LINEAGE POWER

AC Voltage-Current Interface Unit (VCIU) for the Galaxy Millennium Controller

With L10 – L14, L20 – L24, L30 – L38, L40 – L44, and L57 Interface Units

Operation, Installation and Maintenance Manual
WP-93497
Select Code 167-792-105
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HELP!

Technical assistance and customer service for questions specific to the **AC Transducers (WP-93497)** and repair and return is available from *7am-6pm (CST) weekdays* by calling:

1-972-289-5196

For customer service, additional copies of product manuals, or technical assistance with Lineage Power products, call:

1-800-THE-1PWR (1800-843-1797)

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WARNING

OPENING ENCLOSURES EXPOSE HAZARDOUS VOLTAGES.
ALWAYS REFER SERVICE TO QUALIFIED PERSONNEL ONLY.

WARNING

THE TRANSDUCER UNIT IS INTENDED FOR CONNECTION TO BUILDING ENTRANCE PANELBOARDS PROTECTED BY A SECONDARY SURGE ARRESTOR INTENDED FOR LOCATION CATEGORY “B” OR “C” AS DEFINED IN ANSI/IEEE C62.41-1991. THESE ARRESTORS SHOULD BE RATED FOR A MINIMUM OF 50 KA PER PHASE, WITH A CLAMPING VOLTAGE OF 1500V MAXIMUM AT 20 KA. THE ARRESTOR MUST BE CONNECTED TO ALL PHASES OF THE AC LINE AND THE NEUTRAL CONDUCTOR. THE SURGE ARRESTOR IS TO BE GROUNDED WITH THE SHORTEST AND THICKEST WIRE POSSIBLE PER APPLICABLE CODES.

WARNING

THE TRANSDUCER UNIT IS NOT INTENDED FOR USE IN OUTDOOR APPLICATIONS.

NOTE 1: The VCIU is not intended to be a Power Quality Analyzer. It is intended only to provide a “snapshot” view of AC voltage or current peak amplitude scaled to a sinusoidal RMS-equivalent (e.g. Vpeak X 0.707) DC voltage value. The user should be aware that true RMS values of non-sinusoidal waveforms are not calculated by this unit, and that no phase, harmonic, or conduction angle information is provided. Multiplying Voltage and Current to get true RMS power is possible only if the load equipment is substantially resistive, which is seldom true in actual practice. The Galaxy or Millennium controller can be programmed to provide a history of the AC voltage and current monitored by the transducer, but the sampling interval is not “real time” and events of short duration (between sampling intervals) may not be captured.

NOTE 2: The VCIU is powered by an external DC source (24V with internal jumper connected, or 48V with the jumper disconnected). The input is protected against reverse polarity by a series diode (e.g. the unit will not sustain damage when it is connected with the polarity reversed, but will not operate until the correct DC supply polarity is connected). The VCIU can operate with either + or - grounded, since the DC circuitry is totally floating from ground (e.g. there is no internal DC ground connection in the transducer). The RPM module wires which connect to the VCIU are also isolated from ground.

1. GENERAL

The AC Voltage-Current Interface Unit (VCIU) transducer kit is designed to provide a simple to install, pre-packaged solution for AC voltage and current monitoring using external monitoring systems such as the Lineage Power Galaxy based products. The VCIU is designed to provide a flexible solution for applications that require a combination of voltage and current monitoring. The VCIU converts AC voltage and current to isolated low voltage DC outputs which can be transmitted to monitoring systems. The VCIU provides accurate three phase (leg-leg or leg-neutral – depending on unit List Number) voltage and three phase current monitoring in a single enclosure (Current transformers are external to the VCIU enclosure).

The VCIU is equipped with the Galaxy remote peripheral monitoring module (RPM) factory mounted and pre-wired. This greatly simplifies the installation process, since the installer only has to:

- Provide DC input from an overcurrent protected source, typically alarm battery supply (ABS). Put the internal zener bypass jumper in place if a 24VDC (VS 48VDC) input is required.
- Connect AC voltage monitoring point inputs (from a 10A or 15A circuit breaker protected source – normally a branch distribution panel or the building AC mains panel) to the measurement points on TB1.
- Mount remote AC current transformers around AC line(s) to be monitored (usually in an AC panelboard).
- Connect AC Current measurement connections from the remote current transformers (normally on AC mains) to TB1.
- Remove Protective shorting jumper(s) from the remote current transformer(s) monitoring the AC mains (Rev. B and later units).
- Calibrate the VCIU to measure specific AC voltage values using easy to turn trim pots.

All isolated DC outputs feeding the RPM module inputs have been pre-wired with the required current limiting resistors.

1.1 Revision Status of Units

The Revision status of the VCIU can be determined by looking at the front panel label. Units with no revision status are "Pre-rev. B" units. Units with a revision status are "Rev. B and later units". Revision B was first shipped in May, 2000. Revision status is important as it determines accuracy and calibration of the unit.

2. INTRODUCTION

AC voltage transducers are used in applications where direct measurement of AC voltage by other monitoring equipment is not possible. The voltage transducer consists of a voltage transformer per phase and additional circuitry which converts the measured waveform into a proportional 0-3V DC signal (per phase) that can be read by the monitoring unit. Both the voltage transformers and signal conditioning circuitry are conveniently housed in a metal enclosure which can be mounted adjacent to the measurement points. The AC inputs are physically separated and transformer isolated from the DC outputs to the RPM module.

AC current transducers are used in applications where direct measurement of current by other monitoring equipment is not possible. The current transducer consists of a remote current transformer feeding a smaller current transformer containing additional circuitry which converts the measured waveform into a proportional 0-3 VDC signal that can be read by the RPM monitoring unit. The remote current transformer and the smaller current transformer are physically separate (the smaller transformer is in the metal enclosure), but function together to provide accurate current measurements down to 1% of full scale (Revision B and later units as indicated on the front panel label. Pre-Rev. B units can measure currents down to 10% of full scale). The VCIU provides accurate and reliable AC current measurement over a 50 - 400 Hz frequency range. The monitored AC mains and DC output are also isolated by several barriers of isolation. No shunts are used to measure the current. A safety jumper is installed on the larger remote current transformer (Revision B and later units as indicated on the front panel label) to permit easy installation and removal without exposing the operator to hazardous voltages. This safety jumper is opened after the remote transformer is connected to the transducer TB1 terminals. Safety Jumpers can be added to pre-Rev. B units if future removal of the remote current transformers is anticipated (see Parts List in Section 16.9).

WARNING
IT IS STRONGLY RECOMMENDED THAT THIS ENTIRE MANUAL BE READ BEFORE INSTALLING THIS UNIT. OBSERVE ALL *CAUTIONS AND WARNINGS* TO AVOID PERSONAL INJURY OR EQUIPMENT DAMAGE.

2.1 Standard Products

Check the model list number of your unit to make sure it is the type you need. Standard options are as follows.

WP-93497 AC Voltage and Current Interface Unit (VCIU) List Numbers and Comcodes: (See Note A below)

List #	Comcode	Volts	Description	Min. Cur. Res.
WP-93497 L10	407618248	208 line to line	208V three-phase, voltage and current interface unit with three 300 ampere solid core current transformers	30A (pre-Rev. B), 3A (Rev. B and later units)
WP-93497 L11	407618255	208 line to line	208V three-phase, voltage and current interface unit with three 600 ampere solid core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L12	407618263	208 line to line	208V three-phase, voltage and current interface unit with three 600 ampere split-core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L13	407618271	208 line to line	208V three-phase, voltage and current interface unit with three 2000 ampere split-core current transformers	200A (pre-Rev. B), 20A (Rev. B and later units)
WP-93497 L14	407664010	208 line to line	208V three-phase, voltage and current interface unit without current transformers. See Note B.	10% of F.S. (pre-Rev. B), 1% of F.S. (Rev. B and later units)
WP-93497 L20	407618289	240 line to line	240V three-phase, voltage and current interface unit with three 300 ampere solid core current transformers	30A (pre-Rev. B), 3A (Rev. B and later units)
WP-93497 L21	407618297	240 line to line	240V three-phase, voltage and current interface unit with three 600 ampere solid core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L22	407618305	240 line to line	240V three-phase, voltage and current interface unit with three 600 ampere split-core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L23	407618313	240 line to line	240V three-phase, voltage and current interface unit with three 2000 ampere split-core current transformers	200A (pre-Rev. B), 20A (Rev. B and later units)
WP-93497 L24	407664028	240 line to line	240V three-phase, voltage and current interface unit without current transformers. See Note B.	10% of F.S. (pre-Rev. B), 1% of F.S. (Rev. B and later units)
WP-93497 L30	407618321	480 line to line	480V three-phase, voltage and current interface unit with three 300 ampere solid core current transformers	30A (pre-Rev. B), 3A (Rev. B and later units)
WP-93497 L31	407618339	480 line to line	480V three-phase, voltage and current interface unit with three 600 ampere solid core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L32	407618347	480 line to line	480V three-phase, voltage and current interface unit with three 600 ampere split-core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)

List #	Comcode	Volts	Description	Min. Cur. Res.
WP-93497 L33	407618354	480 line to line	480V three-phase, voltage and current interface unit with three 2000 ampere split-core current transformers	200A (pre-Rev. B), 20A (Rev. B and later units)
WP-93497 L34	407664036	480 line to line	480V three-phase, voltage and current interface unit without current transformers. See Note B.	10% of F.S. (pre-Rev. B), 1% of F.S. (Rev. B and later units)
WP-93497 L35	408527832	277 line to neutral	480V three-phase, four-wire, voltage and current interface unit with three 600 ampere solid core current transformers	6A
WP-93497 L36	408527840	277 line to neutral	480V three-phase, four-wire, voltage and current interface unit with three 600 ampere split-core current transformers	6A
WP-93497 L37	408527857	277 line to neutral	480V three-phase, four-wire, voltage and current interface unit with three 2000 ampere split-core current transformers	20A
WP-93497 L38	408527824	277 line to neutral	480V three-phase, four-wire, voltage and current interface unit with three 300 ampere solid core current transformers	3A
WP-93497 L40	407618206	120 line to neutral	208V three-phase, four-wire, voltage and current interface unit with three 300 ampere solid core current transformers	30A (pre-Rev. B), 3A (Rev. B and later units)
WP-93497 L41	407618214	120 line to neutral	208V three-phase, four-wire, voltage and current interface unit with three 600 ampere solid core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L42	407618222	120 line to neutral	208V three-phase, four-wire, voltage and current interface unit with three 600 ampere split-core current transformers	60A (pre-Rev. B), 6A (Rev. B and later units)
WP-93497 L43	407618230	120 line to neutral	208V three-phase, four-wire, voltage and current interface unit with three 2000 ampere split-core current transformers	200A (pre-Rev. B), 20A (Rev. B and later units)
WP-93497 L44	407664044	120 line to neutral	208V three-phase, four-wire, voltage and current interface unit without current transformers. See Note B.	10% of F.S. (pre-Rev. B), 1% of F.S. (Rev. B and later units)
WP-93497 L57	408527865	277 line to neutral	480V three-phase, four-wire, voltage and current interface unit without current transformers	1% of F.S.

Note A: A six channel 3VDC Remote Peripheral Monitor (RPM) module is furnished with these interface units. It is already installed inside the unit.

Note B: Current Transformers must be provided separately. These units were specifically designed to interface with existing AC Current Transformers already connected. They may be connected with any current transformer that has a secondary output current of 5Aac.

3. VCIU KIT CONTENTS

The VCIU kit consists of the following:

- 1 – 3 phase AC voltage and 3 phase current transducer kit in a metal enclosure.
- 3 - Solid or split-core current transformers - Solid-core and Split-Core transformers are prewired with 24" of 16 gauge wire and safety jumper (Rev. B and later units) to prevent high voltage hazard during connection.
- 1 - Pre-Wired and Factory Mounted 0-3V Galaxy Remote Peripheral Monitoring Module.
- 4 – ½ " Conduit Opening Grommets (use bottom conduit openings only, See Section 7.1) if conduit not used.
- 1 - Product Manual (Programming, Installation, Troubleshooting, etc.)

4. EQUIPMENT REQUIRED

For AC measurements with the Galaxy/Millennium Controller, and for installation, the following components are required:

- Galaxy Intelligent Option card
- Galaxy Remote Peripheral Monitoring Option Card
- Remote Peripheral monitoring module bus cable (Reference J85501G-1) as required
- Bus termination resistor (Only if the VCIU unit is the last device on the bus)
- Max. diameter 14 AWG wire for connecting the AC voltage and current transformer sources to the VCIU input, TB1 (Consult local codes). Wire must be rated to handle branch circuit protection device current rating for voltage and rated for 10A maximum current for remote current transformer wires.
- 1 Small Jeweler's Flathead Screwdriver and 1 Philips Screwdriver.
- Crimp tool for butt-splices (see crimp tool specification in plastic package with the connectors).
- Maximum 15A AC branch circuit over-current protection device (usually a thermal circuit breaker) rated for the voltage and number of phases monitored by the VCIU. This device is mounted in the AC panel being monitored.

NOTE 3: Unit Grounding may be provided through the grounded metallic conduit, or by a separate wire from the CO GRD Bar to the identified location on the VCIU (per applicable local codes).

- DC power over current protection device (usually a 1A fuse at the Alarm Battery Supply (ABS) fuse panel).
- 1 Small Jeweler's Flathead Screwdriver and 1 Philips Screwdriver.
- Digital Voltmeter.

NOTE 4: For best results, use 14 AWG stranded, type THN insulation (600V rated for conduit use) for voltage and current monitoring leads.

5. APPLICATIONS

The VCIU provides accurate monitoring of:

- Commercial AC Load Circuits (PDUs)
- Engine/Generator Outputs
- UPS Outputs
- Inverter Outputs
- General Purpose AC Monitoring

The Galaxy controller can be programmed to provide accurate AC monitoring and alarm reporting. Examples are:

- UPS output Voltage/Current too High/Low
- Inverter output Voltage/Current too High/Low
- Commercial AC Failure
- Loss of Phase Voltage/Current
- Transfer to Engine/Generator
- Engine/Generator Voltage too High/Low
- High/Low AC Current Alarms

6. SAFETY

6.1 Safety Statements

Please read and follow all safety instructions and warnings before installing, maintaining, or repairing the VCIU.

The VCIU is listed by Underwriters Laboratories Inc. to the requirements of UL Subject 1801, requirements for DC Power Distribution Centers for Communications Equipment, as a peripheral device for use with DC Power Distribution controllers. The Listing is based on the items noted below.

Install only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17, and 110-18 of the U.S. National Electric Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.

UL Listing does not include evaluation of device performance (i.e. measuring functions or for use as any safety control/monitoring device).

This equipment is to be used in controlled environments (an area where the humidity is maintained at levels that can not cause condensation on the equipment, the contaminating dust is controlled, and the steady-state ambient temperature is within the range specified).

This equipment has been evaluated for use in a continuous ambient temperature of up to 50 degrees Celsius (125 F).

The DC input power is to be connected to 48 or 24 VDC (Put zener bypass jumper in place for 24VDC operation) nominal supply that is electrically isolated from the AC mains and reliably earth grounded or, to 48 or 24 VDC power supplies evaluated to UL1950 and identified as Safety Extra Low Voltage (SELV) outputs. The DC input can be provided from a DC distribution or Alarm Battery Supply (ABS) panel using a minimum 1A overcurrent protection device (maximum 2A) at the panel, and wired per local codes. Either polarity of the DC supply can be grounded, since the VCIU does not have an internal ground reference on the DC circuitry. Accidental reversal of the DC polarity will temporarily prevent the VCIU from operating, and will not cause permanent damage.

The DC input and output shall not be run in the same raceway as the AC wiring. See Section 7.1 for details.

AC input from the source must be protected by a maximum 15A overcurrent branch circuit protector at the monitored source and wired per local codes.

NOTE 5: Unit Grounding may be provided through the grounded metallic conduit, or by a separate wire from the CO GRD Bar to the identified location on the VCIU (per applicable local codes).

6.2 Warning Statements and Safety Symbols

The above symbol identifies the need to refer to the equipment instructions for important information.

This symbol (or equivalent) is used to identify the presence of hazardous AC mains voltages.

This symbol is used to identify the presence of hazardous AC or DC voltages. It may also be used to warn of hazardous energy levels.

The symbols may sometimes be accompanied by some type of statement - for example: "Hazardous voltage/energy inside. Risk of injury. This unit must be accessed only by qualified personnel."

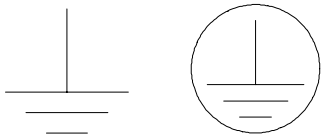
When working on or using this type of equipment, the following precautions should be noted:

- This unit must be installed, serviced, and operated only by skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment.

- Hazardous energy and/or voltages may be present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment.

- The AC voltage and current terminal block (TB-1) contains hazardous AC voltages. Before making any connections to or accessing this connector, disconnect the voltage leads at the source. (Follow all safety lock out and tagging procedures.)

- Even though the current transformer connections on TB-1 are normally at low voltage, use extreme caution when working on these circuits. The wiring for these circuits are normally run with hazardous AC circuits, therefore, the potential exists for these wires to become electrically energized with hazardous voltage levels. Also, CT leads that are at open circuit (i.e. not connected) may contain hazardous voltages. Ensure that the safety jumper (see Section 8.3 below) is connected at the remote current transformer and test the TB1 current terminals with a DVM for low voltage prior to disconnecting either of the 2 paired current transformer leads from TB1. Avoid contact with bare conductors. Check for hazardous voltage levels before accessing these points on the connector. Disconnect power (if possible) to all AC load conductors being monitored before connecting/disconnecting CT connections.



The above symbols (or the "GND" symbol) are used to identify the safety earth ground or bonding point for the equipment.

7. MOUNTING

The VCIU can be wall mounted on any flat, smooth surface using the 4 mounting holes (1/4" diam., use #12 or 3/16 hardware) provided in the rear of the unit. Correct securing hardware for the installation surface is to be used in mounting this product, and mounting is to be per appropriate industry practices. Securing hardware capable of supporting at least 4 times the weight of the product (64 lb) should be chosen to mount the product. Suitable fasteners or wall anchors should be used when mounting on masonry or drywall. The VCIU weighs approximately 16 lbs.

7.1 Conduit Considerations

WARNING

Use the bottom Knockouts for all wiring and conduit entry. Keep wires from the AC voltages being monitored separate from the wires to the Remote Peripheral Module (RPM) and the DC power supply wires. Either grommet(s) or conduit entry fittings must be used at these holes to avoid insulation chafing.

The AC line voltage monitoring wires can be routed to the VCIU via a single ½" conduit connected to the far right bottom knockout. Likewise, the Remote Current Transformer monitoring wires should be routed through the same knockout. These wires all enter to a separate high voltage compartment containing the Voltage transformers. The Data wires to the Galaxy Remote Peripheral Monitor must be routed through a separate conduit (normally the far left bottom knockout. Likewise, the DC power wires to the VIU should be separated from the AC wires (DC normally enters through either of the 2 center knockouts. There are a total of 4 knockout holes (1/2") on the bottom of the unit. The wires must be routed either through the grommets included in the kit, or through the appropriate conduit fittings. For safety, the AC voltage and current monitoring wires and the DC and Data wires should be kept separated from each other within the VCIU box.

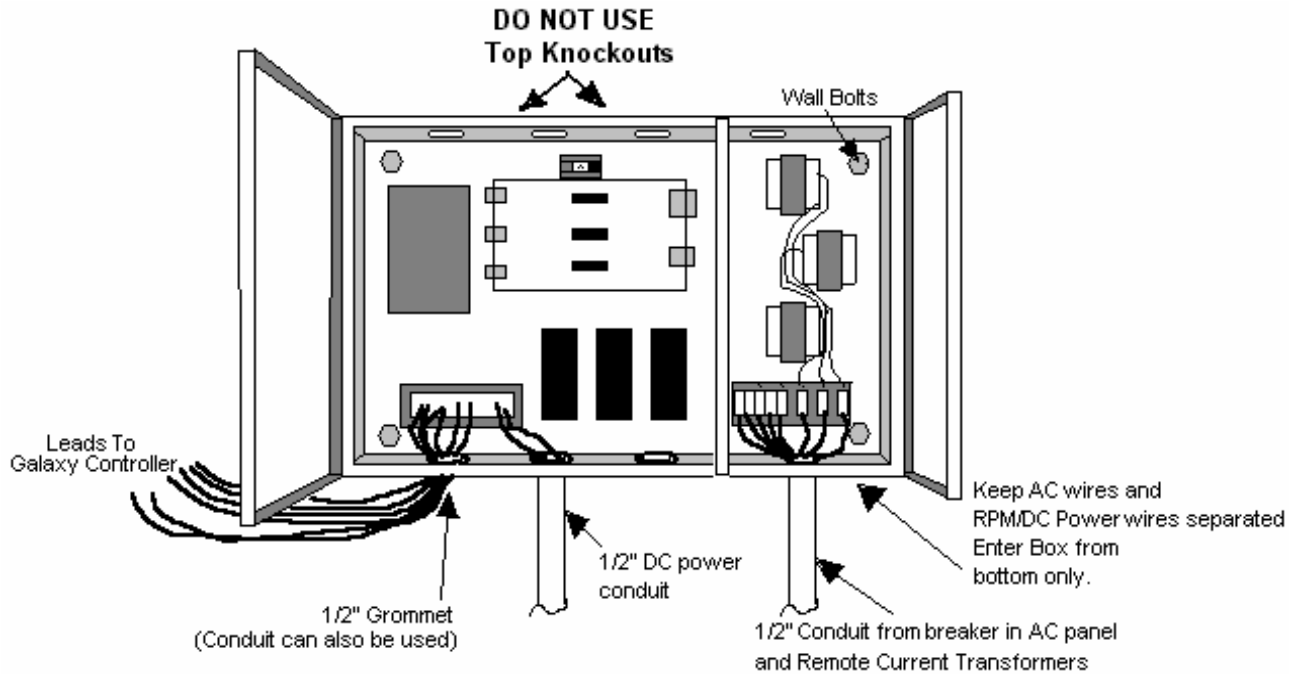


Figure 1 – Conduit and Wire Routing, Typical

8. WIRING

8.1 DC Input

DC Input can be either from a nominal 24 or 48VDC. If 24 VDC is used, the Zener bypass jumper must be connected.

NOTE 6: connection of the 24VDC jumper in a 48VDC system will cause damage to the unit.

The DC input power to the unit must be protected by a 1A (Max 2A) overcurrent protection device at the DC distribution panel. Use 14 AWG stranded (maximum diameter allowed by terminals in the unit) or smaller wire capable of handling the maximum fused DC source current. Insulation should be either RHH or RHW.

8.2 Lineage Power Remote Peripheral Monitoring Module Bus

Before connecting the VCIU to the Galaxy Remote Peripheral Monitoring Module, set the module address.

Caution: ***No two modules can have the same address. All addresses are valid except 00.***

Use one of the bottom center knockouts with a grommet (if conduit is not used) for the DC wiring.

Connect the three wires (out) to the labeled output terminal block and run the Galaxy RPM bus cable through a conduit opening to the next module input. If this is the last module on the bus, do not connect the bus cable to the output terminal block connectors. Simply install a termination resistor (560 ohm, comcode - 405298308) on the standoff provided on the RPM module.

8.3 AC Voltage and Current Measurement Points

Electrical knockouts are provided on the bottom of the VCIU for conduit connections.

The VCIU is provided with a separate AC voltage and current compartment for connecting to the wires going to the AC measurement points. An electrical knockout in this area of the transducer is provided on the bottom of the VCIU for AC conduit connections. Use this knockout for the AC input to keep the wiring separated from the DC side. Use a sufficient length of wire to connect to the AC input terminal block and dress/secure wires neatly to keep separated from the DC side and the PWB. See section 7.1.

The TB-1 terminal block can only accept wires up to 14 AWG stranded wire conductors (Figure 2-4). AC voltage and current measurement leads from the AC panelboard can be run in the same conduit. Leads going to the remote current transformers must be 14 AWG stranded conductors with THHN or better insulation rated at 600V (Fig. 1) for conduit usage. These leads splice onto the 16 AWG leads that are prewired to the remote current transformers. During installation of these current monitoring leads, the safety jumper should be in place at the current transformer. See Figs. 2-4 below.

The sense leads for measuring voltage are to be originated from the load side of a maximum 15A branch circuit protector (not provided with this kit) located within an installed panelboard (the voltage point being monitored). Consult the National Electric Code for recommended wiring sizes and details on connections. The TB1 terminal block can accept wires up to 14 AWG stranded. Insulation should be type THHN or better, 600V, rated for conduit usage. The branch circuit protector must be appropriate for the panelboard being monitored.

Note: All GND references in the figures for AC inputs are ACEG points.

WARNING!! follow appropriate job safety procedures when working with all electrical equipment.

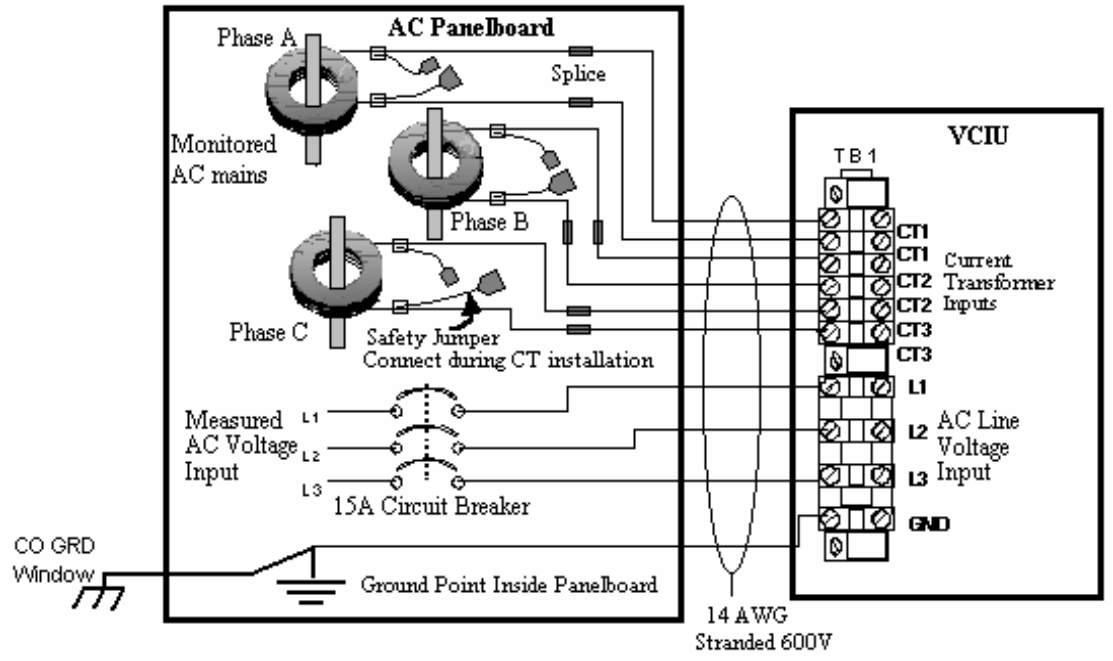


Figure 2 – 3 Phase 3 Wire Configuration (WP-93497 L1X, 2X, 3X)

Caution: Check the CT current rating and the current rating of the AC circuit to be monitored prior to installation. The CT current rating should be equal to or above the AC circuit to be monitored. If the CT is below the current rating of the ac circuit do not install the CTs. Contact your supplier for instructions.

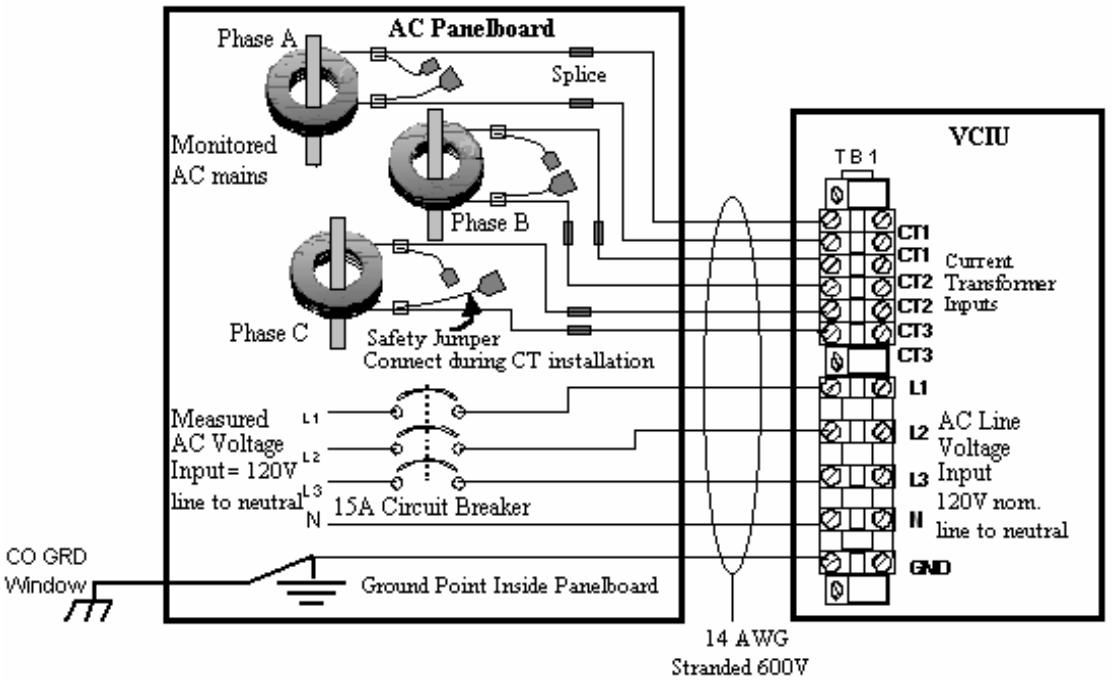


Figure 3 -- 3 Phase 4 Wire Configuration (WP-93497 L4X)

WARNING!!
RISK OF SHOCK

Solid-core current transformers (CT) should be installed, if possible, with the monitored circuit AC power off (follow appropriate job safety procedures). After placing the wire to be monitored through the CT, connect the leads from the CT to the VCIU prior to restoring power to the AC line circuit. Failure to do so could cause electric shock and possibly damage to the CT. Please refer to Safety Jumper procedure below.

Split-core current transformers can be installed with the monitored circuit AC power ON. Before opening the CT and placing it around the wire to be monitored, connect the leads from the CT to the CIU. Once the CT leads have been connected, place the CT around the wire to be monitored and secure. Failure to connect the leads from the CT to the VCIU before placing the CT around a wire to be monitored could cause electric shock and possibly damage to the CT. See Warning Statements and Safety Symbols section for additional precautions. Also refer to Safety Jumper procedure below.

Safety Jumpers are provided with each CT on Rev. B and later units (either solid or split core), and are initially connected when shipped. These jumpers will prevent excessive AC voltages from developing on the CT's output winding while they are connected. During installation on either dead or live conductors, the jumpers should remain connected. They should only be disconnected after ALL CT monitoring leads are connected to TB1 on the transducer. A jumper kit can be ordered (see Replacement Parts list in Section 16.2) for pre-Rev. B units.

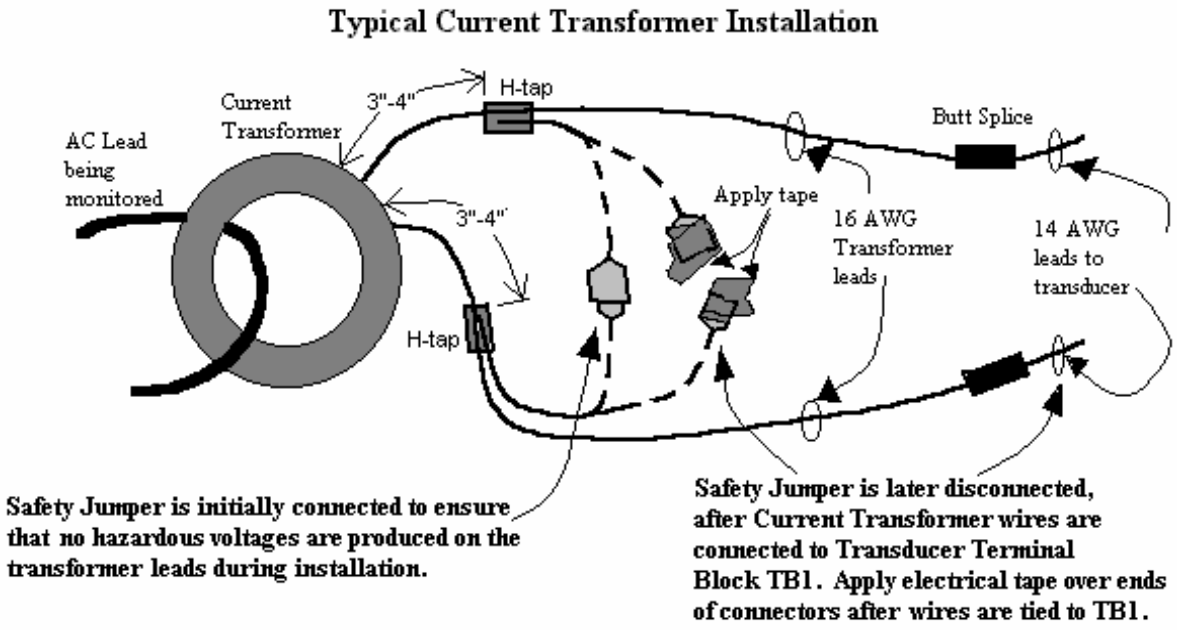


Figure 4. Use of Safety Jumpers (Rev. B and later units)

NOTE 7: All current transformers use a direction arrow to indicate appropriate phasing direction of the transformer. The VCIU does not use the phasing information, so the direction of the arrow is not important.

NOTE 8: FOR BEST RESULTS, THE WIRES TO THE REMOTE CURRENT TRANSFORMERS SHOULD BE 14 AWG STRANDED WITH 600V THHN, RHH, or RHW INSULATION. USING A WIRE GAUGE SMALLER IN DIAMETER THAN 14 AWG WILL REQUIRE THE MAXIMUM DISTANCE BETWEEN THE REMOTE CURRENT TRANSFORMERS AND THE TRANSDUCER TO BE LESS. SEE MAXIMUM LENGTH TABLE AND FORMULA (NOTE 9) BELOW.

Maximum Current rating of Remote Current Transformer	Allowable burden of Transformer	Maximum Pair Distance (14 AWG/60 Hz) between Remote Current Transformer and Transducer TB1
50A	1 VA	8’
100A	2 VA	16’
300A	12.5 VA	100’
600A	30 VA	240’
(split core) 600A	2.5 VA	20’
(split core) 2000A	30 VA	240’

NOTE 9: FOR LONGER DISTANCES THAN THOSE SHOWN IN THE TABLE, LARGER GAUGE WIRES CAN BE SPLICED TO 14 AWG WIRES (SOLDERING IS PREFERABLE). A WIRE RESISTIVITY TABLE SHOULD BE CONSULTED TO ENSURE THAT THE ALLOWABLE BURDEN OF THE REMOTE CURRENT TRANSFORMER IS NOT EXCEEDED FOR THE LOOP RESISTANCE.

FORMULA: Max. Distance = (Allowable Burden / (25 * Ohms per foot)) / 2

PLEASE ALSO NOTE THAT GOING TO LARGER GAUGE WIRES MAY REQUIRE THE CONDUIT DIAMETER TO INCREASE, AND MAY REQUIRE THE TRANSDUCER BOX CONDUIT KNOCKOUT TO BE ENLARGED.

TB2 is used to connect the Galaxy module communications network. Follow the instructions in the Galaxy installation manual concerning wire size and type. The diagram below indicates the proper field wiring to the TB2 terminal blocks.

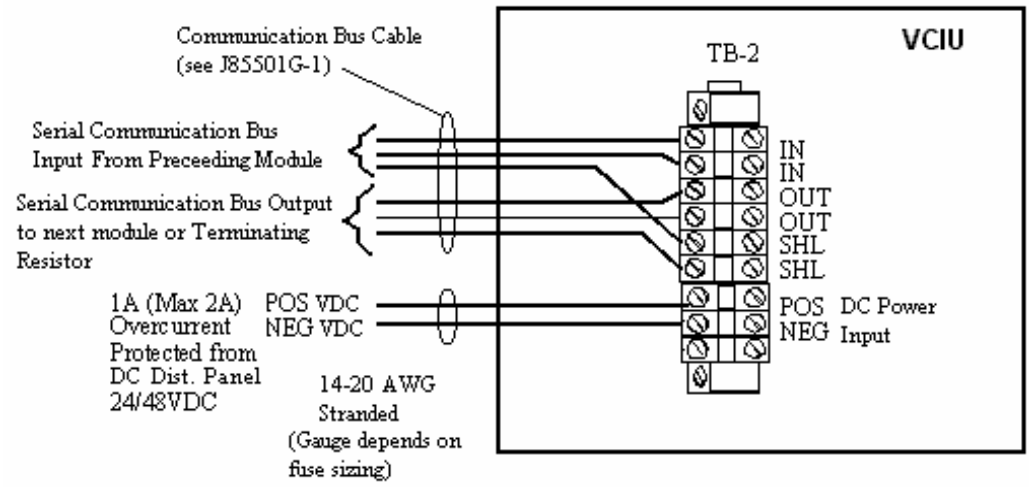


Figure 5 - Galaxy communications network and DC Power wiring

9. TECHNICAL SPECIFICATIONS

AC Voltage-Current Interface Unit (VCIU) Specifications

Model Number	WP-93497
Configurations	
VOLTAGE CONFIG.	Three Phase (Phase/Phase or Phase/Neutral)
MEASURED VOLTAGE	3 @ 0-600 Vac **Choose From:** 208, 240, or 480
Voltage Accuracy	2% for +/- 25% of Calibrated point
MONITORED CURRENT	Specifies AC current monitoring options. Solid-Core or Split-Core transformers are available. (contains 3 transformers) 300 A Solid-Core - 1.25" inner dia., 3.7" outer dia. 600 A Solid-Core - 2.5" inner dia., 4.7" outer dia. 600 A Split-Core - Rectangular: inner dimensions: 2" X 2"; outer dimensions: 4.5" X 3.4" 2000 A Split-Core - Rectangular: inner dimensions: 2.0" X 5.5"; outer dimensions: 4.25" X 7.75"
Accuracy	Transformer: Solid-Core: 1% ; Split-Core: 2% (Full Scale); Transducer: 2%. Pre Rev. B units can only read current down to 10% of full scale.
Electrical Ratings	
DC Input Power	
Nominal	24 or 48 Vdc
Operating Range	16 to 36VDC or 40 to 60 VDC
Current	50 mA max.
Voltage Outputs	3 @ 0-3 Vdc. for AC Voltage Max 3 @ 0-3 Vdc. for AC Current (Note: VCIU outputs are prewired to internal RPM module)
Environmental	
Temperature	0-125 °F (-17°C to 51 °C)
Humidity	5 - 95 % RH Non-Condensing
Size	21.5"W x 14.375H" x 4.0"D
Weight	16 lbs. (Current Transformers not included in weight)
Safety Agency	Underwriters Laboratories (UL) Listing

10. PROGRAMMING THE GALAXY CONTROLLER

*Before beginning, if you are an experienced Easy-View programmer, you may want to bypass this detailed section, and go to the **EasyView Quick Configuration Table.***

10.1 EasyView Graphical User Interface (GUI) (Microsoft Windows® Based)

The address MUST BE SET by the user, using the rotary hex switches on each remote monitoring module.

Procedure

1. Verify that the VCIU unit is connected to the bus.
2. Login to the Galaxy using the EasyView program.
3. Select **Configure** menu.
4. Under the **Configure** menu, select **Monitoring**.

ALL EASYVIEW ILLUSTRATIONS REFERENCED ARE FOUND IN APPENDIX 1

5. Under **Monitoring**, select **Voltage Channels**. Reference *Illustration A*.

6. A screen similar to *Illustration B* shall be shown.

7. Locate the address and channels of the transducer module used. Each channel must be modified.

Channel 1 Configuration (Voltage #1)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor = 50 (110Vac), 100 (208-277Vac), 200 (480 Vac)
Offset = 0.0
Units = Vac

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC voltage for phase 1 is above or below a threshold, a user defined event must be created.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen. *Illustration C*.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC voltage increases or decreases from the desired value being measured. An example would be *AC Voltage #1 Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC voltage is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC voltage is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy controller Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:

(C1**XX** > *Upper Threshold*) | (C1**XX** < *Lower Threshold*)

XX = Module Address

The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

Channel 2 Configuration (Voltage #2)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor = 50 (110Vac), 100 (208-277Vac), 200 (480 Vac)
Offset = 0.0
Units = Vac

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC voltage phase 2 is above or below a threshold, a user defined event must be created. *Illustration C*.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC voltage increases or decreases from the desired value being measured. An example would be *AC Voltage #2 Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC voltage is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC voltage is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:

(C2**XX** > *Upper Threshold*) | (C2**XX** < *Lower Threshold*)

XX = Module Address

The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

Channel 3 Configuration (Voltage #3)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor = 50 (110Vac), 100 (208-277Vac), 200 (480 Vac)
Offset = 0.0
Units = Vac

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC voltage phase 3 is above or below a threshold, a user defined event must be created. *Illustration C*.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC voltage increases or decreases from the desired value being measured. An example would be *AC Voltage #3 Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC voltage is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC voltage is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:

(C3**XX** > *Upper Threshold*) | (C3**XX** < *Lower Threshold*)

XX = Module Address

The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

Channel 4 Configuration (Current #1)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor, Offset, Units (Rev. B and later units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	16.6667	0	Aac
100A	33.3333	0	Aac
300A	100	0	Aac
600A	200	0	Aac
2000A	666.67	0	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Scale Factor, Offset, Units (pre-Rev. B units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	15	-0.33333	Aac
100A	30	-0.33333	Aac
300A	90	-0.33333	Aac
600A	180	-0.33333	Aac
2000A	600	-0.33333	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3.3333
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC current above or below a threshold, a user defined event must be created. *Illustration C*.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC current increases or decreases from the desired value being measured. An example would be *AC Current 1 Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC current is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC current is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:
(C4**XX** > *Upper Threshold*) | (C4**XX** < *Lower Threshold*)
XX = Module Address
The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

Channel 5 Configuration (Current #2)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor, Offset, Units (Rev. B and later units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	16.6667	0	Aac
100A	33.3333	0	Aac
300A	100	0	Aac
600A	200	0	Aac
2000A	666.67	0	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Scale Factor, Offset, Units (pre-Rev. B units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	15	-0.33333	Aac
100A	30	-0.33333	Aac
300A	90	-0.33333	Aac
600A	180	-0.33333	Aac
2000A	600	-0.33333	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3.3333
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC current is above or below a threshold, a user defined event must be created. *Illustration C*.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC current increases or decreases from the desired value being measured. An example would be *AC Current Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC current is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC current is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:
(C5**XX** > *Upper Threshold*) | (C5**XX** < *Lower Threshold*)
XX = Module Address
The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

Channel 6 Configuration (Current #3)

Click on the **Modify** button located in the lower left hand corner of the screen. A screen similar to *Illustration C* will now be displayed.

Description field

Type in a text description of the channel. (Note that the following fields are automatically configured by the Galaxy and can not be changed: *Value, Identifier, Type, Address, TL1, Status, Channel, and Voltage Range*)

Scale Factor, Offset, Units (Rev. B and later units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	16.6667	0	Aac
100A	33.3333	0	Aac
300A	100	0	Aac
600A	200	0	Aac
2000A	666.67	0	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Scale Factor, Offset, Units (pre-Rev. B units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	15	-0.33333	Aac
100A	30	-0.33333	Aac
300A	90	-0.33333	Aac
600A	180	-0.33333	Aac
2000A	600	-0.33333	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3.3333
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Create User Defined Event for Alarming

For the Galaxy to generate an alarm when the monitored AC current is above or below a threshold, a user defined event must be created. *Illustration C*.

For each channel, using the mouse, select the *Create New User Defined Event And Modify* button in the lower left corner of the screen.

Select **OK** to confirm changes. A screen similar to *Illustration D* will now be seen.

The *Description* field is used to define the alarm condition when the AC current increases or decreases from the desired value being measured. An example would be *AC Current #3 Out of Range*.

Select the *Severity* of the alarm. *Illustration D*.

(***Optional Step***) Select the *LED* to be illuminated on front panel of the controller when the AC current is out of range. *Illustration D*.

(***Optional Step***) Select the alarm *Relay* that will become active when the AC Current is out of range. *Illustration D*.

Configuration of the *Callout on Alarm* fields is beyond the scope of this manual. Refer to the Galaxy Product Manual.

To configure this user defined event as a *Latched* alarm event, *Enable* the *Latched* field. (*Latched* implies that once the alarm condition retires, the alarm will remain active until it is cleared by the user)

The final step is the *Program Line* definition. The *Program Line* should be the following:

(C6**XX** > *Upper Threshold*) | (C6**XX** < *Lower Threshold*)

XX = Module Address

The "|" symbol is the symbol for **OR. It is usually above the ENTER key on your keyboard.**

This completes the VCIU unit programming with EasyView. Galaxy is now ready to monitor AC voltage and current.

11. PROGRAMMING OTHER MONITORING DEVICES

Use recommended current limiting resistors and program the channel use to monitor voltage/current as follows: Scale Factor =(see table below) , Offset = 0, Units = Vac, Output of Voltage Transducer is 0-3Vdc.

AC Input Voltage	Scale Factor
110	50
208	100
240	100
480	200

Use recommended current limiting resistors and program the channel use to monitor current as follows:

Scale Factor, Offset, Units (Rev. B and later units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	16.6667	0	Aac
100A	33.3333	0	Aac
300A	100	0	Aac
600A	200	0	Aac
2000A	666.67	0	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

Scale Factor, Offset, Units (pre-Rev. B units)

Transformer Current Rating (Primary)	Scale Factor	Offset	Units
50A	15	-0.33333	Aac
100A	30	-0.33333	Aac
300A	90	-0.33333	Aac
600A	180	-0.33333	Aac
2000A	600	-0.33333	Aac

For other transformers not found in this table, the SCALE FACTOR = Transformer Rating divided by 3.3333
Transformers used must have a secondary winding rated at 5Aac at Full Scale.

12. MAINTENANCE

The VCIU should be checked on a semi-annual basis to ensure the VM-1 board is calibrated properly. To perform the maintenance test, use a standard DVM to measure the input line voltage at TB1 L1-L2, L1-L3 and L2-L3 (L1-N, L2-N, L3-N for 4-wire units). Record these manual readings. Compare the measured readings with the display of the Galaxy controller. If the measured voltage is more than 2% +/- difference the VM-1 should be field calibrated. Follow the instructions below to calibrate the analog outputs of the VM-1. No other maintenance is required for the VCIU.

13. CALIBRATION

To calibrate the VCIU's VM-1 analog outputs, , use a standard DVM to measure the input line voltage at TB1 L1-L2, L1-L3 and L2-L3 (L1-N, L2-N, L3-N for 4-wire units). Record these manual readings. Use the DVM to measure the DC analog voltage outputs from the VM-1 Board by placing the black probe on "COM" and the red probe on "OUT 1", "OUT 2" and "OUT 3". The OUT 1 output corresponds to Phase A, OUT 2 to Phase B, OUT 3 to Phase C.

To adjust the analog output voltage for each phase use a suitable screwdriver to turn the corresponding adjustment trim pot for the phase being calibrated. Slowly turn the trim pot until the Galaxy displays an accurate reading. After calibrating each phase, recheck all phases. See Fig. 6 and Table A below.

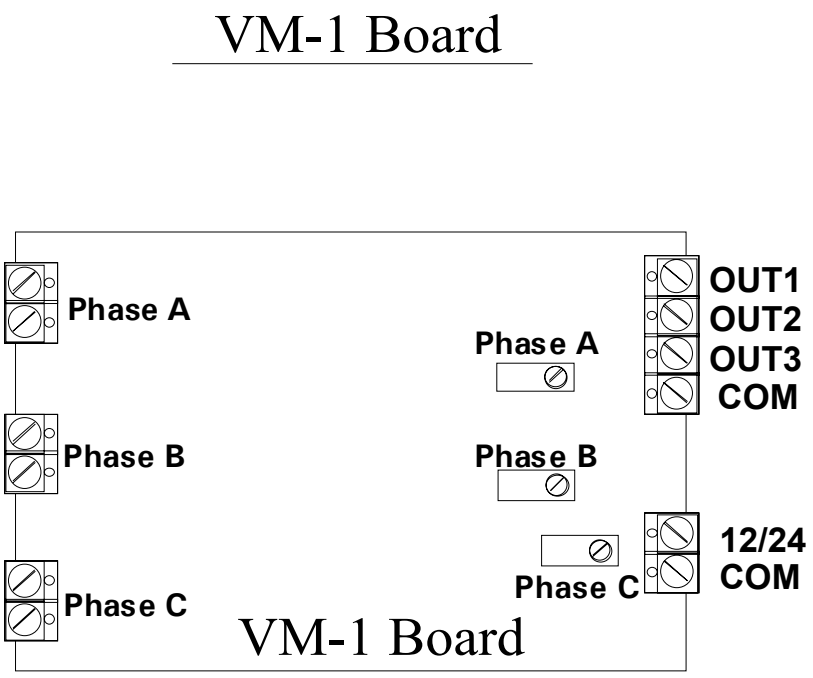


Figure 6 – Calibration Pot Locations

Table A – Potentiometer Calibration

VCIU LIST NUMBER	Adjust Phase M (where M = A, B, or C) Pots for:
L10 – L24	DC Volts on OUT N (where N = 1, 2, or 3) = Line to Line AC Volts ÷100
L30 – L34	DC Volts on OUT N (where N = 1, 2, or 3) = Line to Line AC Volts ÷200
L40 -- L44	DC Volts on OUT N (where N = 1, 2, or 3) = Line to Neutral AC Volts ÷50

14. TROUBLESHOOTING

PROBLEM	Possible CAUSE	SOLUTION
No AC voltage Reading at the Galaxy, but the voltmeter has a reading.	There may be a bad connection from the source to the VCIU input.	Verify that a solid connection exists between the source and the VCIU input.
When a low voltage alarm is present, no LED on Galaxy Front Panel.	The User Defined Event and/or severity LED for the voltage transducer is not configured.	Modify User Defined Event for the voltage channel. (See Galaxy Product Manual)
The Alarm LEDs and conditions stay active after a low AC voltage condition is no longer present.	The channel is configured as a latched event.	Disable the Latched event feature under the modify screen.
The Voltage values reported by Galaxy are out of the specified accuracy range.	The Scale Factor and Offset values may have been changed.	Change the Scale Factor and Offset values.
No alarms are generated when the alarm thresholds are exceeded.	The User Defined Event for AC Voltage Reporting may have been changed.	Verify that the Alarm configuration for the User Defined Event is correct.
No AC current Reading at the Galaxy, but the ammeter has a reading.	There may be a bad connection from the transformer to the VCIU input, or a Safety Jumper has been left connected.	Verify that a solid connection exists between the transformer output and the VCIU input, and/or open Safety Jumper.
When a low current alarm is present, no LED on Galaxy Front Panel.	The User Defined Event and/or severity LED for the current transducer is not configured.	Modify User Defined Event for the current channel. (See Galaxy Product Manual)
The Alarm LEDs and conditions stay active after a low AC current condition is no longer present.	The channel is configured as a latched event.	Disable the Latched event feature under the modify screen.
The current values reported by Galaxy are out of the specified accuracy range. This may include inability to accurately see currents near the maximum transformer rating, or inability to see currents less than 10% of transformer full scale.	The Scale Factor and Offset values may have been changed.	Change the Scale Factor and Offset values. Refer to tables in Section 10.1 and 11.0.
	The VCIU unit is “older” (e.g. pre-Rev. B).	Rev. B and later units offer increased dynamic range down to 1% of full scale. An upgrade kit is available.
	The remote current transformer may have had turns added to the primary (e.g. transformer has been rescaled).	Rescaling of the transformer is done to allow more accurate measurement of currents far below full scale, which compresses the high end capability of the transformer. See Section 16.10.
	The remote current transformer may be undersized.	Order a larger transformer. See section 16.9 for part numbers.
	The remote current transformer is too far from the VCIU, and/or the wires to the remote current transformer are of insufficient gauge.	Consult the Burden table in Section 8.3, and Notes 8 and 9. Maximum distance at 14 AWG is given.
	The remote current transformer is in close proximity to another high-current conductor and is receiving interference.	Relocate transformer and its monitored lead away from other high current carrying conductors (6” distance is typical good distance).
No alarms are generated when the alarm thresholds are exceeded.	The User Defined Event for AC current Reporting may have been changed.	Verify that the Alarm configuration for the User Defined Event is correct.

15. EASYVIEW QUICK CONFIGURATION TABLE

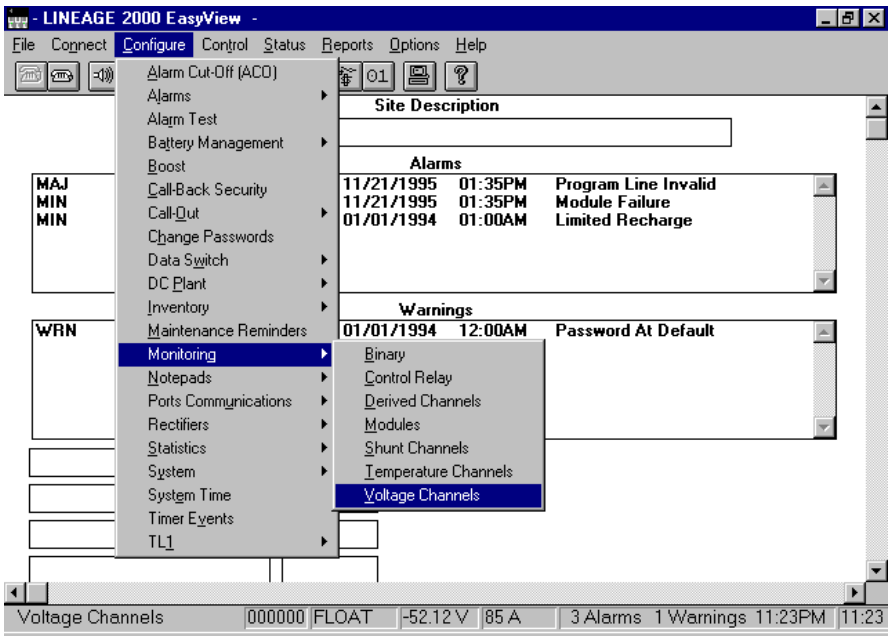
	Required	Optional	**Entry** for Required Values; **Example** for Optional Values
Channel 1- Voltage #1			
Description		Yes	AC Voltage #1
Scale Factor	Yes		50 (110 Vac), 100 (208-277 Vac), 200 (480 Vac)
Offset	Yes		0
UDE Description		Yes	AC Voltage #1 Out of Range
Severity		Yes	Major
LED		Yes	AC
Alarm Relay		Yes	AC
Program Line	Yes		(C1**XX** > *Upper Threshold*) | (C1**XX** < *Lower Threshold*)
Latched		Yes	Disable
Channel 2- Voltage #2			
Description		Yes	AC Voltage #2
Scale Factor	Yes		50 (110 Vac), 100 (208-277 Vac), 200 (480 Vac)
Offset	Yes		0
UDE Description		Yes	AC Voltage #2 Out of Range
Severity		Yes	Major
LED		Yes	AC
Alarm Relay		Yes	AC
Program Line	Yes		(C2**XX** > *Upper Threshold*) | (C2**XX** < *Lower Threshold*)
Latched		Yes	Disable
Channel 3- Voltage #3			
Description		Yes	AC Voltage #3

	Required	Optional	**Entry** for Required Values; **Example** for Optional Values
Scale Factor	Yes		50 (110 Vac), 100 (208-277 Vac), 200 (480 Vac)
Offset	Yes		0
UDE Description		Yes	AC Voltage #3 Out of Range
Severity		Yes	Major
LED		Yes	AC
Alarm Relay		Yes	AC
Program Line	Yes		(C3**XX** > *Upper Threshold*) | (C3**XX** < *Lower Threshold*)
Latched		Yes	Disable
Channel 4- Current #1			
Description		Yes	AC Current #1
Scale Factor	Yes		Rev. B and later units: Transformer Rating (Primary Side) divided by 3 Pre-Rev. B units: Transformer Rating (Primary Side) divided by 3.3333
Offset	Yes		Rev. B and later units: 0 Pre-Rev. B units: -0.33333
UDE Description		Yes	AC Current #1 Out of Range
Severity		Yes	Major
LED		Yes	AC
Alarm Relay		Yes	AC
Program Line	Yes		(C4**XX** > *Upper Threshold*) | (C4**XX** < *Lower Threshold*)
Latched		Yes	Disabled
Channel 5- Current #2			
Description		Yes	AC Current #2
Scale Factor	Yes		Rev. B and later units: Transformer Rating (Primary Side) divided by 3 Pre-Rev. B units: Transformer Rating (Primary Side) divided by 3.3333
Offset	Yes		Rev. B and later units: 0 Pre-Rev. B units: -0.33333
UDE Description		Yes	AC Current #2 Out of Range
Severity		Yes	Major
LED		Yes	AC

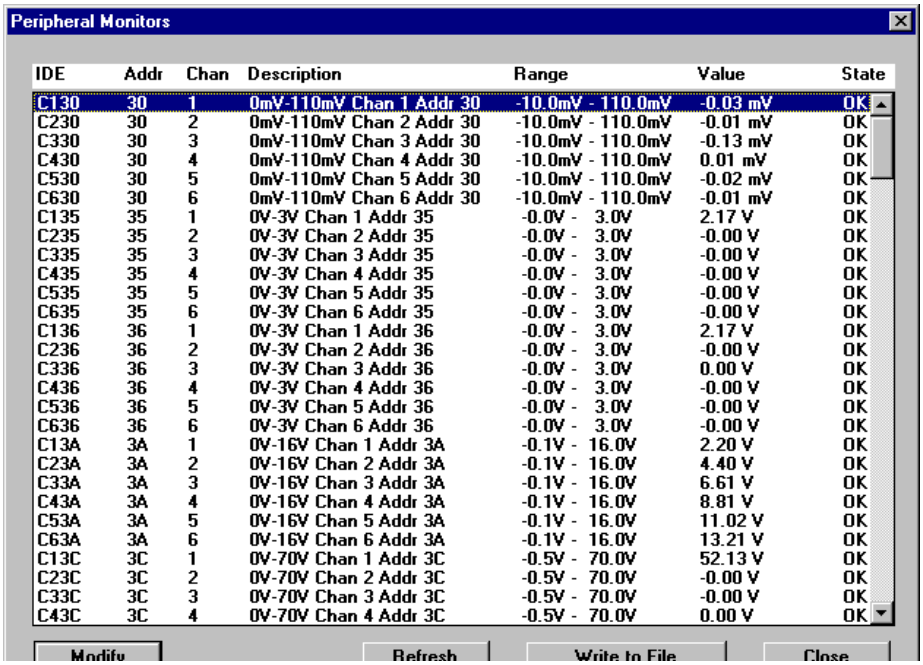
Alarm Relay		Yes	AC
Program Line	Yes		(C5**XX** > *Upper Threshold*) | (C5**XX** < *Lower Threshold*)
Latched		Yes	Disabled
Channel 6- Current #3			
Description		Yes	AC Current #3
Scale Factor	Yes		Rev. B and later units: Transformer Rating (Primary Side) divided by 3 Pre-Rev. B units: Transformer Rating (Primary Side) divided by 3.3333
Offset	Yes		Rev. B and later units: 0 Pre-Rev. B units: -0.33333
UDE Description		Yes	AC Current #3 Out of Range
Severity		Yes	Major
LED		Yes	AC
Alarm Relay		Yes	AC
Program Line	Yes		(C6**XX** > *Upper Threshold*) | (C6**XX** < *Lower Threshold*)
Latched		Yes	Disabled

16. APPENDIX 1

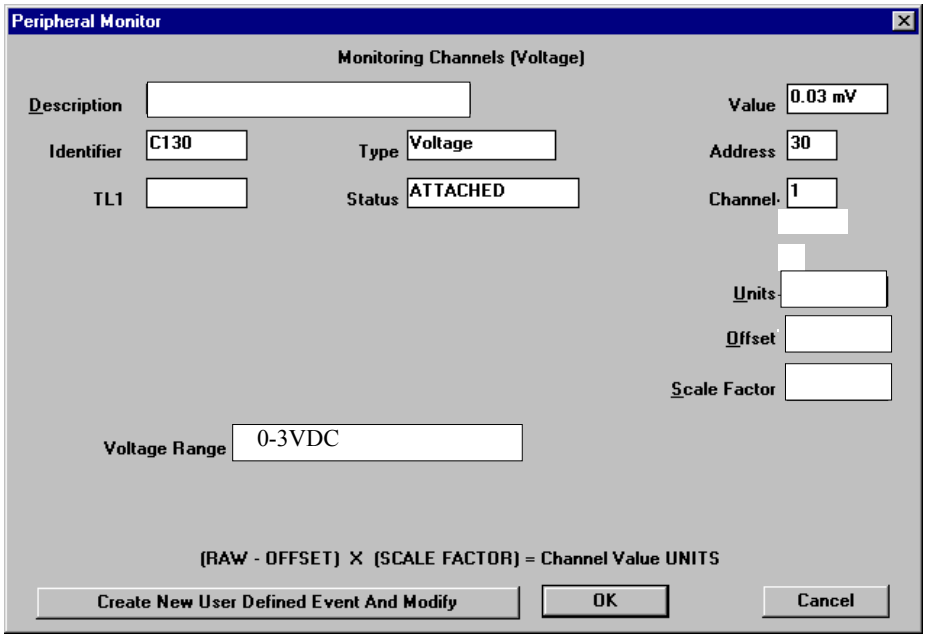
16.1 Illustration A



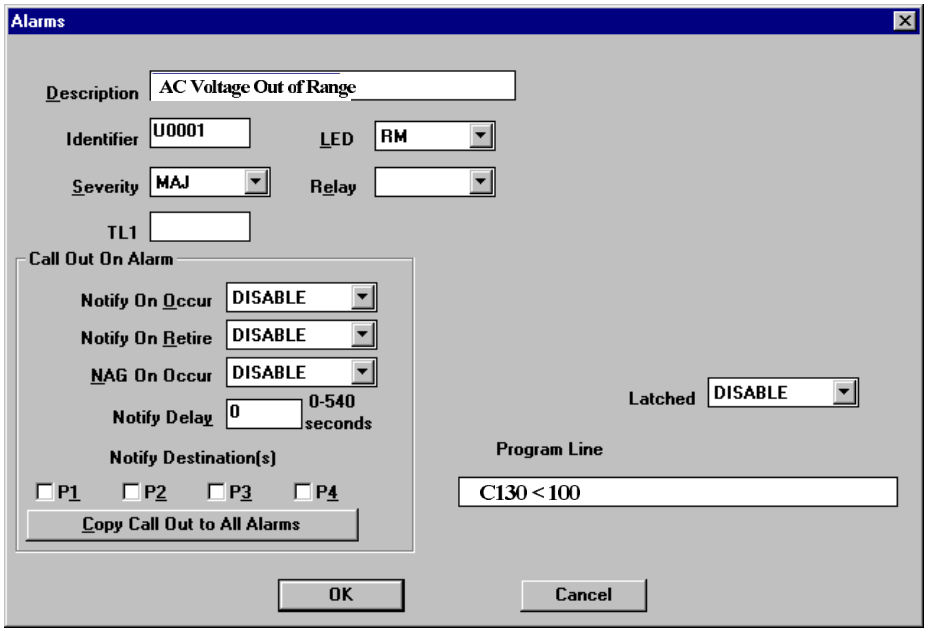
16.2 Illustration B



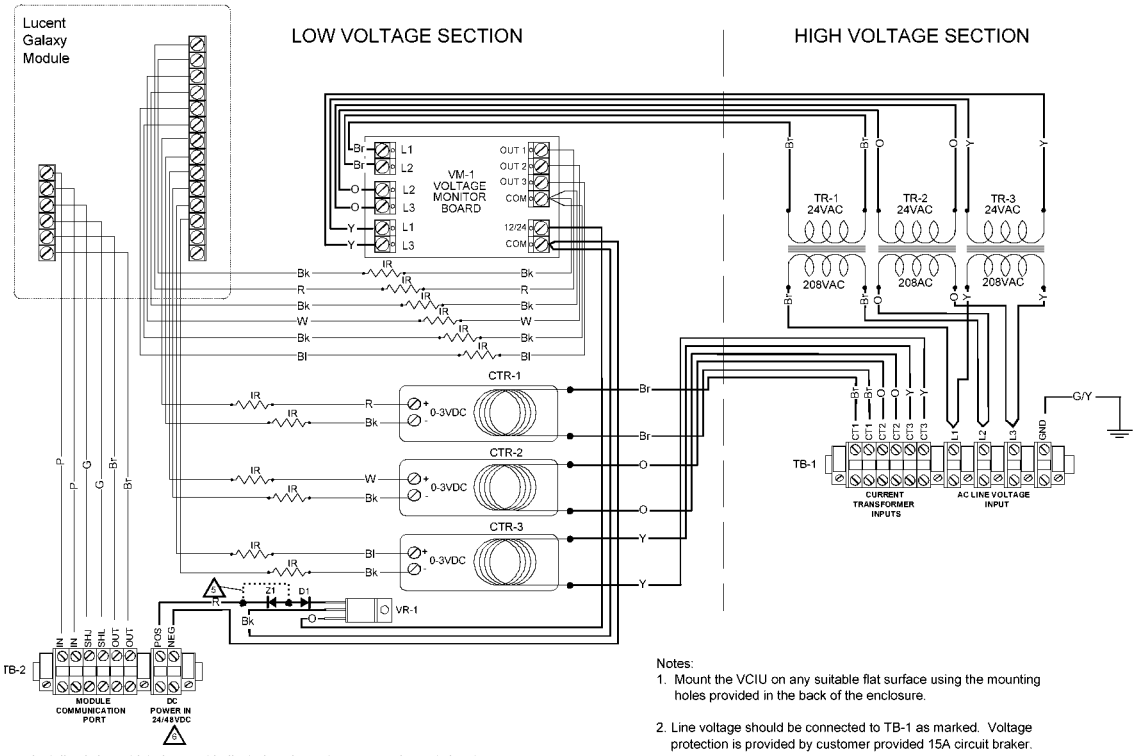
16.3 Illustration C



16.4 Illustration D



16.5 VCIU Internal Wiring Diagram 208VAC - 3 Phase (WP-93497 L10-L14)



Install only in restricted areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17 and 110-18 of the U.S. National Electrcal Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.

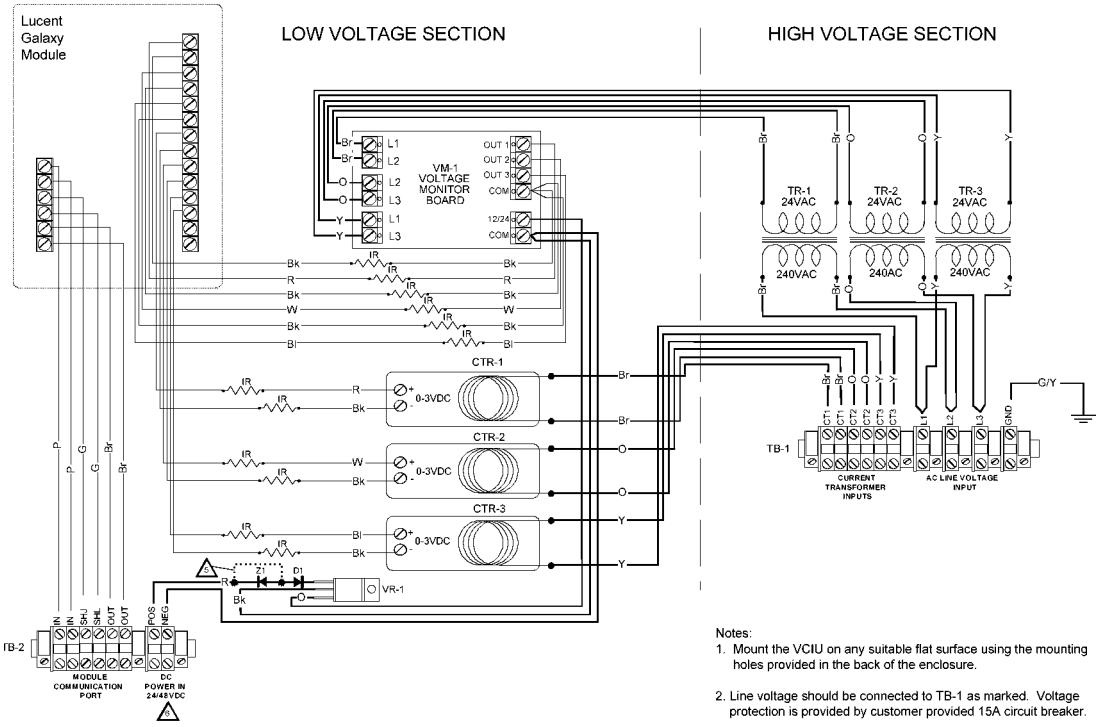
This equipment is to be used in controlled environments.

Before making any connections to this equipment, refer to the product documentation for safety precautions, important connection and operating considerations and proper hardware (wire, lugs, and crimping tools).

Notes:

1. Mount the VCIU on any suitable flat surface using the mounting holes provided in the back of the enclosure.
2. Line voltage should be connected to TB-1 as marked. Voltage protection is provided by customer provided 15A circuit braker.
3. Connect the current CT output wiring to TB-1 before appling current to the monitored circuit. Failure to do so could damage the CTs.
4. All wiring to the VCIU must meet all local and national electrical codes.
5. Put zener bypass jumper across for 24VDC Input
6. For -48VDC Neg = Bat
   For +24VDC Pos = Bat
   For -24VDC Neg = Bat

16.6 VCIU Internal Wiring Diagram 240VAC - 3 Phase (WP-93497 L20-L24)



Install only in restricted areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17 and 110-18 of the U.S. National Electrcal Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.

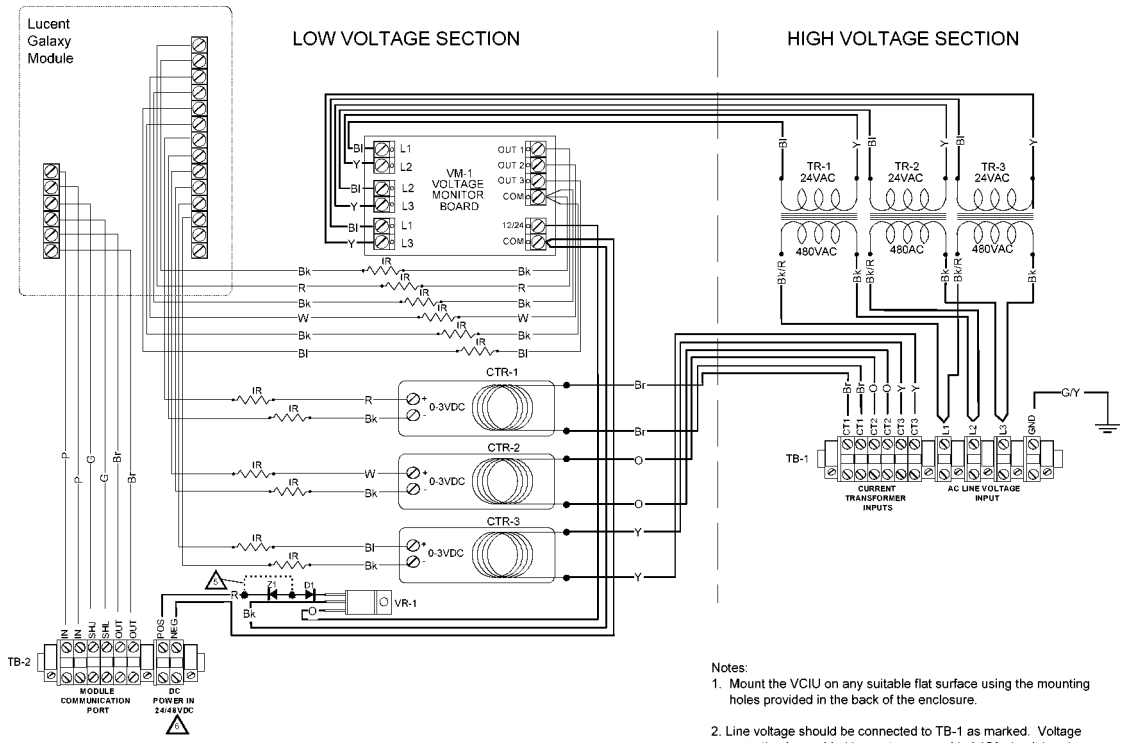
This equipment is to be used in controlled environments.

Before making any connections to this equipment, refer to the product documentation for safety precautions, important connection and operating considerations and proper hardware (wire, lugs, and crimping tools).

Notes:

1. Mount the VCIU on any suitable flat surface using the mounting holes provided in the back of the enclosure.
2. Line voltage should be connected to TB-1 as marked. Voltage protection is provided by customer provided 15A circuit breaker.
3. Connect the current CT output wiring to TB-1 before appling current to the monitored circuit. Failure to do so could damage the CTs.
4. All wiring to the VCIU must meet all local and national electrical code
5. Put zener bypass jumper across for 24VDC Input
6. For -48VDC Neg = Bat
   For +24VDC Pos = Bat
   For -24VDC Neg = Bat

16.7 VCIU Internal Wiring Diagram 480VAC - 3 Phase (WP-93497 L30-L34)



Install only in restricted areas (dedicated equipment rooms, equipment closets, or the like) in accordance with articles 110-16, 110-17 and 110-18 of the U.S. National Electrcal Code (NEC), ANSI/NFPA No. 70, and pursuant to applicable local codes.

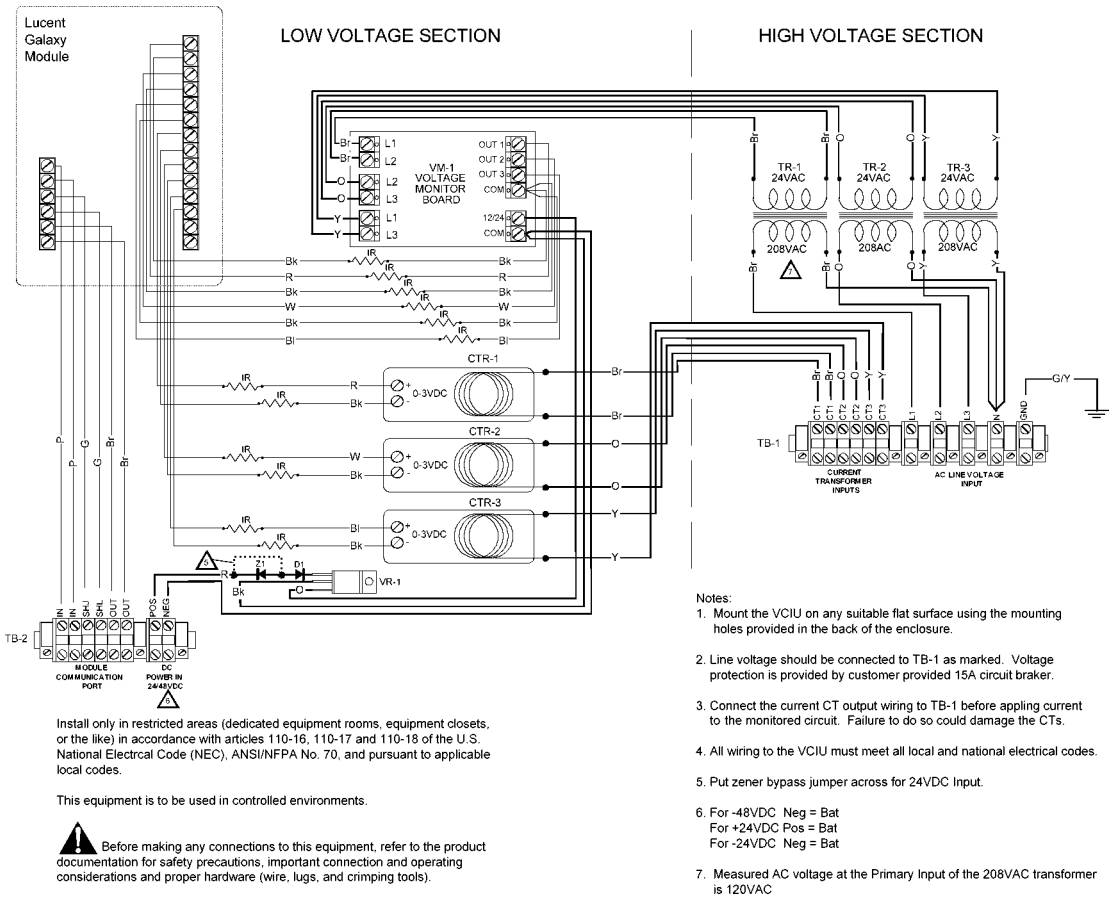
This equipment is to be used in controlled environments.

Before making any connections to this equipment, refer to the product documentation for safety precautions, important connection and operating considerations and proper hardware (wire, lugs, and crimping tools).

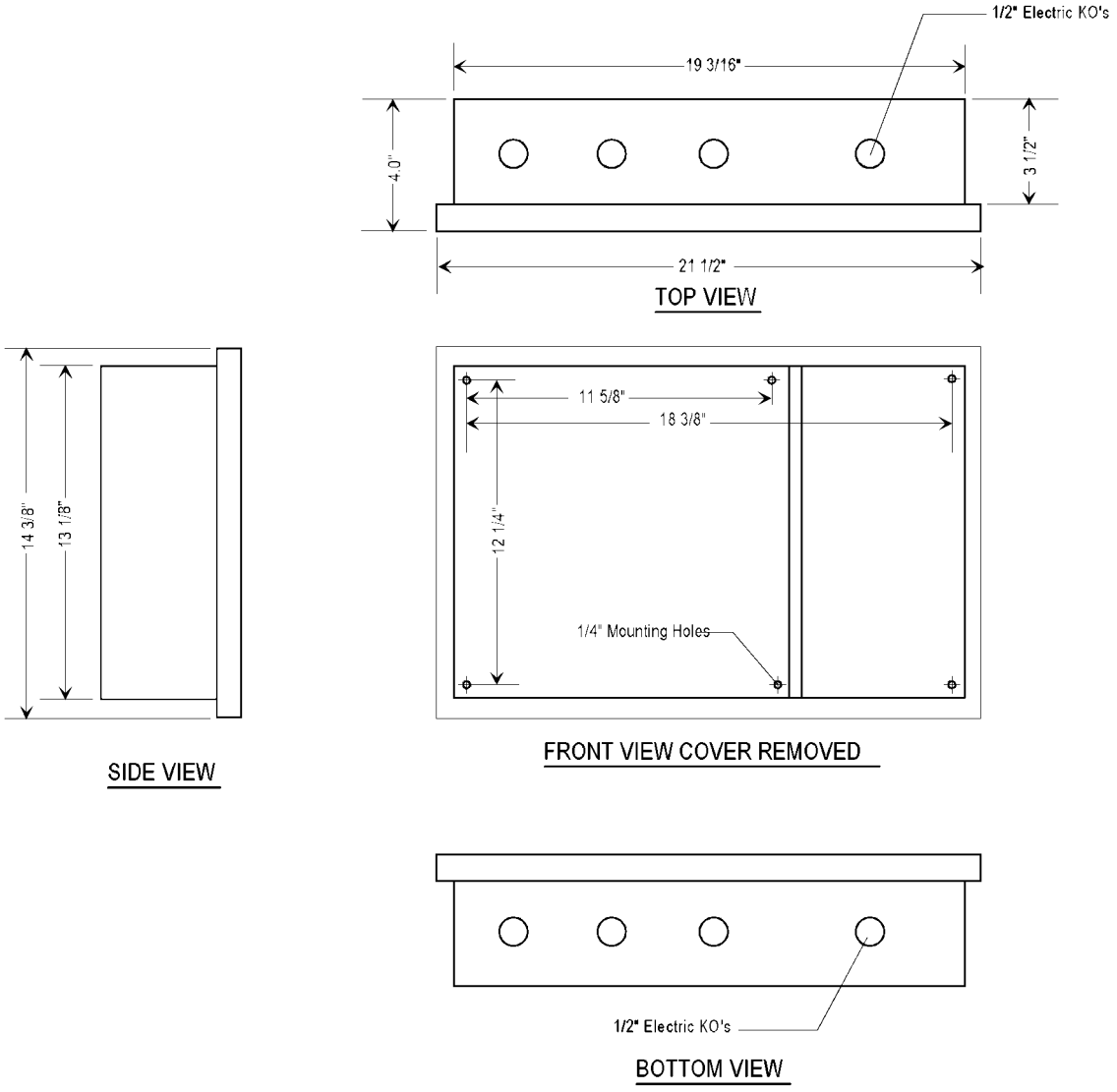
Notes:

1. Mount the VCIU on any suitable flat surface using the mounting holes provided in the back of the enclosure.
2. Line voltage should be connected to TB-1 as marked. Voltage protection is provided by customer provided 15A circuit breaker.
3. Connect the current CT output wiring to TB-1 before appling current to the monitored circuit. Failure to do so could damage the CTs.
4. All wiring to the VCIU must meet all local and national electrical codes.
5. Put zener bypass jumper across for 24VDC Input
6. For -48VDC Neg + Bat
   For +24VDC Pos = Bat
   For -24VDC Neg = Bat

16.8 VCIU Internal Wiring Diagram 120/208VAC - 3 Phase - 4 Wire (WP-93497 L40-L44)



NOTE: Transformers are wired and rated to accept 208VAC line to neutral, even though they are used at 120VAC line to neutral in the actual application. The voltage scaling factor in the Galaxy section takes this transformer ratio into account.


1/2" Electric KO's
19 3/16"
4.0"
3 1/2"
21 1/2"
TOP VIEW
14 3/8"
13 1/8"
SIDE VIEW
11 5/8"
18 3/8"
12 1/4"
1/4" Mounting Holes
FRONT VIEW COVER REMOVED
1/2" Electric KO's
BOTTOM VIEW

16.9 VCIU Parts List

Comcode	Used On List #(s)	Part Number	Description	Qty
408283760	10,11,12,13,14	**WP-93497-10-HVMA**	Major Assembly - Transformer section - includes backplate and all components (transformers, terminal blocks etc.)	1
408271054	10,11,12,13,14	WP-93497-TR208	Isolation Transformer 208VAC Pri / 24VAC Sec.(TR-)	3
408283687	10,11,12,13,14	WP-93497-10-TB1	Terminal Block - High voltage section(TB-1)	1
408283810	10,11,12,13,14	**WP-93497-10-LVMA**	Major Assembly - Low voltage section - includes backplate and all components (current transducers, VM-1, terminal blocks etc.)	1
408280410	10,11,12,13,14	WP-93497-CTR100	Internal Current Transducer 0-3VDC output(CTR-)	3
408271070	10,11,12,13,14	WP-93497-VM208	Voltage Transducer 208VAC (PCB VM-1)	1
108040890	10,11,12,13,14	WP-93497-LUC221A	Galaxy Peripheral Monitoring Module	1
847635851	10,11,12,13,14	WP-93497-LUC221TB	Terminal Block – Monitoring Module	1
408283695	10,11,12,13,14	WP-93497-10-TB2	Terminal Block - Low voltage section(TB-2)	1
408270916	10,11,12,13,14	WP-93497-PS24	Power Regulator 48/24VDC harness assembly(includes IN4004 diode, 20V Zener, harnessed as a one assembly.)	1
408280469	10	WP-93497-CT300	External Current Transformer - Solid Core - 300 AMP	3
408280535	11	WP-93497-CT600	External Current Transformer - Solid Core - 600 AMP	3
408280501	12	WP-93497-CTS600	External Current Transformer - Split Core - 600 AMP	3
408280568	13	WP-93497-CT2000	External Current Transformer - Split Core - 2,000 AMP	3
408283778	20,21,22,23,24	**WP-93497-20-HVMA**	Major Assembly - Transformer section - includes backplate and all components (transformers, terminal blocks etc.)	1
408271013	20,21,22,23,24	WP-93497-TR240	Isolation Transformer 240VAC Pri / 24VAC Sec.(TR-)	3
408283703	20,21,22,23,24	WP-93497-20-TB1	Terminal Block - High voltage section(TB-1)	1
408283836	20,21,22,23,24	**WP-93497-20-LVMA**	Major Assembly - Low voltage section - includes backplate and all components (current transducers, VM-1, terminal blocks etc.)	1
408280410	20,21,22,23,24	WP-93497-CTR100	Internal Current Transducer 0-3VDC output(CTR-)	3
408271039	20,21,22,23,24	WP-93497-VM240	Voltage Transducer 240VAC (PCB VM-1)	1
108040890	20,21,22,23,24	WP-93497-LUC221A	Galaxy Peripheral Monitoring Module	1
847635851	20,21,22,23,24	WP-93497-LUC221TB	Terminal Block – Monitoring Module	1
408283711	20,21,22,23,24	WP-93497-20-TB2	Terminal Block - Low voltage section(TB-2)	1
408270916	20,21,22,23,24	WP-93497-PS24	Power Regulator 48/24VDC harness assembly(includes IN4004 diode, 20V Zener, harnessed as a one assembly.)	1
408280469	20	WP-93497-CT300	External Current Transformer - Solid Core - 300 AMP	3
408280535	21	WP-93497-CT600	External Current Transformer - Solid Core - 600 AMP	3
408280501	22	WP-93497-CTS600	External Current Transformer - Split Core - 600 AMP	3
408280568	23	WP-93497-CT2000	External Current Transformer - Split Core - 2,000 AMP	3
408283786	30,31,32,33,34	**WP-93497-30-HVMA**	Major Assembly - Transformer section - includes backplate and all components (transformers, terminal blocks etc.)	1
408271138	30,31,32,33,34	WP-93497-TR480	Isolation Transformer 480VAC Pri / 24VAC Sec.(TR-)	3
408283729	30,31,32,33,34	WP-93497-30-TB1	Terminal Block - High voltage section(TB-1)	1
408283844	30,31,32,33,34	**WP-93497-30-LVMA**	Major Assembly - Low voltage section - includes backplate and all components (current transducers, VM-1, terminal blocks etc.)	1
408280410	30,31,32,33,34	WP-93497-CTR100	Internal Current Transducer 0-3VDC output(CTR-)	3
408271146	30,31,32,33,34	WP-93497-VM480	Voltage Transducer 480VAC (PCB VM-1)	1
108040890	30,31,32,33,34	WP-93497-LUC221A	Galaxy Peripheral Monitoring Module	1
847635851	30,31,32,33,34	WP-93497-LUC221TB	Terminal Block – Monitoring Module	1
408283737	30,31,32,33,34	WP-93497-30-TB2	Terminal Block - Low voltage section(TB-2)	1
408270916	30,31,32,33,34	WP-93497-PS24	Power Regulator 48/24VDC harness assembly(includes IN4004 diode, 20V Zener, harnessed as a one assembly.)	1
408280469	30	WP-93497-CT300	External Current Transformer - Solid Core - 300 AMP	3
408280535	31	WP-93497-CT600	External Current Transformer - Solid Core - 600 AMP	3
408280501	32	WP-93497-CTS600	External Current Transformer - Split Core - 600 AMP	3
408280568	33	WP-93497-CT2000	External Current Transformer - Split Core - 2,000 AMP	3

Comcode	Used On List #(s)	Part Number	Description	Qty
408283794	40,41,42,43,44	**WP-93497-40-HVMA**	Major Assembly - Transformer section - includes backplate and all components (transformers, terminal blocks etc.)	1
408270924	40,41,42,43,44	WP-93497-TR120	Isolation Transformer 120VAC Pri / 24VAC Sec.(TR-)	3
408283745	40,41,42,43,44	WP-93497-40-TB1	Terminal Block - High voltage section(TB-1)	1
408283851	40,41,42,43,44	**WP-93497-40-LVMA**	Major Assembly - Low voltage section - includes backplate and all components (current transducers, VM-1, terminal blocks etc.)	1
408280410	40,41,42,43,44	WP-93497-CTR100	Internal Current Transducer 0-3VDC output(CTR-)	3
408271070	40,41,42,43,44	WP-93497-VM208	Voltage Transducer 208VAC (PCB VM-1)	1
108040890	40,41,42,43,44	WP-93497-LUC221A	Galaxy Peripheral Monitoring Module	1
847635851	40,41,42,43,44	WP-93497-LUC221TB	Terminal Block – Monitoring Module	1
408283752	40,41,42,43,44	WP-93497-40-TB2	Terminal Block - Low voltage section(TB-2)	1
408270916	40,41,42,43,44	WP-93497-PS24	Power Regulator 48/24VDC harness assembly(includes IN4004 diode, 20V Zener, harnessed as a one assembly.)	1
408280469	40	WP-93497-CT300	External Current Transformer - Solid Core - 300 AMP	3
408280535	41	WP-93497-CT600	External Current Transformer - Solid Core - 600 AMP	3
408280501	42	WP-93497-CTS600	External Current Transformer - Split Core - 600 AMP	3
408280568	43	WP-93497-CT2000	External Current Transformer - Split Core - 2,000 AMP	3
848537130	As Needed	WP-93497-L90	Remote Current Transformer Safety Jumper (if req'd – shown for ordering purposes only)	3
408361426	As Needed	WP-93497-CT100	External Current Transformer - Solid Core – 100 AMP (if req'd -- shown for ordering purposes only)	3
408361434	As Needed	WP-93497-CT50	External Current Transformer - Solid Core - 50 AMP (if req'd -- shown for ordering purposes only)	3

16.10 Rescaling of Remote Current Transformers

A remote current transformer can be rescaled to read lower current values. Typically, this rescaling is done at sites operating much lower than 50A output current (AC inverters and UPS equipment 4 KVA and below in power rating). Rescaling is accomplished by adding turns to the primary by passing the monitored conductor through the hole in the transformer multiple times (if space permits). For example:

Inverter = 2 kVA, monitor the output current.

Inverter Iout max = 2000 / 120V = 16.67A
Transformer Max Current = 50A (using a 50A, 1 primary turn, full scale external current transformer).
Minimum readable current for this transformer (1 turn on primary) = 50A X 0.01 = 500mA
(for Rev. B and later units).

Rescaling - example:

50A / 16.67 = 3.0 → this implies that using 3 primary turns is the maximum number that will allow the transformer to operate over the full inverter output range. This lowers the minimum readable current to: 16.67 X 0.01 = 166.7 mA (vs 500mA without rescaling) for the Galaxy/Millennium, or other controller. However, the new Maximum current limit for the rescaled transformer is 16.67A, which is only 1/3 of the former 50A Therefore, currents below 500 mA can now be accurately measured (down to 166.7 mA), but currents in excess of 16.67A may read back as a lesser amount. (e.g. reading = 17.0, actual current = 18.02A). The maximum load current must be less than or equal to the lower, rescaled limit of 16.67A.

Rescaling the remote current transformer(s) also requires modification of the Galaxy scaling factors. The transformer current rating in the table is divided by the number of primary turns, and then again by 3.0 (for Rev. B and later units) or 3.3333 (for pre-Rev. B units).

Rescaling of other, larger transformers follows the same principles. In all cases, it is recommended to note (on an adhesive label or other means) inside the VCIU enclosure that the remote current transformer has been

rescaled, and the amount of primary turns. It may also be helpful to make notes in the Galaxy user's manual giving the same details. These notes may be helpful should a Galaxy module, a Transducer, or a remote current transformer need replacing, or if the AC load grows larger in the future.

17. REVISION HISTORY

Issue 9
Added Lists 35 through 38, and List 57 to ordering information.

Issue 8
Correction to comcode 408271070 in parts list.

Issue 7
Correction to comcode 408270965 description in parts list.