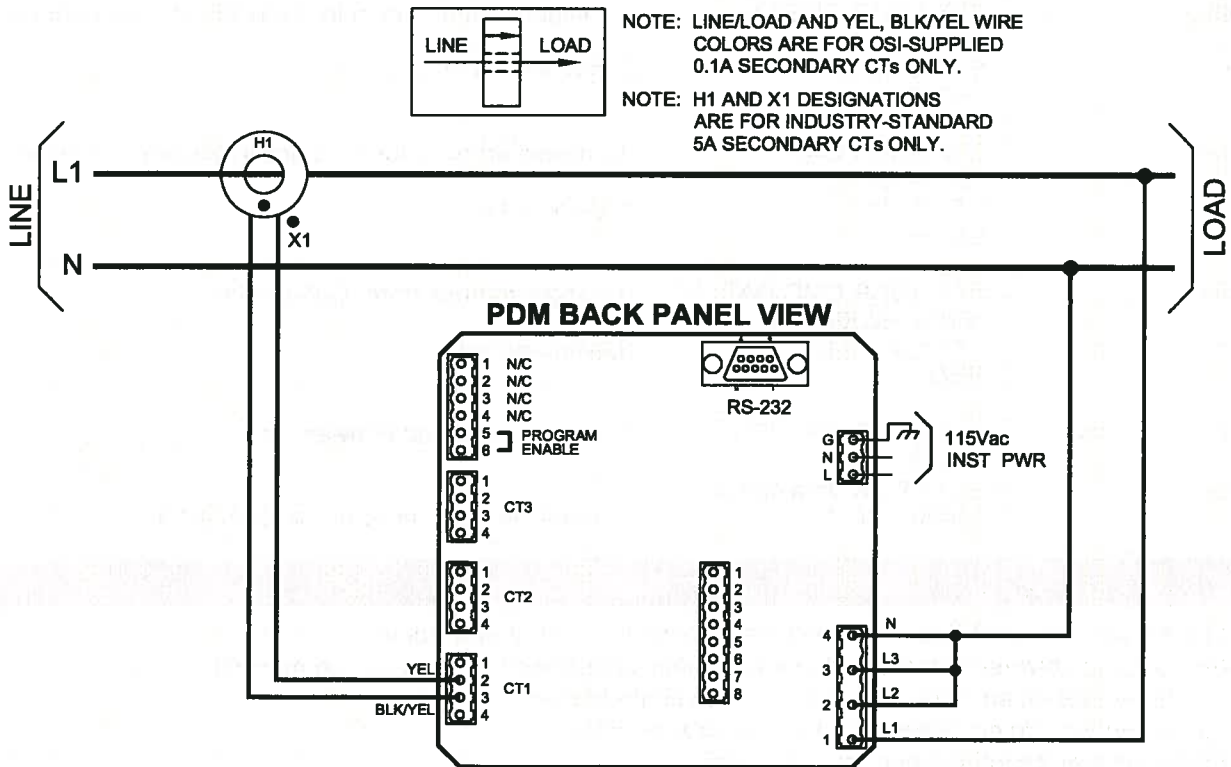
1. Universal address is 0000 and may be used to verify or write a new address.
2. Never use the universal address with multiple units connected to the same communication line.
3. When the universal address is used there is no command echo.
4. Read commands do not respond to the universal address.
5. Commands may be either upper or lower case.

CASE DIMENSIONS



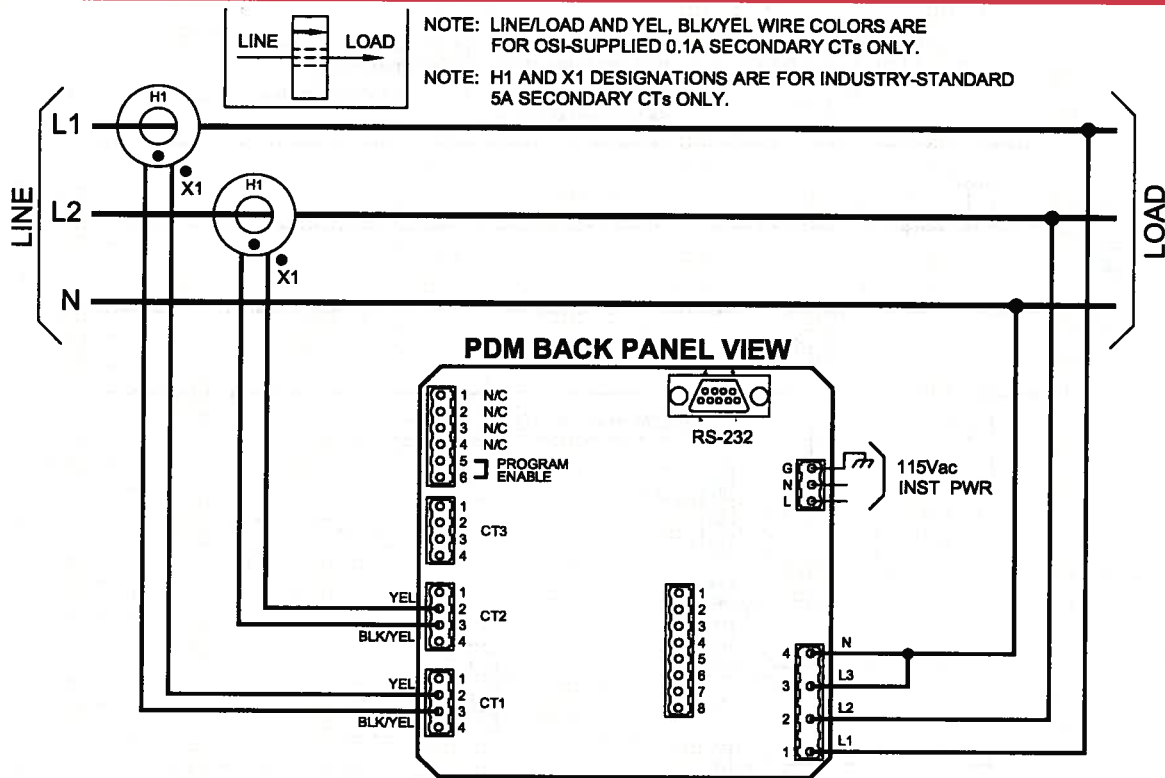
Dwg# B902-0756c1

SINGLE-PHASE, 2-WIRE CONNECTIONS USING EXTERNAL CT



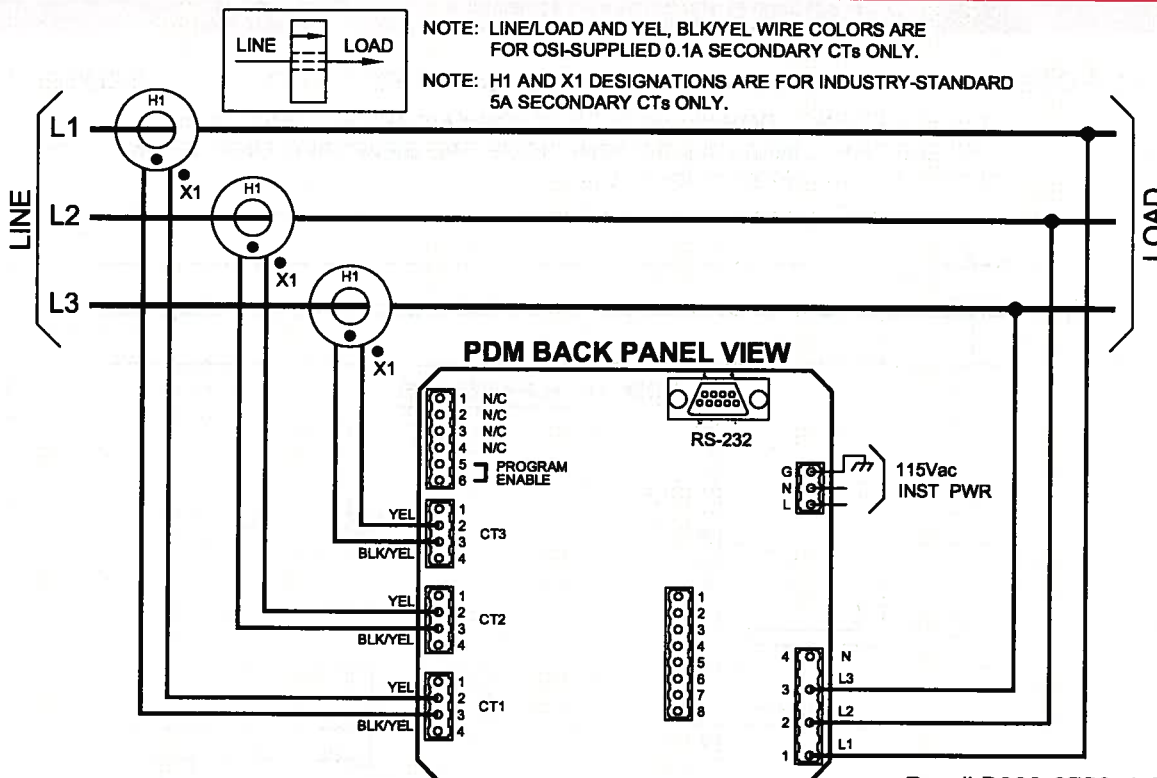
Dwg# B902-0756c1-1PH 2W

SINGLE-PHASE, 3-WIRE CONNECTIONS USING EXTERNAL CTs



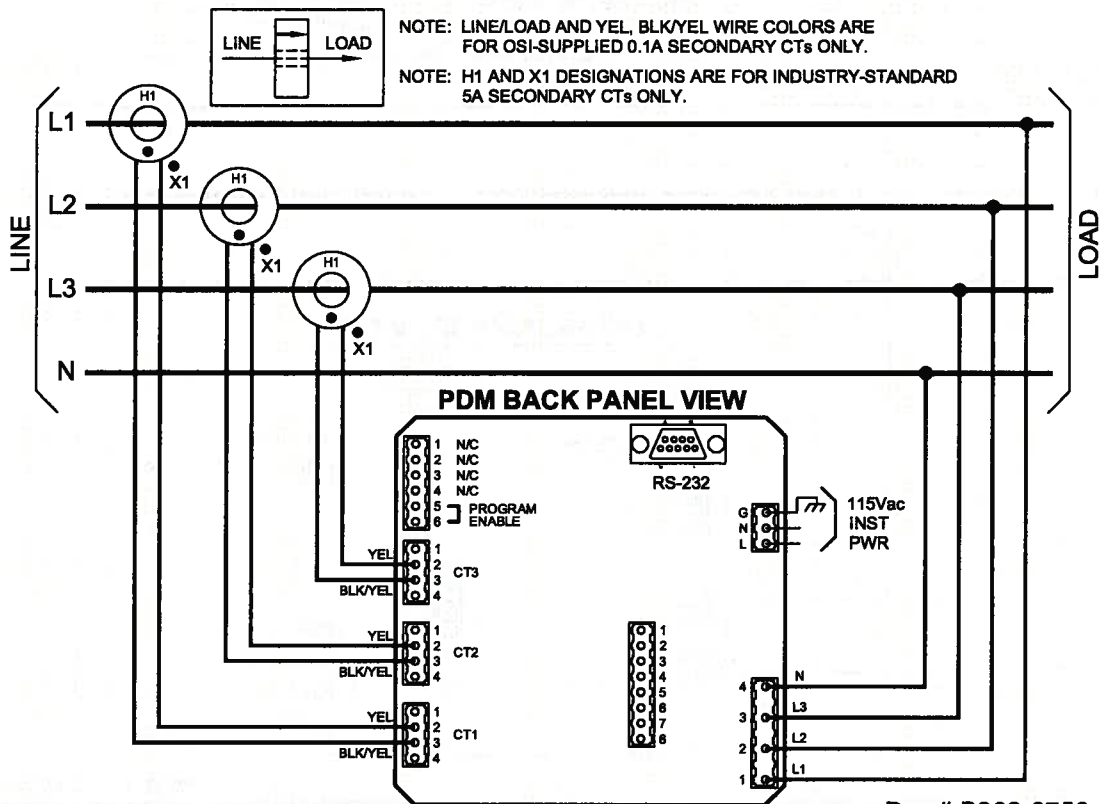
Dwg# B902-0756c1-1PH 3W

3-PHASE, 3-WIRE CONNECTIONS USING EXTERNAL CTs



Dwg# B902-0756c1-3PH 3W

3-PHASE, 4-WIRE CONNECTIONS USING EXTERNAL CTs

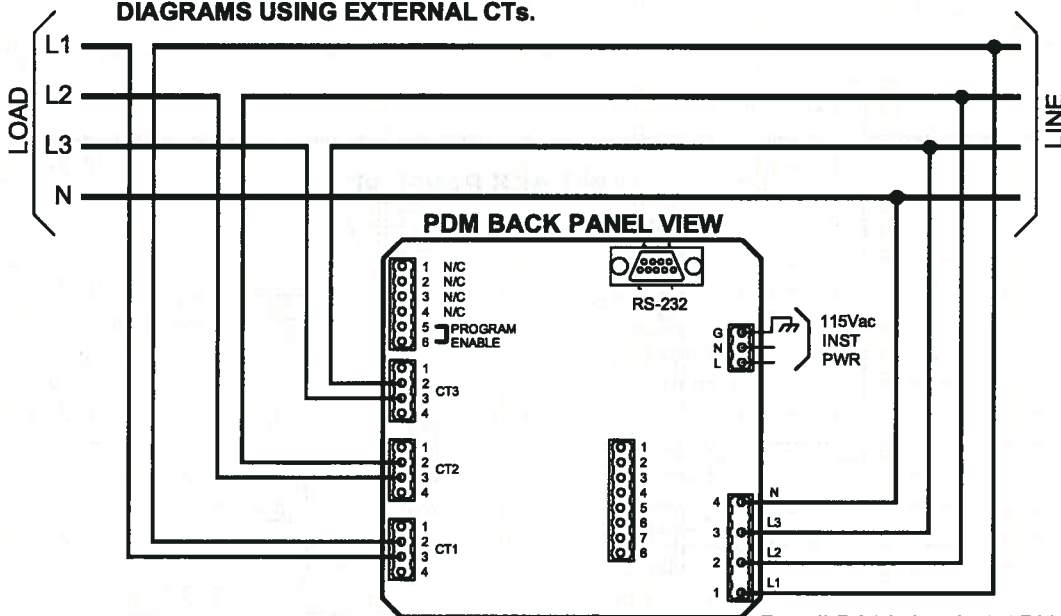


Dwg# B902-0756c1-3PH 4W

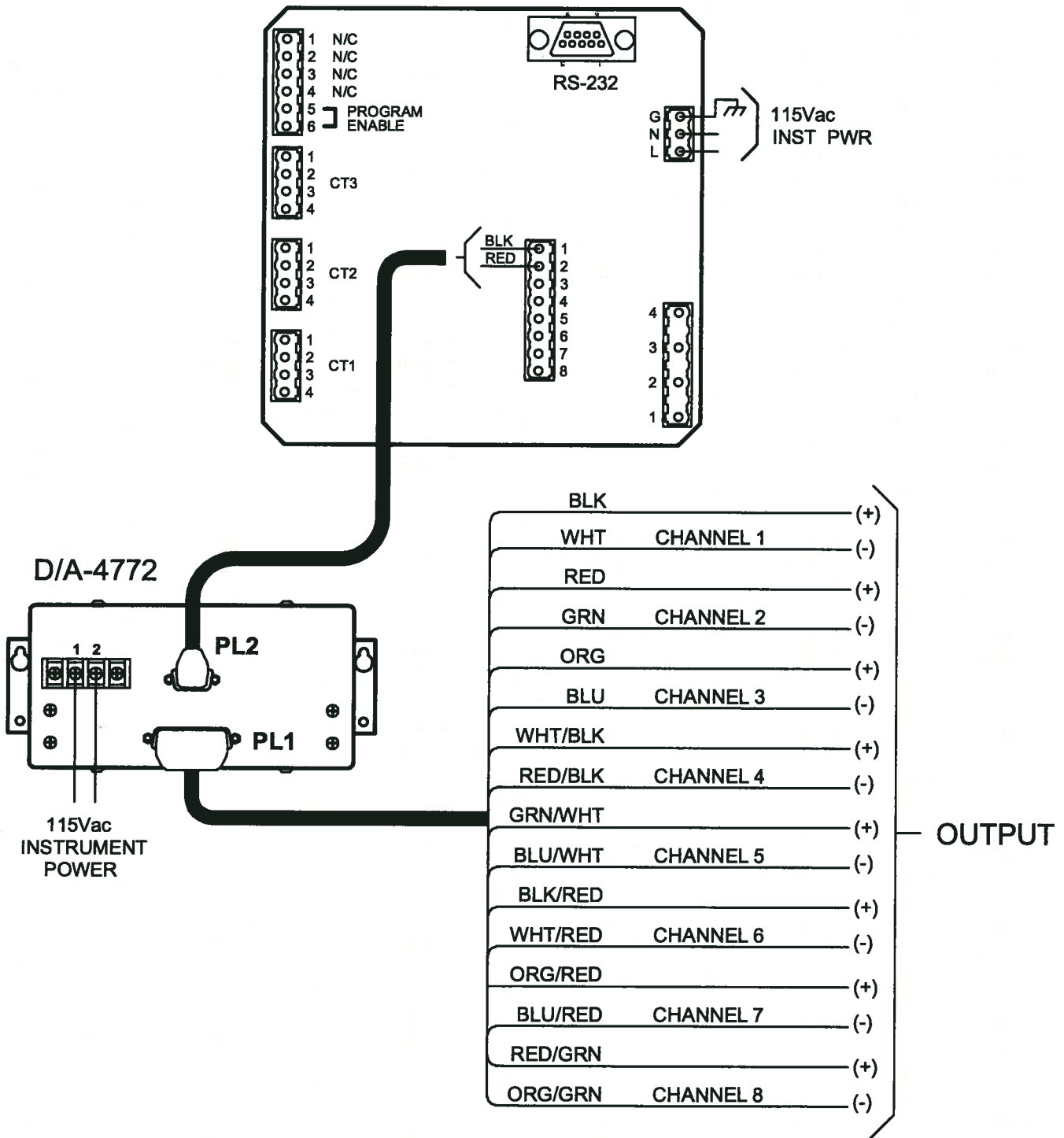
3-PHASE, 4-WIRE DIRECT CONNECTIONS

DO NOT CONNECT 0.1A CURRENT INPUT MODELS DIRECTLY TO THE MEASURED LINES!

DIRECT CONNECTION IS VALID ONLY FOR 5A CURRENT INPUT MODELS. NOTICE THAT LINE/LOAD DESIGNATIONS ARE REVERSED FROM CONNECTION DIAGRAMS USING EXTERNAL CTs.



Dwg# B902-0756c1-3PH 4W DIRECT



Dwg# B902-0756c1-ANALOG

