

INTELLIMETER® REGISTER™

MODEL RG2

INSTALLATION AND CONNECTIONS

INSTALLATION MANUAL

WARNING: Any work on or near energized metering equipment can present a danger of electrical shock. All work on these products should be performed only by qualified industrial electricians and metering specialists in accordance with local utility safety practices and procedures outlined in the **Handbook for Electricity Metering** (available from the Edison Electric Institute, 1111 19th St. NW, Washington, DC 20036). The Information contained within this book is intended to be an aid to qualified metering personnel. It is not intended to replace the extensive training necessary to install or remove meters from service.

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INTRODUCTION

The Intellimeter Registers are CT- based, universal meters suitable for new buildings or retrofit projects in existing buildings. Their design makes installation simple. No meter sockets or additional hardware is needed. No expensive rewiring, is required either. Simply install a Register wherever you want to meter loads.

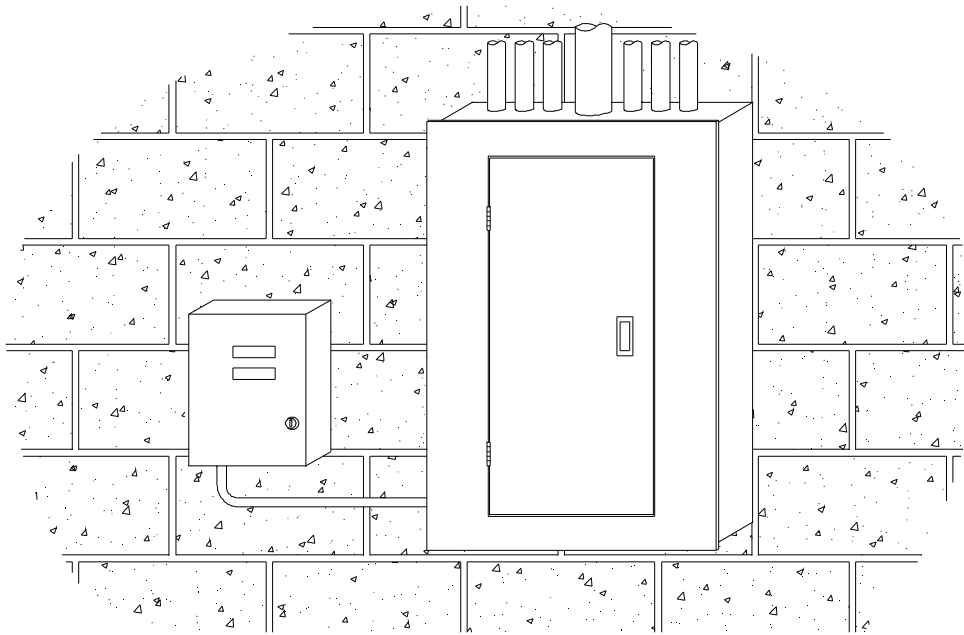


FIGURE 1 - TYPICAL INSTALLATION

Register models are available for conventional 5 Amp output current transformers or low cost 0.1 amp output current transformers, including split-core types. Using split-core current transformers, the Register can be installed without disturbing existing wiring.

The standard version of the Intellimeter Register measures kilowatt-hour consumption. It is available with a demand metering option as well. The demand meter is available for different demand intervals, with the standard demand interval in any geographical area determined by local rate structures. A cumulative demand register is standard on Registers equipped for demand metering. Any authorized or unauthorized reset of the demand meter will register in the cumulative demand register, preserving the demand reading.

If the Register is not installed properly or needs service, it displays a help code. It includes an “88888888” display that cycles with the dial displays so the user can always verify that the liquid crystal display is functioning properly. The Register also has displays to enable a trained meter tester to conduct accuracy tests in the field. These consist of blinking indicators, a horizontal bar and a vertical bar that will be displayed in the far left position of the display. There is also a blinking dot just to the right of the display number any time the meter is accumulating energy.

The Register is compatible with the Intellimeter system, used for remote meter reading. Should the number of loads metered make it desirable to use a remote reading metering system, the pulse output on the Register allows you to interface the meter with an Intellimeter Pulse Monitor for remote reading capabilities.

The pulse output of the Register is Standard KYZ, Form C output. It is compatible with most energy management systems which may be used with the Register for remote meter reading and load control. It is also compatible with pulse recording devices commonly used by electric utility companies for remote billing and load research.

INSTALLATION

Inspect installation site. Working clearances should comply with the national Electric Code (NEC), Article 110-16. If not, take corrective action. **The Register is intended for indoor use only.** Do not install in damp or wet locations without proper enclosure.

Inspect the switchgear panel. Wire bending space should be in compliance with NEC Article 373-6. Verify that current transformers, voltage taps and wiring devices can be installed without crowding the subpanel. If adequate space is not available, an exterior current transformer cabinet will be required.

Identify the source of power. Trace wiring back to transformer or the service entrance if the service is not known.

<u>Electrical Service</u>	<u>5 Amp Secondary CT Register Type</u>	<u>0.1 Amp Secondary CT Register Type</u>
120V 2 Wire single-phase	RG2-120	RG2-120.1
3 Wire High Voltage using Voltage Transformers	RG2-120	RG2-120.1
120/208V 3 Wire Network	RG2-208	RG2-208.1
208V 3 Wire ungrounded or 120/208V 4 Wire Wye	RG2-208	RG2-208.1
120/240V 3 Wire single-phase	RG2-240	RG2-240.1
240V 2 Wire Delta	RG2-240	RG2-240.1
240V 3 Wire Delta	RG2-240	RG2-240.1
240V 4 Wire Delta	RG2-240	RG2-240.1
480V 3 Wire Delta or 277/480V 4 Wire Wye	RG2-480	RG2-480.1
600V 3 Wire Delta or 346/600V 4 Wire Wye	RG2-600	RG2-600.1

Verify that you have the correct type of Intellimeter Register for the application.

Warning: If the equipment described is modified or used in any manner not specified by these instructions the protection provided by the equipment may be impaired.

Inspect the Register electronic assembly for the correct type number on the label and for signs of damage during shipping and handling. See Figure 3 for electronics assembly layout.

Mount the Register enclosure. See Figures 2 and 3. The 10 inch side of the enclosure must be vertical so the dial display can be read after installation.

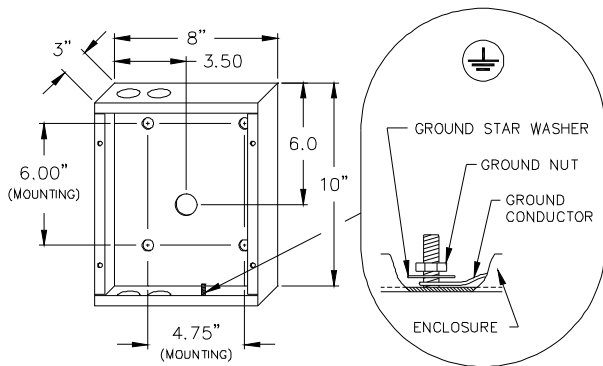


FIGURE 2 - REGISTER ENCLOSURE WITH GROUND CONNECTION DETAIL

Knockouts are provided for 3/4 inch trade size metal conduit. Reliable grounding is required.

Note: Equipment grounding must be done in accordance with local and national codes of the authority having jurisdiction. The protective earth terminal is provided for this function.

Attach the enclosure to a wall stud using screws or provide equivalent support.

Pull leads from the load to be metered to the Register. Color code or label all leads. Provide voltage disconnect and CT shorting means if required.

EXAMPLES

- 3 Wire Network: pull 2 voltage taps, 1 neutral, 2 leads for CT-1 and 2 leads for CT-2; 7 leads total.
- 4 Wire Wye: pull 3 voltage taps, 1 neutral 2 leads for CT-1, 2 leads for CT-2 and 2 leads for CT-3; 10 leads total.
- 3 Wire Delta: pull 3 voltage taps, 2 leads for CT-1 and 2 leads for CT-2; 7 leads total.
- 4 Wire Delta, pull 3 voltage taps, 1 neutral, 2 leads for CT-1, 2 leads for CT-2 and 2 leads for CT-3; 10 leads total.
- If pulse output is used, pull three leads from the pulse recording device to the Register enclosure.

Mount the Register electronics assembly. Align the holes in the printed circuit board with the standoffs provided in the enclosure. Push the printed circuit board onto the standoffs until it snaps in place. Refer to Figure 14 for additional instructions.

Connect the leads to the input Connectors, following the appropriate wiring diagram exactly. Plug connectors into headers on board. If the pulse output is used plug in and wire connector PL1 on the upper left side of the electronics assembly.

See Figure 4 for 2 Wire grounded single-phase connections.

See Figure 5 for 2 Wire ungrounded single-phase connections.

See Figure 6 for 3 Wire Network and 3 Wire single-phase 120/240V.

See Figure 7 for 3 Wire Delta connections.

See Figure 8 for 4 Wire Delta and Wye connections.

See Figure 9 for High Voltage 3 Wire (without grounded neutral) connections. Note if the service is 4 wire wye, any loads connected to neutral or ground will cause meter errors.

See Figure 10 for High Voltage 4 Wire connections.

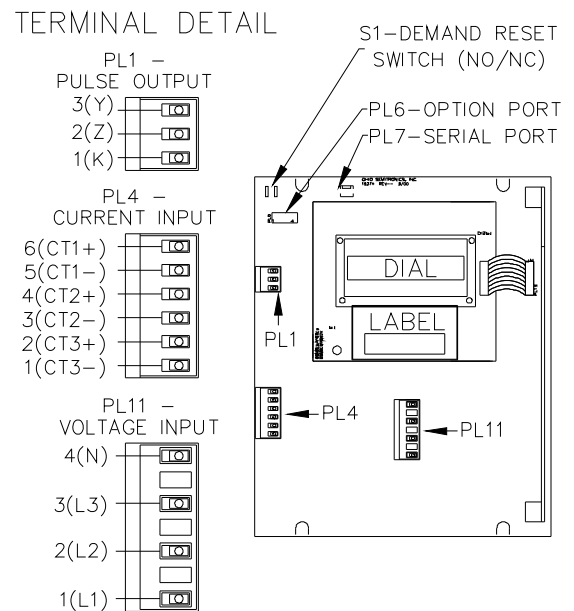


FIGURE 3 - REGISTER ELECTRONICS

WARNING: IN METERING APPLICATIONS WITHOUT A GROUNDED NEUTRAL, CURRENT TRANSFORMERS AND THE ELECTRONICS ASSEMBLY COULD BE AT A VOLTAGE ABOVE GROUND. TO AVOID ELECTRIC SHOCK, DO NOT ENERGIZE THE VOLTAGE LEADS UNTIL ALL CONNECTIONS ARE MADE AND THE COVER IS INSTALLED.

Calculate the kilowatt-hour multiplier and mark it on the Register nameplate label.

Use a permanent marker. Determine the marked ratio of the current transformers that will be installed. The marked ratio of the current in the primary (metered load) that will produce rated secondary amps in the circuit attached to the current transformer (the meter). Divide the primary current by 100 to determine the multiplier. (See following).

Current Transformer <u>Marked Ratio</u>	<u>Multiplier</u>
100:5 or 100:0.1	1
200:5 or 200:0.1	2
400:5 or 400:0.1	4
800:5 or 800:0.1	8
1000:5 or 1000:0.1	10
1500:5 or 1500:0.1	15
2000:5 or 2000:0.1	20

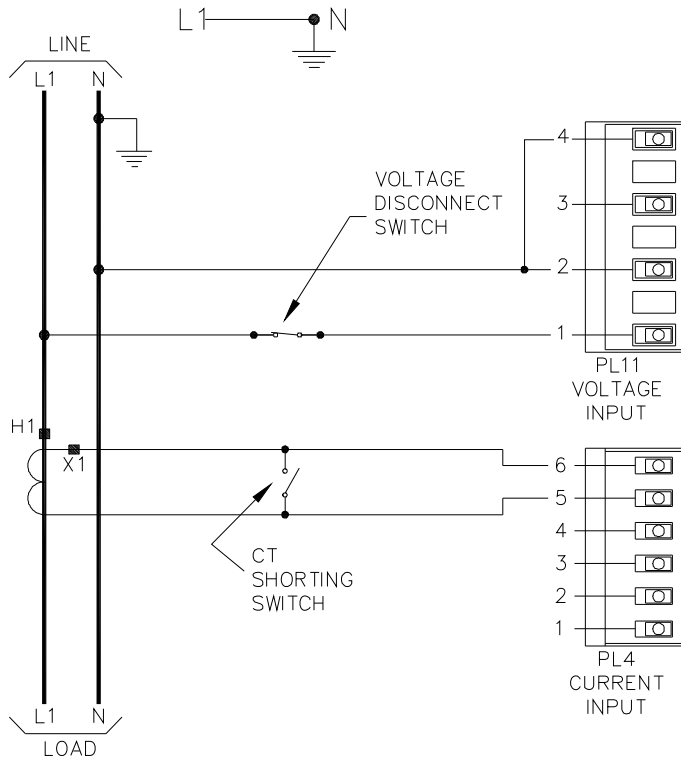
Disconnect power to the metered load. Turn off all breakers in the cabinet to be metered.

Install current transformers. See Figure 11 for examples. See Figure 4 through 10 for connections.

SPECIFICATIONS

Voltage:	Nominal $\pm 10\%$, 50/60Hz, 7 watts Nominal (Line-To-Line) 120, 208, 240, 480, 600 Installation Overvoltage Category III Pollution Degree 2
Power Factor:	Accurate at any
Temperature:	-20°C to +50°C
Altitude:	Up to 2,000m
Humidity:	Maximum relative humidity 80% for temperatures up to 31°C decreasing linearity to 50% relative humidity at 40°C
Accuracy:	Exceeds ANSI C12.16
Memory:	Nonvolatile EE PROM
Burdens:	Voltage: 7VA maximum on L1-L2 for instrument power otherwise 0.22VA maximum per phase. Current: 0.25VA maximum per phase.
Approvals:	UL/CUL to 3111, FCC Part 15 Class B
Enclosure:	8"W x 10"H x 3"D
Current Transformers:	Any 5 amp secondary output CT (class 10 meter)
Transformers:	RG2-XXX.1 (Any 0.1 Amp output CT)
Pulse Output:	Form C or form A contacts rated at 0.1 amp 240Vac
Readout:	LCD (backlighted), six digit dials
Cleaning:	The meters are not suitable for hose down cleaning. Use only a damp cloth to remove dust or dirt from the outside of the enclosure.

TWO WIRE (GROUNDED)



ELECTRICAL SERVICE	METER
1PH 2W 120Vac	RG2-120
1PH 2W 240Vac	RG2-240

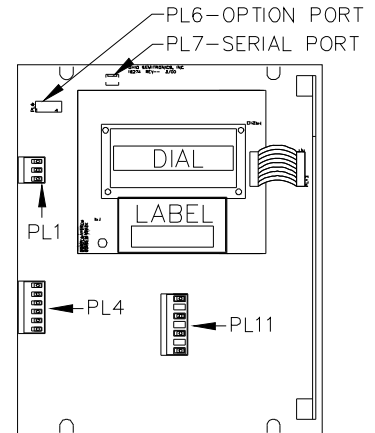
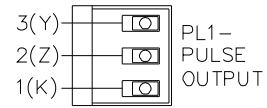
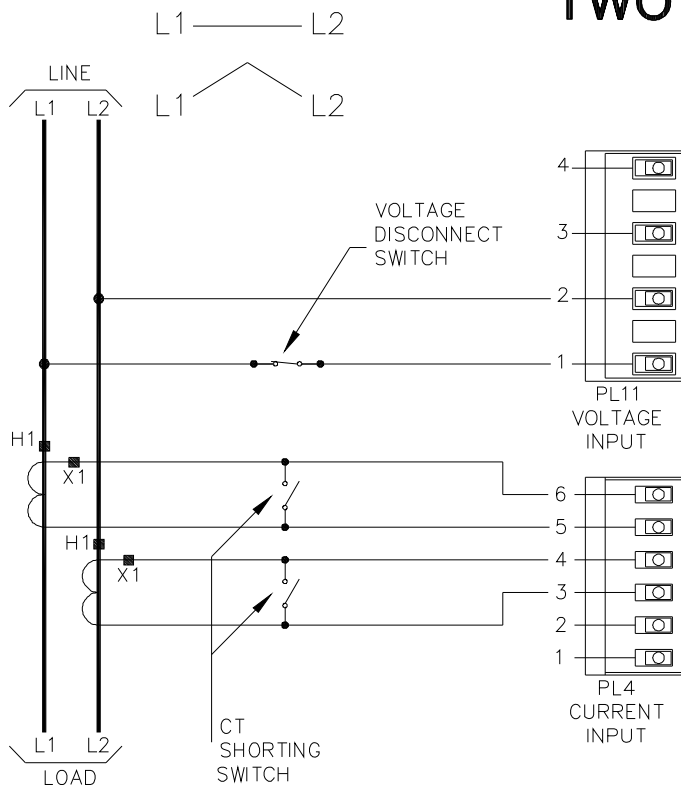


FIGURE 4

TWO WIRE (UNGROUND)



ELECTRICAL SERVICE	METER
1PH 2W 120Vac	RG2-120
1PH 2W 208Vac	RG2-208
1PH 2W 240Vac	RG2-240
1PH 2W 480Vac	RG2-480

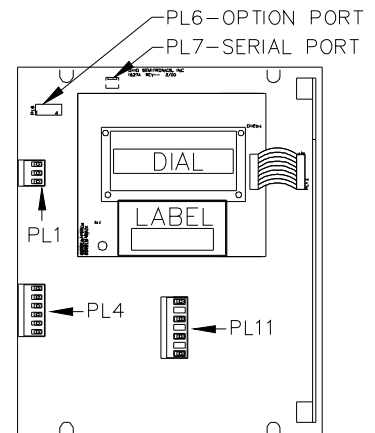
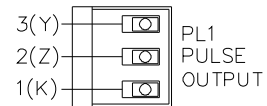
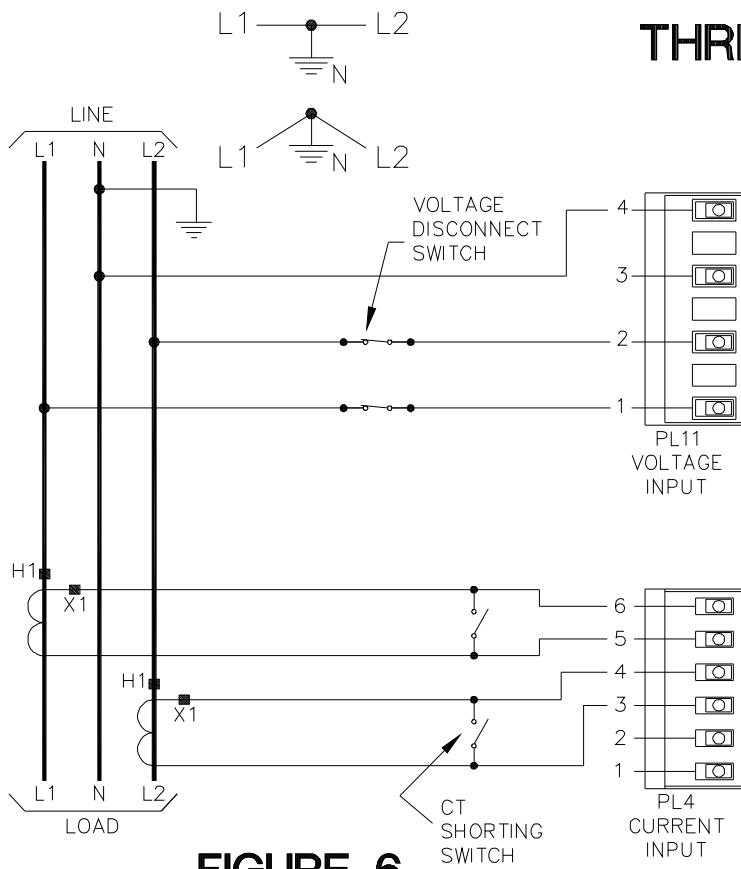


FIGURE 5

THREE WIRE (GROUNDED)



ELECTRICAL SERVICE	METER
1PH 3W 120/240Vac	RG2-240
NETWORK 208Vac	RG2-208

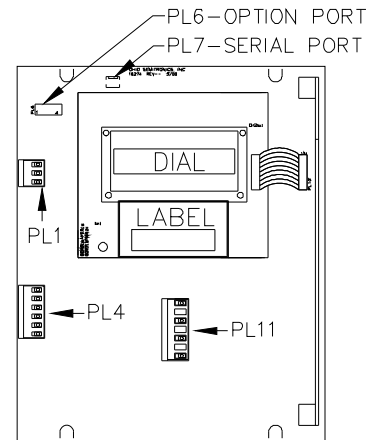
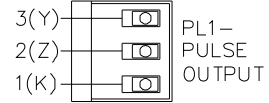
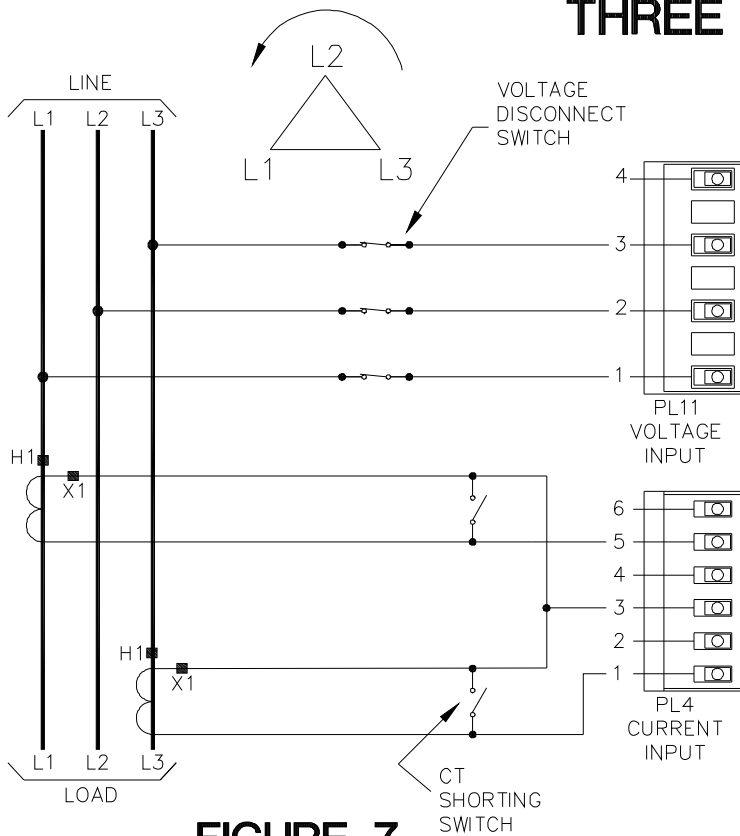


FIGURE 6

THREE WIRE (UNGROUNDDED)



ELECTRICAL SERVICE	METER
3PH 3W 208Vac	RG2-208
3PH 3W 240Vac	RG2-240
3PH 3W 480Vac	RG2-480

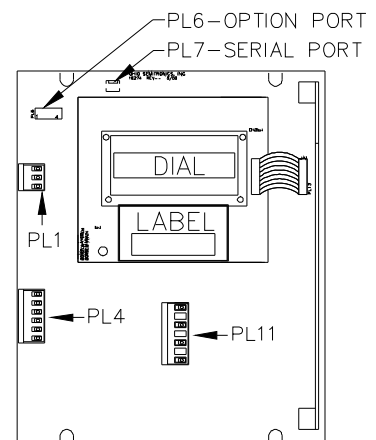
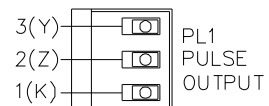
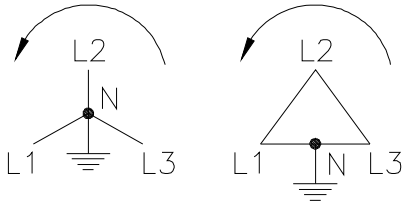


FIGURE 7

FOUR WIRE



ELECTRICAL SERVICE	METER
3PH, 4W, WYE 120/208Vac	RG2-208
3PH, 4W, DELTA 120/240Vac	RG2-240
3PH, 4W, WYE 277/480Vac	RG2-480

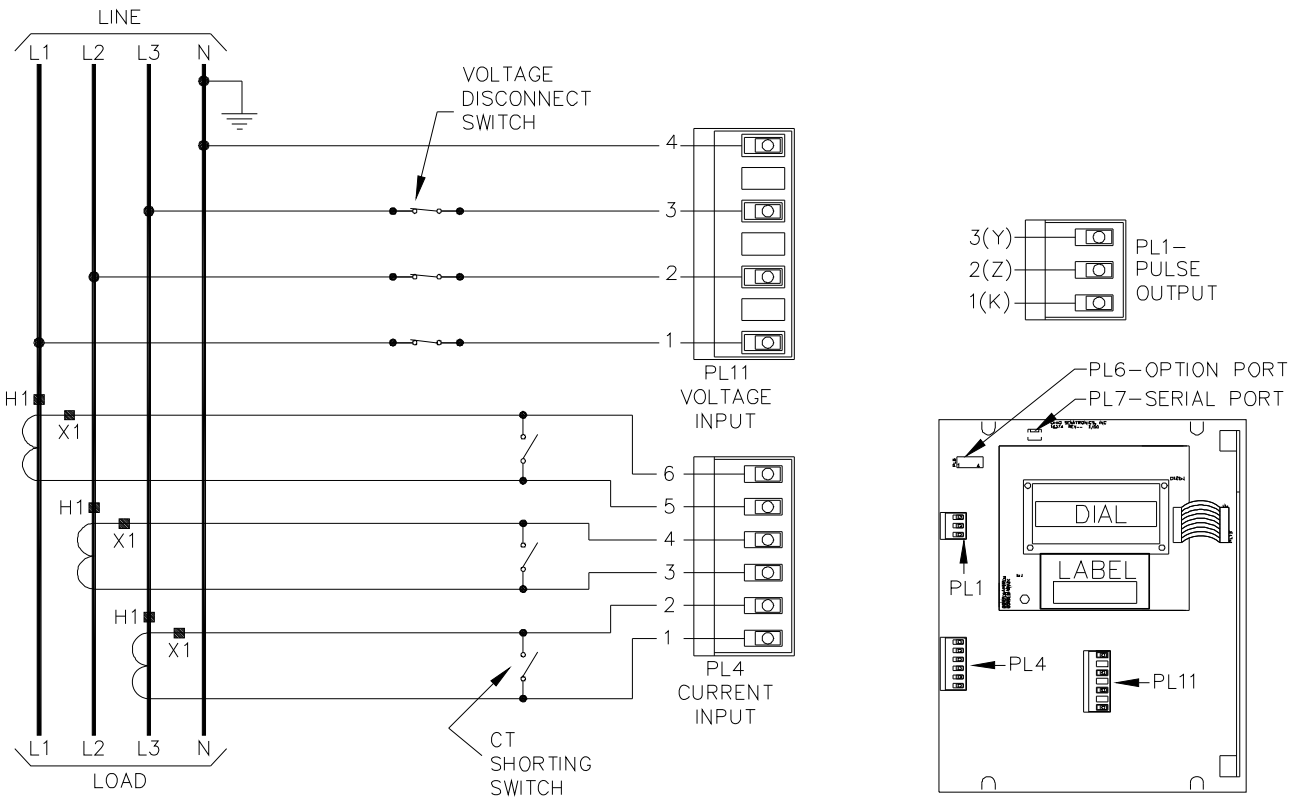
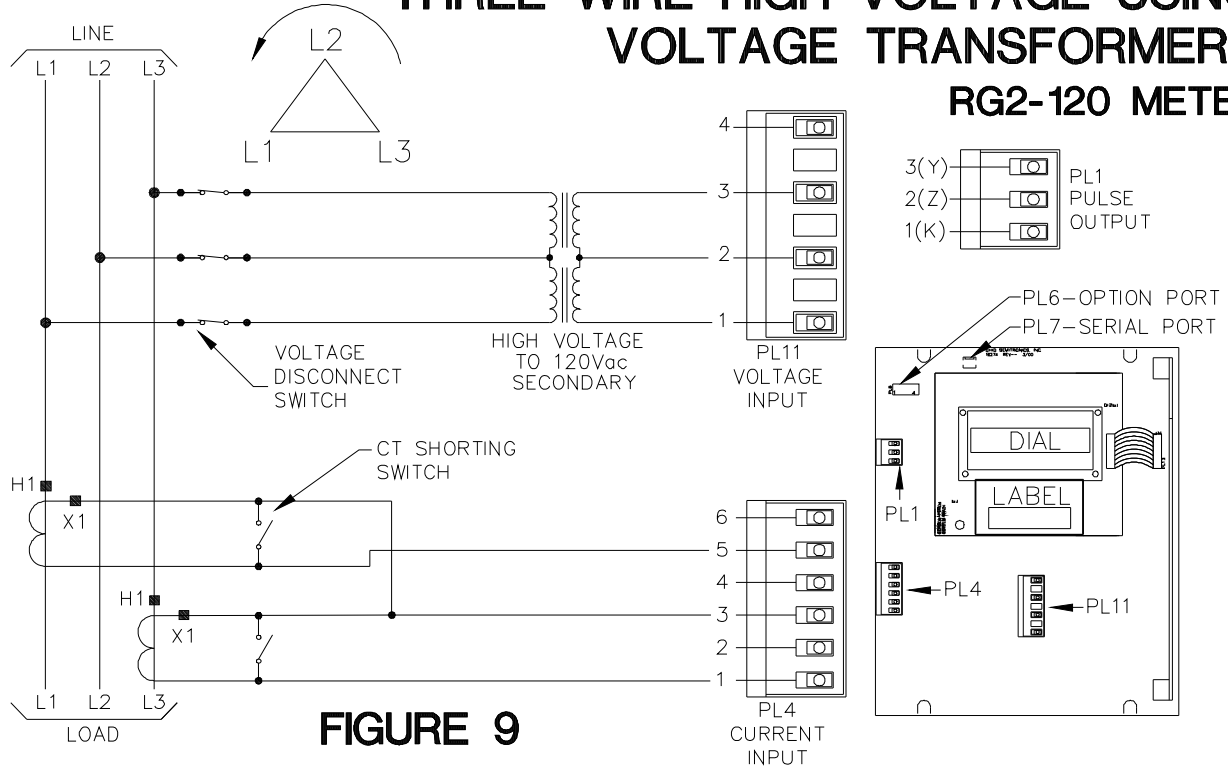
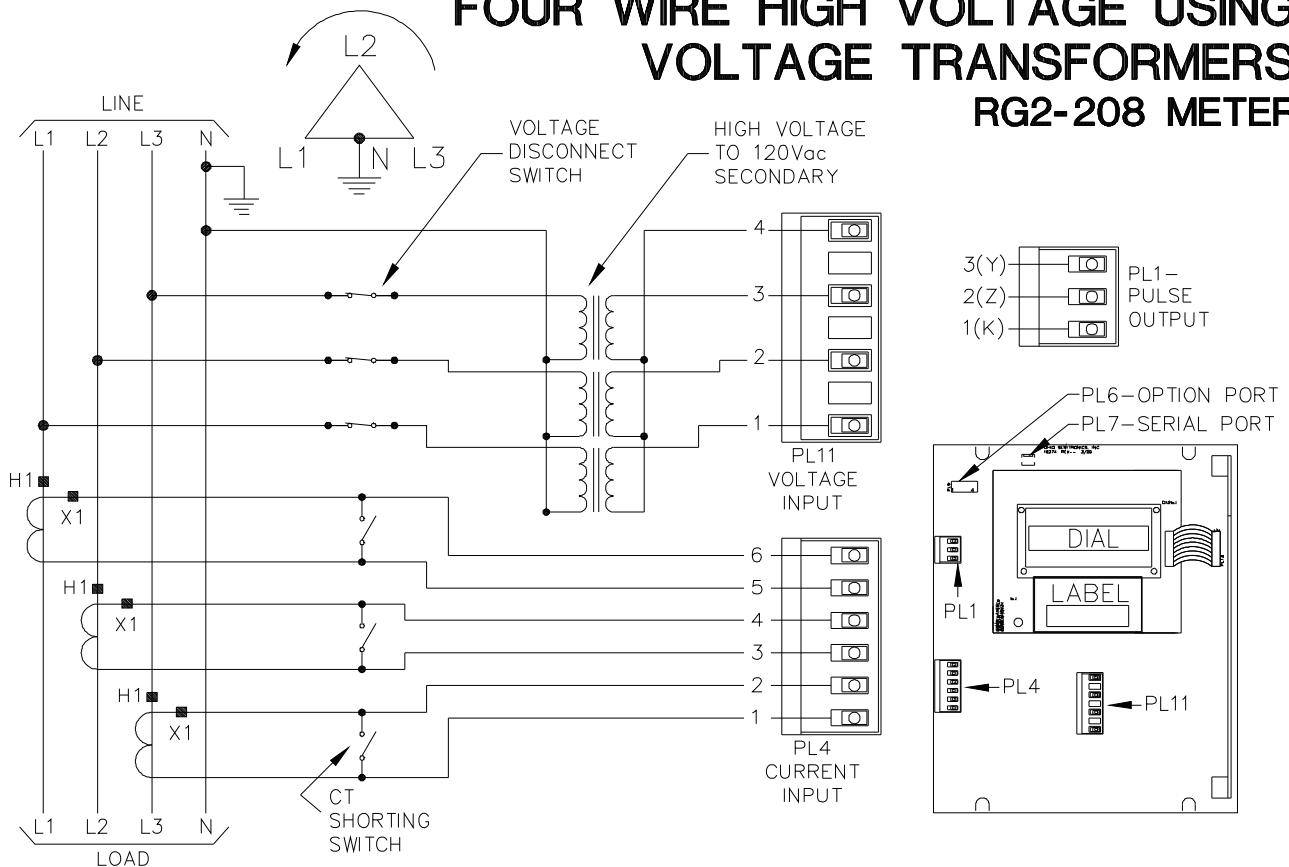


FIGURE 8

THREE WIRE HIGH VOLTAGE USING VOLTAGE TRANSFORMERS RG2-120 METER



FOUR WIRE HIGH VOLTAGE USING VOLTAGE TRANSFORMERS RG2-208 METER



Note the polarity mark on the current transformer, usually a white dot or “H1”. The polarity mark must be toward the line or source of power when the current transformer is installed. The polarity (plus) output of the current transformer is indicated by a white dot or “X1” marked by one of the secondary terminals. OSI split core, 0.1A secondary, transformers have a BLACK/YELLOW polarity (plus) lead and for 5 amp secondary transformers the WHITE lead is polarity (plus).

Larger current transformers are usually provided with integral shunts between the secondary terminals. The shunt, if provided, should remain in place until installation of the current transformer is complete.

If split core current transformers are being used, disassemble each current transformer and reassemble it around the feeder with the polarity mark on the line side of the current transformers. If more than one polarity mark is provided on the current transformer, both should be on the line side when it is assembled on the line.

WARNING: Split-Core Current Transformers can be installed on a feeder that is conducting current. If the secondary terminals are not shunted or already connected to the meter, a high voltage will develop across the secondary terminals, possibly providing a lethal shock and/or damaging the current transformer.*

* OSC/Intellimeter 0.1 Amp secondary CTs have over voltage protection built-in which allows the secondary to be open circuited safely.

If solid-core window type current transformers are used, remove each feeder from its lug and place a current transformer on the feeder with the polarity mark on the line side of the current transformer. When metering critical loads that cannot be shut down, provision of a means to short circuit CT secondary leads before disconnecting them from the Register is recommended to facilitate testing and service. Secure current transformers to feeders with wire ties or equivalent support.

If a direct voltage tap is to be used, connect taps on the line side of the current transformer on each line. Provision of a means to disconnect the meter from voltage taps is recommended to facilitate testing and service.

See figures 4 through 10 for connections. Use minimum 14 AWG wire for the voltage tap. Voltage taps and current transformers in corresponding positions must be on the same electrical phase for proper operation of the Register. For example, if the Line 1 voltage tap was connected to A-Phase, then CT-1 must be on the A-Phase feeder.

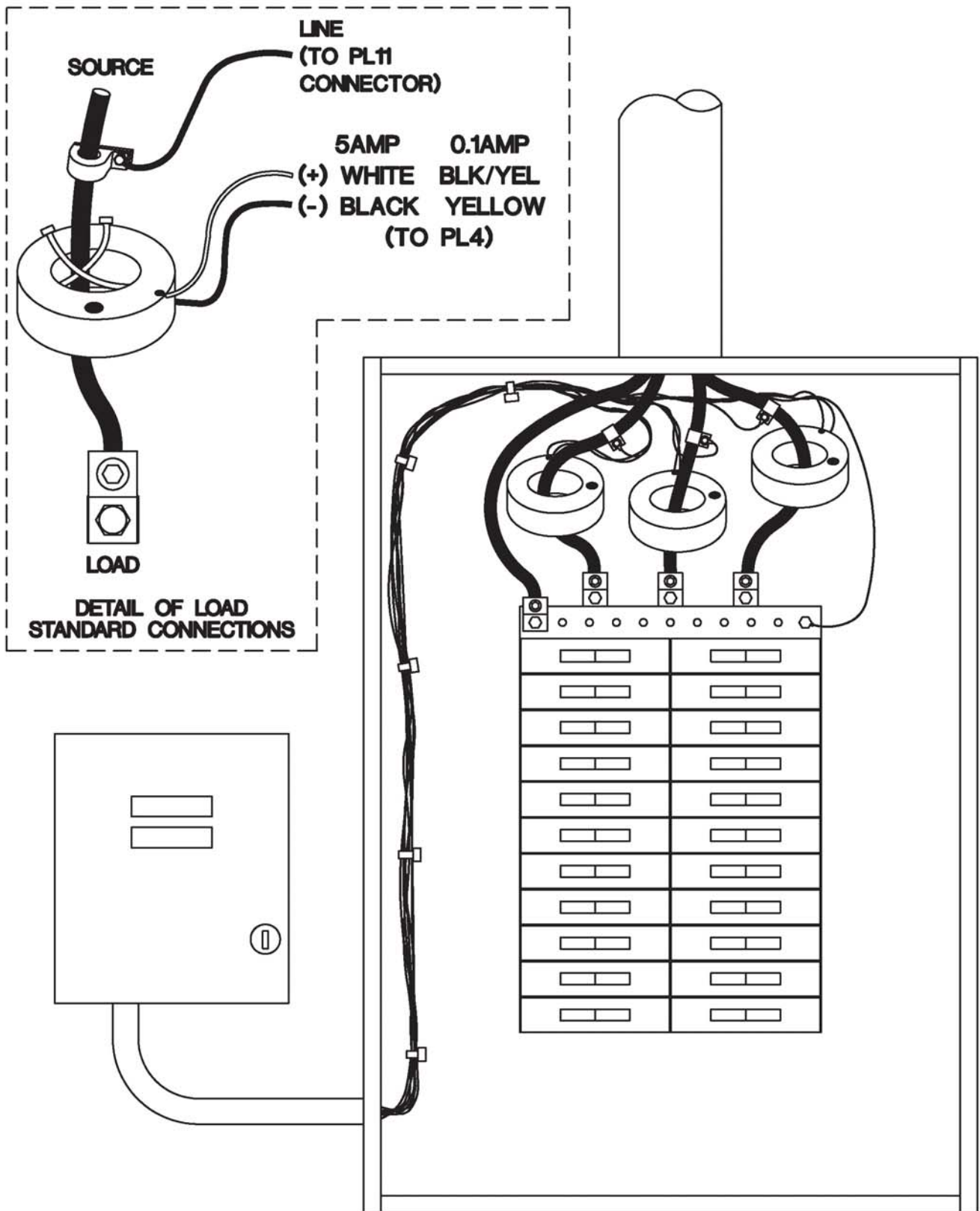


FIGURE 11 - EXAMPLE CURRENT TRANSFORMER INSTALLATION

Connect the voltage taps to the feeders with the ILSCO Connector No. IPC-4/0-6 or equivalent. Torque the connector as specified by the manufacturer, (13 foot-pounds for ILSCO Connector No. IPC-4/0-6 using a torque wrench. Equivalent connections include direct connection to bus bars, split bolt connectors, and other means of permanent connection acceptable to local authorities.

If voltage taps will exceed 10 feet, overcurrent protection is required for the conductors where the voltage taps are connected to the line.

Alternate connections can be made if it is impractical to make voltage taps directly to the feeder on the line side of the current transformers. For example when the meter voltage tap is made at the circuit breaker panel. See Figure 12 for an example.

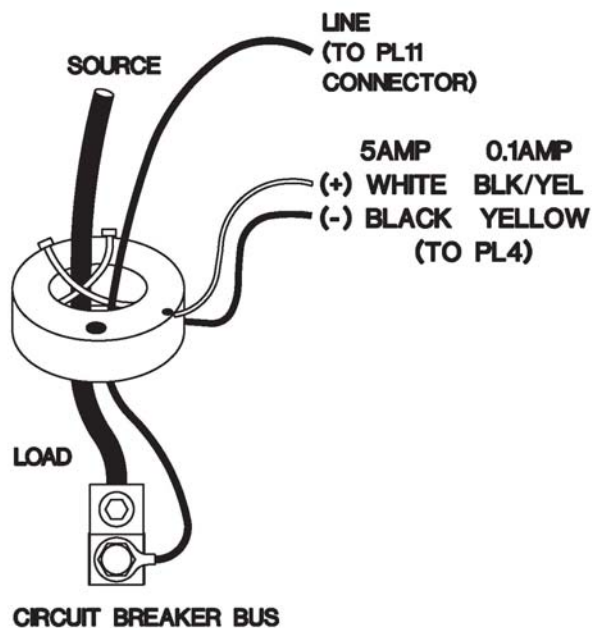


FIGURE 12 - ALTERNATE CONNECTIONS

Connect the voltage tap on the load side of the current transformer.

Route the free end of the voltage tap through the current transformer from the load side to the line side.

If AC Neutral is used (Network, Wye or 4 Wire Delta), connect neutral to the neutral buss.

Use wire ties to bundle the wiring harness and route it away from the other conductors in the cabinet. Also bundle wiring harness in the Intellimeter Register enclosure with wire ties.

Secure covers on the switchgear cabinet and the Intellimeter Register. If the Register cover is equipped with Demand Reset Switch, connect the switch to the S1 terminals located at the top left corner of the main printed circuit board of the Register electronics assembly. See Figure 3 for location of the S1 terminals.

WARNING: TO AVOID ELECTRIC SHOCK, DISCONNECT POWER TO THE REGISTER BEFORE CONNECTING THE DEMAND RESET SWITCH.

Seal the cover on the Intellimeter Register with a pair of lead-wire seals, if desired.

See Figure 13. Two of the screws supplied with the Register have horizontal holes through the head of the screw. Two corners of the cover have holes to accept the wire from a lead wire seal. Match screws to corners for sealing. Place wires through holes in enclosure. Tighten screws securely. Run lead through hole in screw and crimp to other lead as close to screw as possible. Repeat for second screw.

Connect power to load. Turn on Circuit breakers.

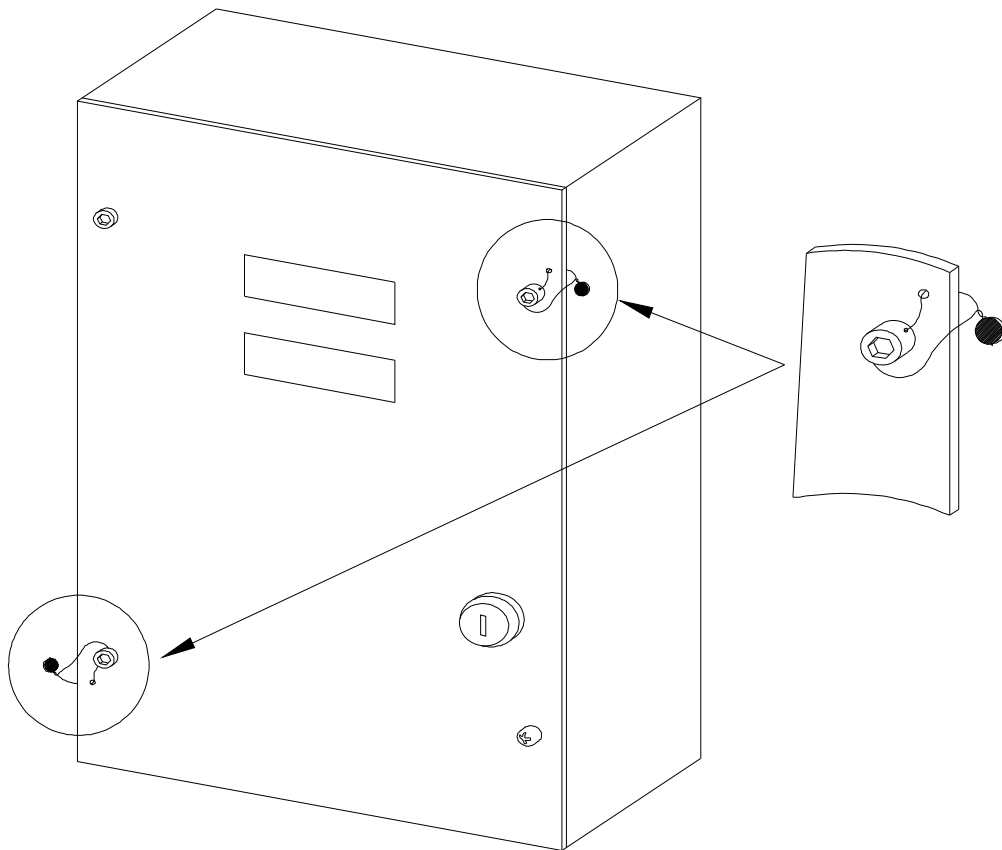


FIGURE 13 - SEALING THE REGISTER

MAINTENANCE

Routine Maintenance: There are no required maintenance operations for the Intellimeter Register. However, qualified personnel may wish to perform an annual inspection of wiring connections. It is advisable to check for help messages every time the meter is read. If the Register is integrated into a remote reading system with the pulse output a periodic check for help messages is advisable.

Repairs: It is not recommended that the field personnel replace any of the Register's internal components, including fuses. If it is necessary to replace an Intellimeter Register, qualified personnel should follow the procedure below:

Have replacement board available before starting procedure. Disconnect power from the metered load and the register.

WARNING: If the metered electrical service is ungrounded, current transformers and electronics could be at a voltage above ground until the voltage taps are disconnected. Do not touch current transformer leads or any part of the electronics assembly until the voltage leads have been disconnected from power.

Remove the cover from the Intellimeter Register. Short circuit the secondary of each current transformer. Unplug the 4 position and 6 position connectors.

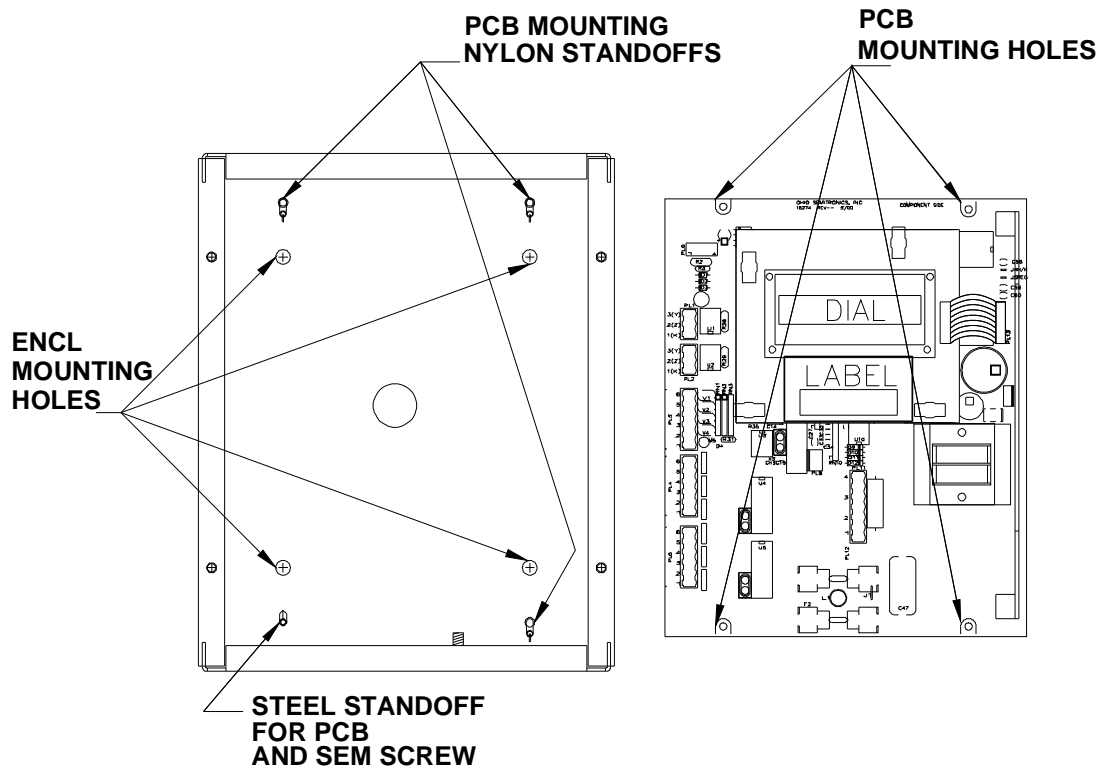
WARNING: If the current transformer secondaries are left open circuited and current is supplied to the primary, a high voltage will develop between the secondary terminals of the transformer. To avoid electric shock and the possibility of damage to the current transformer, be sure the secondaries are shorted together on each current transformer.*

* OSC/Intellimeter 0.1 Amp secondary CTs have over voltage protection built-in which allows the secondary to be open circuited safely.

Disconnect the KYZ leads from the pulse output board, if provided. Insulate the ends of the leads.

Replace the Register electronics assembly (refer to installation instructions on page 4). Return the electronics assembly to the dealer or distributor from whom it was purchased for replacement.

ELECTRONICS ASSEMBLY



STEP 1: INSTALL PRINTED CIRCUIT BOARD IN ENCLOSURE BY LINING UP NYLON STANDOFFS WITH BOARD MOUNTING HOLES IN THE DIRECTION SHOWN ABOVE AND PRESSING BOARD DOWN ONTO NYLON STANDOFFS UNTIL THEY LOCK.

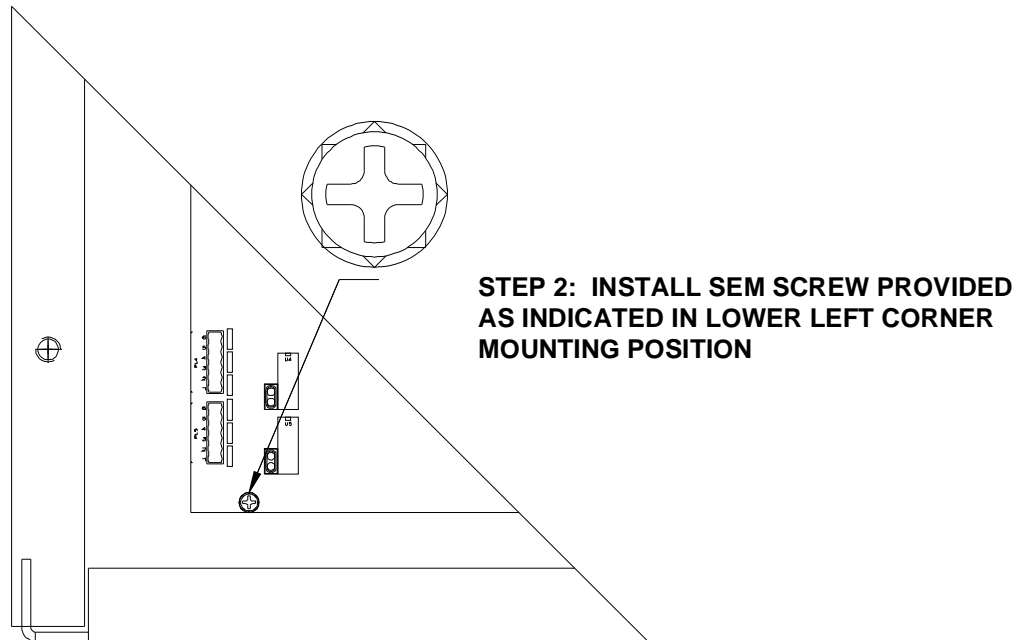


FIGURE 14