TRANSTECTOR
an INFINITE brand

Series 700 AV/T Power Conditioner

60 K(I) Power Conditioner with Voltage Regulation (60 Hz)

Owners Manual

Important safety instructions - save these instructions and review prior to using equipment

Designed for the Varian On Board Imager™

60 k(I) 60 Hz Single Output

TABLE OF CONTENTS

RECEIVING & INSPECTING THE UNIT

INSPECTING THE POWER CONDITIONER

Upon receipt of the unit, visually inspect for shipping damage. If any damage is found, the Purchaser must contact the Carrier immediately and file a shipping damage claim.

NOTE: Be sure to remove the top and side panels, and inspect the inside of the unit for shipping damage.

If any internal damage has occurred or any external damage that could affect the operation of the unit, please contact Transtector.

FOR ASSISTANCE CALL 1-800-882-9110 X 6112 or +1 208.762.6112 (8am-5pm Pacific Time)

AFTER HOURS CALL 1-800-521-4792 or +1 208.755.2072

STORING

If it is necessary to store the unit for a period of time before it is installed, be sure to place the unit in a clean, dry area. To prevent excessive dust from accumulating on the unit, it is advisable to protect it by replacing it in the original container (if possible). If the original container is not available it is recommended that all openings that lead internally into the unit are covered so that dust, water or any other substance cannot enter the internal components of the system. The unit must be handled at all times with the same care you would give to any piece of precision industrial equipment.

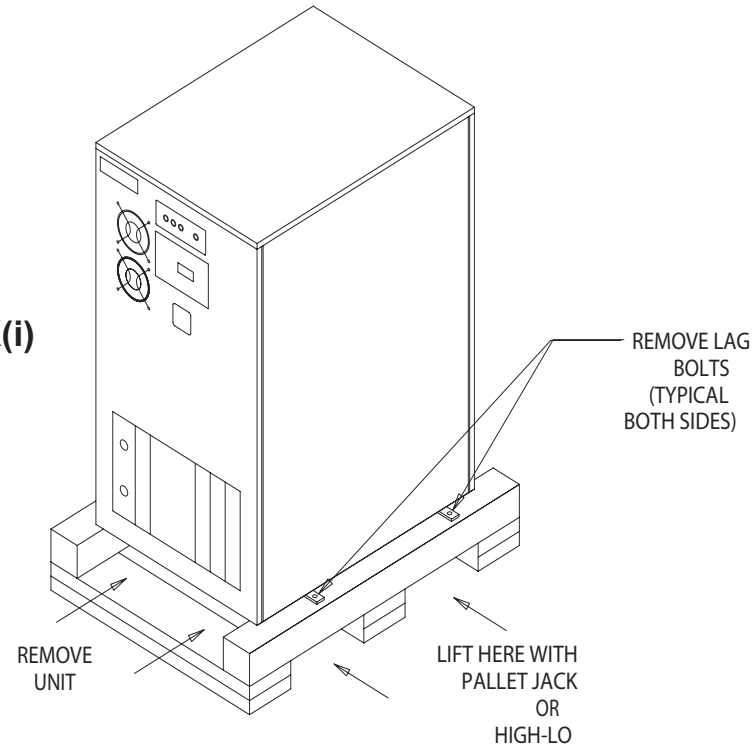
REMOVING THE POWER CONDITIONER FROM PALLET

Please take special care when removing the unit from the pallet. Depending on the size and weight of the unit, proper equipment must be used for lifting and moving, and all safety precautions should be taken. Each unit is bolted to a wooden pallet. In order to properly remove the cabinet from the pallet, all bolts connecting the unit to the pallet must be removed completely. Most sizes must be lifted off with a pallet jack or a fork lift. When lifting the unit off of the pallet, be sure to take proper safety precautions. Serious injury and/or unit damage can result otherwise.

RECEIVING & INSPECTING THE UNIT (continued)

REMOVING THE POWER CONDITIONER FROM PALLET

60K(i)



GENERAL DESCRIPTION

The Series 700 AV/T Power Conditioner is a continuous duty power line conditioner designed to supply reliable, clean regulated power to critical loads. An efficient design with state of the art micro-processor controlled solid state devices provide immunity to all line disturbances.

The basic design consists of a three phase triple shielded isolation transformer with seven separate voltage taps per phase. Output regulation is achieved by monitoring the input and automatically switching taps anytime the input line sags or surges. The special process of triple shielded isolation transformer provide superior common mode and transverse mode noise attenuation. Automatic switching occurs during current zero allowing noise free switches for both leading and lagging power factor loads that are connected to the Series 700AV/T.

MONITOR

Monitoring of the Series 700AV/T is simple, clean and effective. Three green light indicators are utilized to display “POWER ON” (output line to neutral for each phase) and one red light indicator to display “ALERT”. The “POWER ON” display is connected directly to the output that indicates the Series 700AV/T is operating properly with just a quick glance. The “ALERT” display represents an over-temp problem or output voltage loss (optional) when illuminated, and will shut down the output, but cooling fans remain on. Over-temp thermal sensors are strategically located at critical points on the regulator assemblies and transformer. The main AC input circuit breaker must be turned off in order to reset the “ALERT” light.

PROTECTION

Protection is accomplished very effectively to minimize failures and the cost of repairs. A total of four major devices protect the Series 700AV/T.

1. The input is protected with a integrally mounted AC circuit breaker for abnormal current overloads and provides a convenient means of disconnecting utility power.

   A. A. As an option the input breaker may be equipped with a shunt trip device that is interfaced with a REMOTE EMERGENCY POWER OFF PUSH BUTTON. By pressing this button, the input breaker will trip and disable the Series 700AV/T completely. The input breaker must be physically reset before unit will turn on again.

2. The electronic regulating devices are protected with fast acting semi-conductor fuses. These fuses are designed to clear before damage occurs to the more expensive SCR regulating devices. The main transformer is protected by fuse links connecting the SCR regulators together, and are designed to clear in the event that two or more SCR’s should fail. This will prevent a transformer tap short and the possibility of transformer failure.

3. (Optional) The output of the Series 700AV/T is constantly monitored for extreme over and under voltage conditions. This device monitors each output phase and will electronically disable the Series 700AV/T when any phase exceeds +10% or -10% of nominal output voltage.

4. Overtemp sensing devices are mounted at critical points on the SCR regulating assembly and the main transformer. When an overtemp condition exists the “ALERT” light will illuminate and hold until the overtemp is corrected. There are no automatic shutoff circuits for the “ALERT” condition. The main AC input breaker must be turned off in order to reset the “ALERT” light.

GENERAL DESCRIPTION (continued)

OPERATION

The Series 700AV/T Power Conditioner is operated by simply turning on the main AC input circuit breaker. As an option, units may have a bypass switch. This is a no load switch and MUST only be operated when the unit is OFF. The bypass switch should be in the “NORMAL” position unless a problem occurs with the system. If a problem occurs, turn OFF the main AC circuit breaker and turn the bypass switch to the “BYPASS” position. Reenergize the system by turning on the AC circuit breaker and contact the Customer Support Department for repairs.

Any “ALERT” condition requires the main AC input breaker to be turned off in order to reset the “ALERT” light.

FOR ASSISTANCE CALL 1-800-882-9110 X 6112 or +1 208.762.6112 (8am-5pm Pacific Time)

AFTER HOURS CALL 1-800-521-4792 or +1 208.755.2072

THEORY OF OPERATION

The Series 700AV/T Power Line Conditioner provides the triple function of isolation, noise attenuation and voltage regulation. The first two functions are provided by the power transformer, where as the third function of voltage regulation is achieved through solid state thyristors (SCR's) connected to taps on the power transformer. A microprocessor monitors and controls the overall function of regulating the system.

The power transformer is manufactured with a unique method of shielding which produces very low capacitive coupling between the primary and secondary. This low coupling provides excellent attenuation of the common mode noise. In addition, special care is taken in the design of the transformer to attenuate transverse-mode noise above 1000 Hz.

The power transformer has taps to which solid state switches (SCR's) are connected.

The voltage regulator incorporated in the Series 700AV/T Power Line Conditioner is microprocessor controlled to achieve optimum correction time of input voltage sags and surges. The response time is typically one (1/2) cycle for 100% correction, therefore, a very smooth switch takes place undetected by computer equipment.

As the input voltage (building power) varies, the voltage available at each tap of the transformer will also change. The amount of variation is dependant upon the input sag or surge, turns ratio and transformer losses.

By selecting a particular tap voltage, the output can be kept within a tight range. The way in which this is accomplished is that an electronic control card using a micro-processor continually monitors the input voltage. When a voltage fluctuation occurs, which exceeds the limit of rated regulation (typically ± 2%), the output is switched to another tap, that is within the required range. This "switch" will be made at the next current zero crossing to allow for both leading and lagging power loads to be connected to the conditioner.

SAFETY PRECAUTIONS

*******************WARNING*******************

THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT WITHIN THE ENCLOSURE OF THE POWER SUPPLY SYSTEM.

CAUTION MUST BE TAKEN WHEN WORKING WITH THE SYSTEM.

IT IS RECOMMENDED THAT ALL WORK BE PERFORMED BY QUALIFIED ELECTRICAL PERSONNEL ONLY.

PRELIMINARY INSTALLATION

INSTALLATION CONSIDERATIONS

Prior to installing the Series 700A/VS, be sure to take into consideration the site you have selected. Power Conditioners produce heat and therefore require ventilation as well as accessibility. Consider these factors.

- Ventilation
- Size of the Power Conditioner
- Weight Load
- Audible Noise Requirements
- Remote Emergency Power Off (Repo)
- Monitors
- Options
- Clean Environment
- Proper Ground Techniques
- Input Source Voltage
- Receiving Facilities
- Distribution of Power
- Room Temperature
- Clearances
- Accessibility
- Excessively Long Power Runs

CHOICE OF LOCATION

The unit has been completely inspected and extensively tested under various load conditions prior to shipment. Care to install it at a proper location will assure long trouble-free operation.

The unit has been completely inspected and extensively tested under various load conditions prior to shipment. Care to install it at a proper location will assure long trouble-free operation. The unit is air cooled with the air intake at the bottom and exhausts at the top, front or at the sides. Therefore, it should be installed in a clean, dry place with enough clearance to allow a free flow of air. Allow at least 4 inches of space between the unit and the wall or other equipment. Allow enough space for maintenance on all four sides of the unit.

INPUT WIRE SIZE, GROUNDING AND OUTPUT WIRING

UNIT CONTINUOUS KVA	OUTPUT KVA CONTINOUS	INPUT BREAKER SIZE	MAX OUTPUT CURRENT
60 K(I)	30 kVA	110 A for 208 V 100 for 240 V 60 for 480 V 40 A for 600 V	36 A continuous for 480 V 72 A intermittent for 480 V

NOTE: Refer to NEC (or applicable national and local electric code) for output wire size based on output breaker size and Article 310 Section 8A as mentioned in Step E below.

INPUT WIRE SIZE, GROUNDING AND OUTPUT WIRING

A. Conduit should be used for both input and output wiring.

B. Minimum ground wire size is based on 1990 Nation Electric Code Table 250.

C. Input wire size is based on 1990 NEC Table 310-16 specifying not more than 3 conductors in a raceway based on ambient of 30° Celsius, and wire rated at 75° Celsius.

D. Output neutral to ground is already bonded during manufacturing of Power Conditioner.

E. Output requires 4 (5 including ground wire) conductors in a raceway assuming neutral as a current carrying conductor. This requires conductors to be derated by using a multiplier of .8, reference 1990 NEC Article 310 Section 8A.

Example:

1. Assume #10 wire max current = 25 Amps.
2. Multiply 25 x .8 = 20
3. 20 Amps is max current for #10 wire in a raceway with 4 conductors.

NOTE: Installation is subject to local codes - verify with a local electrical inspector.

60K(I) INSTALLATION

Before installing the Power Processor make sure that the input voltage and the output voltages match the unit's specification plate.

CLEARANCES, INPUT WIRE SIZE, GROUNDING AND OUTPUT WIRING

The following pages show the locations of the conduit landings and input/output terminals, plus any clearances required in the installation. Before any wiring or placement is performed, please read the following list of instructions below.

A. Be sure that a placement location is selected that meets all of the clearance requirements.

B. Conduit should be used for both input and output wiring.

C. Minimum wire sizes should be selected according to latest NEC standards based on the following factors: environment, length, current and voltage.

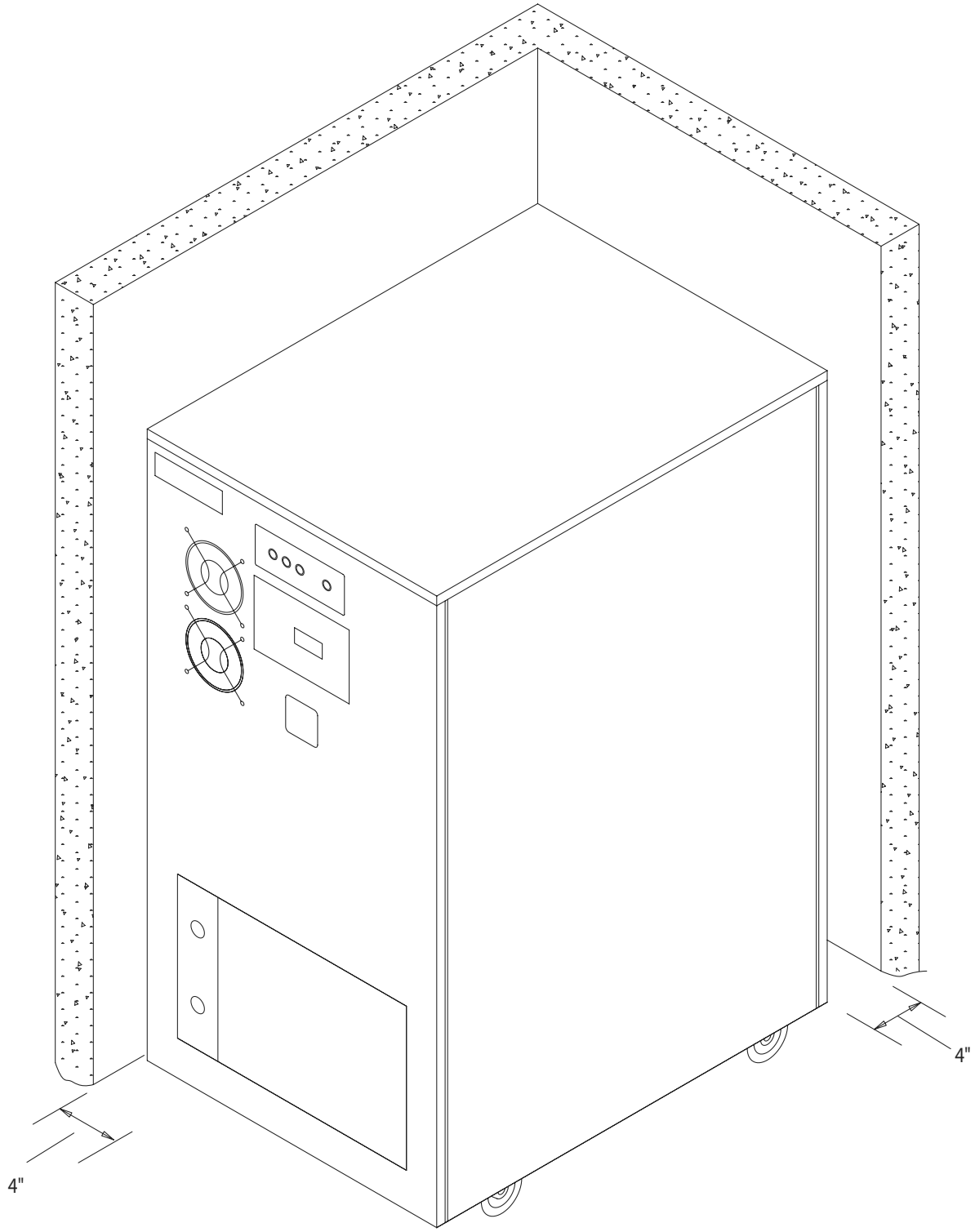
D. Output neutral to ground is already bonded during manufacturing of the Series 700 AV/T.

E. Output requires 4 (5 including ground wire) conductors in a raceway assuming neutral as a current carrying conductor. Verify for latest NEC standards.

NOTE: Installation is subject to local codes - verify with a local electrical inspector.

60K(I) INSTALLATION

CABINET CLEARANCES - 60K(I)

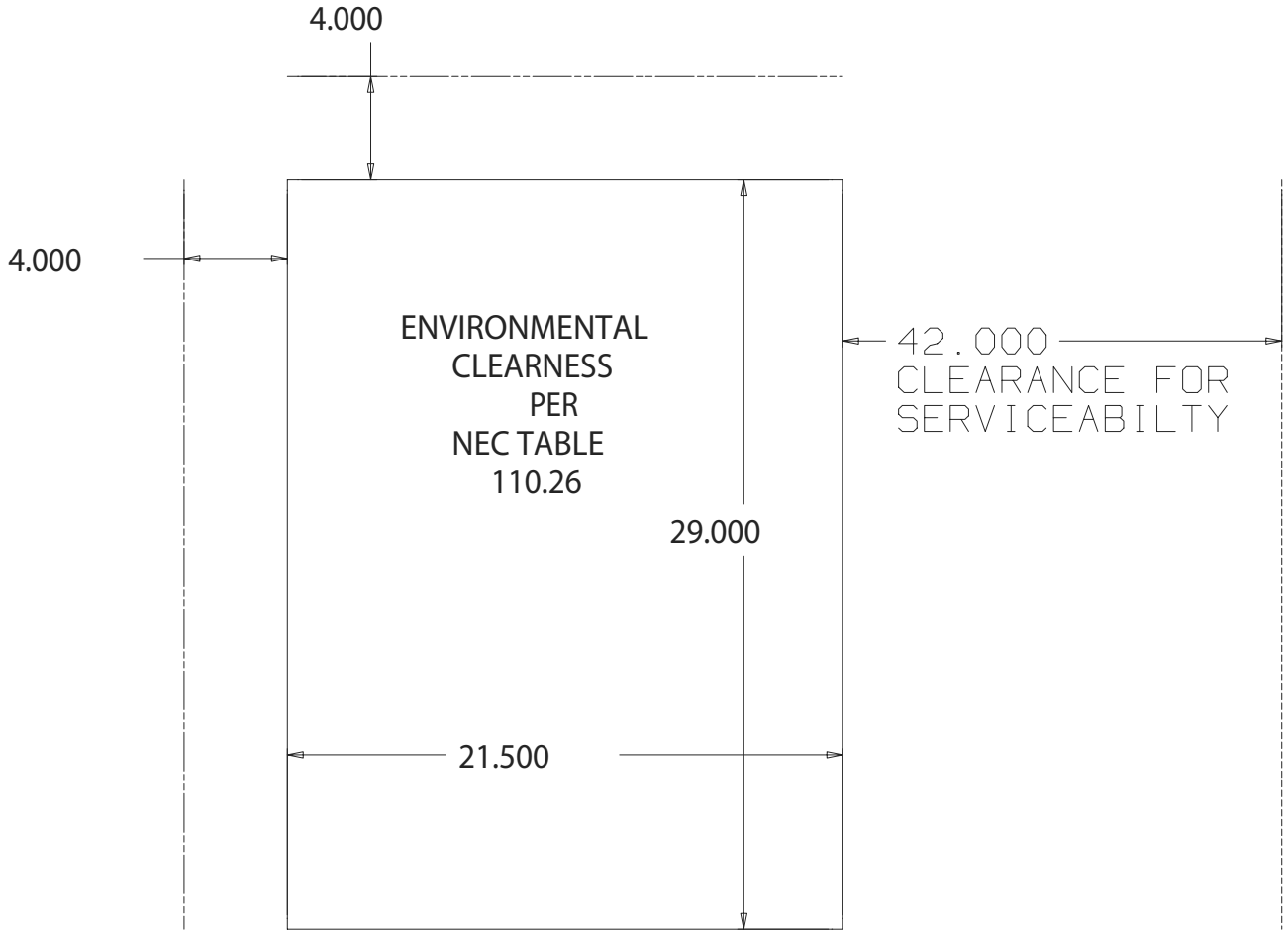


60K(I) INSTALLATION (continued)

CABINET CLEARANCES - 60K(I)

TO REMOVE TOP: REMOVE RETAINING SCREW IN REAR OF TOP,
LIFT REAR, & SLIDE FORWARD.

TO REMOVE SIDE: REMOVE RETAINING SCREW IN TOP OF PANEL,
& BOTTOM SIDE. LIFT PANEL OFF.

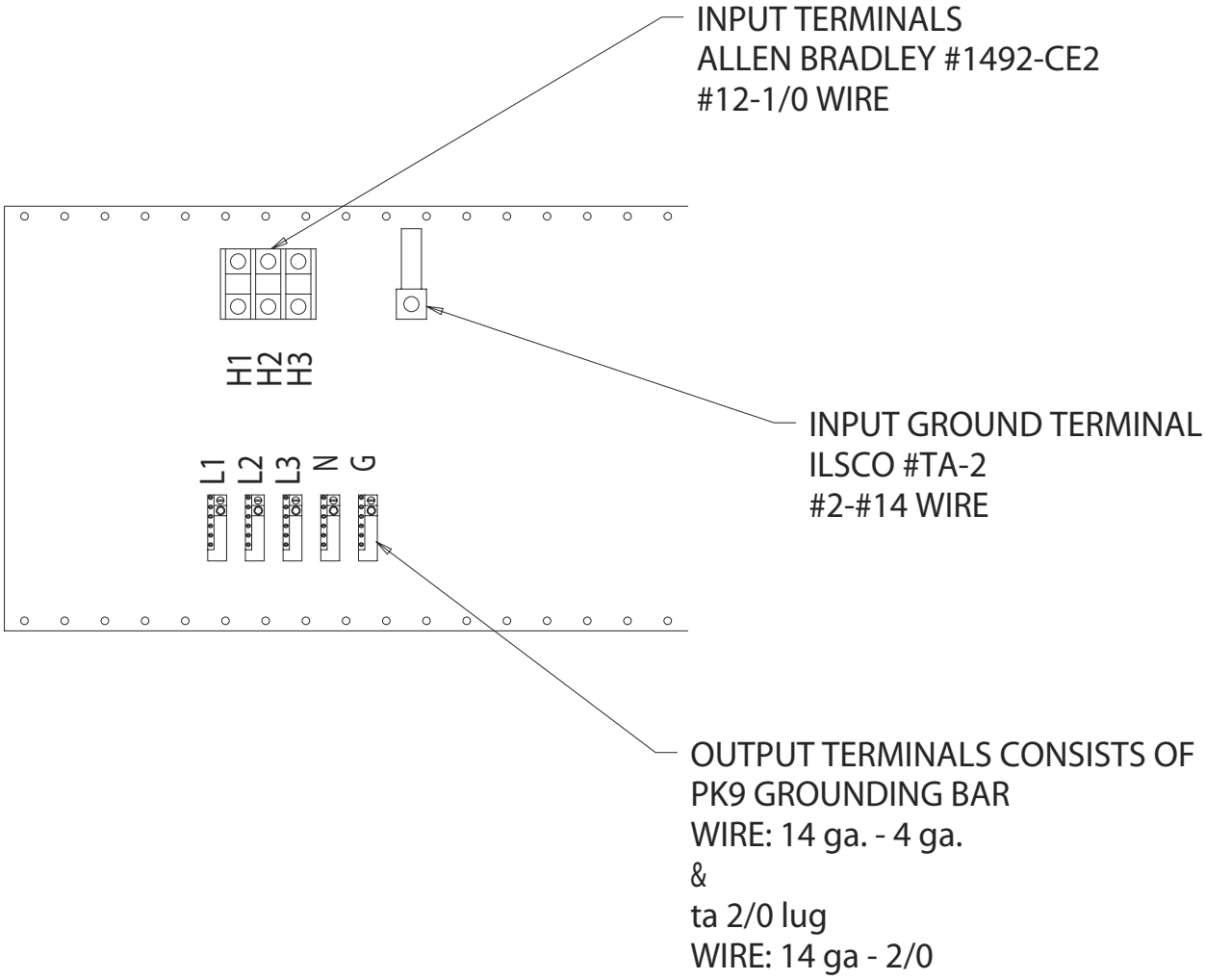


TOP VIEW

60K(I) INSTALLATION (continued)

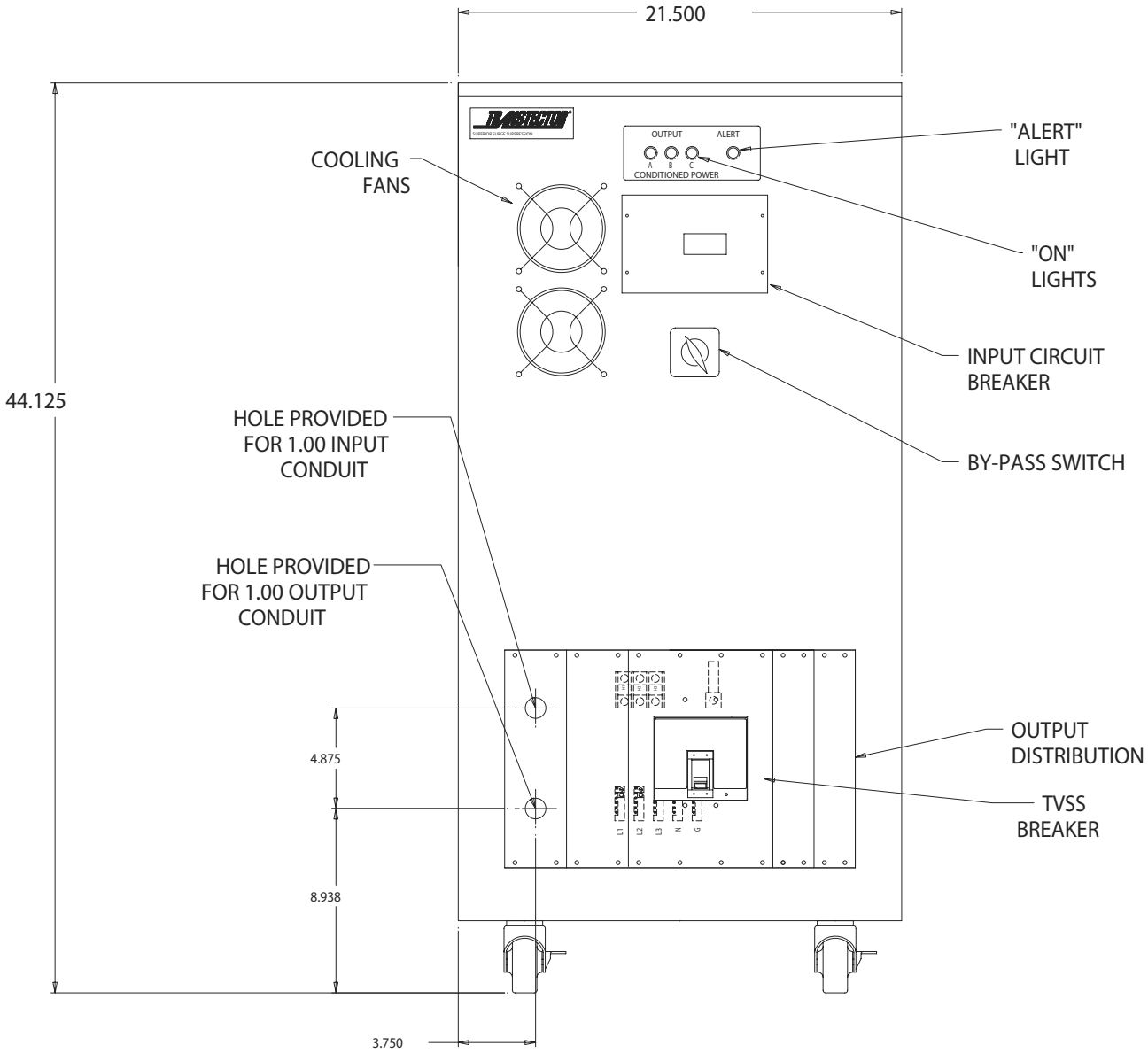
INPUT & OUTPUT CONNECTIONS - 60 K(I)

1. Input and output terminals are located at the front of the unit.
2. To access terminal blocks, remove the conduit panels and any other panels necessary on the front of the unit.
3. Wire accordingly. The terminals will be clearly marked. If there are any discrepancies refer to the schematic which accompanies the unit.



60K(I) INSTALLATION (continued)

INPUT & OUTPUT CONNECTIONS - 60 K(I)



FRONT VIEW

BYPASS SWITCH

The manual bypass switch is a break before make switch located on the Series 700AV/T. The manual bypass switch is used to by-pass all power electronics in case of failure.

NORMAL MODE

With the switch in the normal position, the Series 700AV/T will provide clean and regulated power to the critical loads. The Series 700AV/T should have the switch in the normal position unless a failure has occurred.

BYPASS MODE

With the switch in the bypass position, the Series 700AV/T will provide clean power to the critical loads. In the bypass position, the unit will not regulate the incoming voltage. The Series 700AV/T should be placed in the bypass position when a failure of the system has occurred. This provides the user with some protection until a service technician arrives.

*****CAUTION*****

Prior to switching from one position to another- turn off the AC input breaker.

REMOTE EMERGENCY POWER OFF (REPO) OPTION

The REPO is operated by a remote push button that when depressed will shunt trip the Series 700AV/T input breaker and disable the unit. This option may be added to units in the field.

Contact the Customer Support Department if you wish to add this option.

START-UP

WARNING

THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT WITHIN THE ENCLOSURE OF THE POWER SUPPLY SYSTEM. CAUTION MUST BE TAKEN WHEN WORKING WITH THE ENCLOSURE. IT IS RECOMMENDED THAT ALL WORK BE PERFORMED BY QUALIFIED ELECTRICAL PERSONNEL ONLY.

NOTE: INITIAL START-UP SHOULD BE PERFORMED WITH NO LOAD ON SYSTEM.

1. Re-install all panels that may have been removed during installation.
2. Make sure the input circuit breaker is in the off position.
3. Energize the primary building power.
4. Turn on the main AC input breaker.
5. Verify that the output voltage is within the specified range.
6. Verify output phase rotation is correct.
7. Turn the system off.
8. Connect the loads one at a time and repeat Step 4.

PREVENTIVE MAINTENANCE

*****WARNING*****

DANGER OF ELECTRICAL SHOCK, TURN OFF ALL POWER SUPPLYING THIS EQUIPMENT PRIOR TO MAINTENANCE.

To ensure longer component life and trouble-free operation, minor preventive maintenance procedures should be performed at regular intervals, for example once every year. More frequent inspection intervals would be needed for more severe operating conditions and larger number of hours of continuous operation.

A. Remove top and side panels and at each service inspection any accumulated dust, dirt or foreign particles should be carefully removed. Special care should be exercised in cleaning the thyristors, heat sinks and the control assembly.

B. Inverse Parallel Silicon Rectifiers (SCR's) or Thyristors

   The silicon controlled rectifiers (SCR's) usually fail in the shorted mode. When this happens, normally the fusible link in series with the SCR will be blown open to clear the short and prevent damage to the transformers. If a blown SCR is suspected, contact Transtector for service.

C. A simple performance checklist has been developed for use in maintenance. See Pages 19 and 20 and check off items 1-8.

D. After items 1-8 have been checked on the performance checklist, the next step is to check the operation of the system.

E. Replace top and side panels. Turn unit on with no load. Check item 9 on the performance checklist.

F. Turn on loads and check items 10-13 of the performance checklist on pages 19 and 20.

NOTE: Preventive Maintenance Plans are available. Please contact the Customer Support Group for information. Call +1 208.762.6112 or 1-800-882-9110 X 6112.

PERFORMANCE CHECKLIST

Company_____

Model #_____ Serial #_____

1. Customer Comments or Problems_____

2. Power Conditioner Environment Clean and Dust Free Yes No

3. Phase Rotation Correct (ABC) Yes_____ No_____

4. Electrically wired properly ie...Conductor Sizing, Breakers, Grounding

5. Verify Input Voltage (See spec. tag)

6. Check Tightness of Electrical Connections:

_____Input Connections_____Output Connections_____Heatsink Connections (SCR's)

_____Circuit Board Connections_____By-Pass Switch_____ Fuse Connections

_____Fan Connections_____Transformer Connections

7. Exercise all circuit breakers-

_____Input Breaker _____Output Breakers

8. Resistance Check of all Semiconductors Power Mods (SCR's):

Phase A	Phase B	Phase C
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

NOTE: Must remove Semiconductor Fuses from circuit prior to resistance checking SCR's:

PERFORMANCE CHECKLIST (continued)

9. Input/Output Voltage Checks (Adjust as Needed).

No Load Input	No Load Output	
A-B_____VAC_____	A-N_____ VAC	A-B_____VAC
B-C_____VAC_____	B-N_____ VAC	B-C_____VAC
A-C_____VAC_____	C-N_____ VAC	A-C_____VAC

10. Available Load Input	Available Load Output	
A-B_____VAC_____	A-N_____VAC	A-B_____VAC
B-C_____VAC_____	B-N_____VAC	B-C_____VAC
A-C_____VAC_____	C-N_____VAC	A-C_____VAC

11. Input/Output Current Checks (Balance as Needed).

Input	Output
A_____ Amps	A_____ Amps
B_____ Amps	B_____ Amps
C_____ Amps	C_____ Amps
	N_____ Amps
	G_____ Amps

12. Fans Operational_____

13. Testing Shutdown Circuitry ie...REPO, Over/Under Voltage_____
_____

14. Comments: _____
_____
_____
_____
_____
_____
_____
_____

GENERAL TROUBLESHOOTING

*****WARNING*****

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SYMPTOM	PROBABLE CAUSES
1. No Output on One or More Phases.	A. No Input.
	B. Blown Fuse.
	B. Defective SCR or Power Mod.
	C. Defective Control Card.
	D. Defective Sense Card.
	E. Defective Over/Under Output Detection PCB - Optional with the Power Processor.
2. Output is too High or too Low.	A. Input Out of Range.
	B. Control Card Adjustment.
	C. Defective Control Card.
	D. Defective Sense Card.
	E. Defective SCR or Power Mod.
3. Input Breaker Tripping Off.	A. System Overloaded.
	B. Defective Breaker.
	C. Over/Under Voltage Detection is Shutting Down System (See Symptom #2).
	D. Defective Over/Under Detection Card.
	E. Shorted Taps.
4. Blowing Semi-Conductor Fuses.	A. Shorted SCR's or Power Mods.
	B. Output Loads Shorted.

TROUBLESHOOTING (continued)

*****WARNING*****

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NOTICE: CIRCUIT DIAGRAMS IN THIS MANUAL ARE FOR REFERENCE ONLY. ALWAYS REFER TO THE ACTUAL CIRCUIT DIAGRAMS RECEIVED WITH THE SYSTEM.

INTRODUCTION

This procedure is written in a specific order and must be used from start to finish when troubleshooting. Any steps skipped over may cause serious damage to the system.

EQUIPMENT REQUIRED

True RMS Digital multimeter, SCR tester, common hand tools, spare parts kit (contact service center at +1 208.762.6112 or 1-800-882-9110 X 6112).

STEP 1. DISASSEMBLING THE POWER LINE CONDITIONER

A. Turn off the power to the Power Processor at its source.

B. Turn off the input circuit breaker on the unit and the output circuit breakers to all loads. (Remove all loads from unit).

C. Remove the top and side covers to the Power Processor. Refer to Diagrams in Appendix A, Page 38.

STEP 2. ELECTRICAL CONNECTIONS, FUSES

Refer to Diagrams in Appendix A, Page 38 for component locations.

A. Inspect the unit for proper tightness of all electrical connections, burnt, frayed, broken or loose connections and components in these areas.

   Input and output connections, SCR assembly, SCR snubber, output filter assembly, MOVs (metal oxide varistors), circuit boards, bypass switch and transformer connections.

TROUBLESHOOTING (continued)

B. Correct and tighten any loose connections, replace any physically burned or broken components.

C. Check all fuses in system *.

Time delay fuses, semi-conductor fuses, fan fuses, circuit board fuses, SCR fusible Link wire.

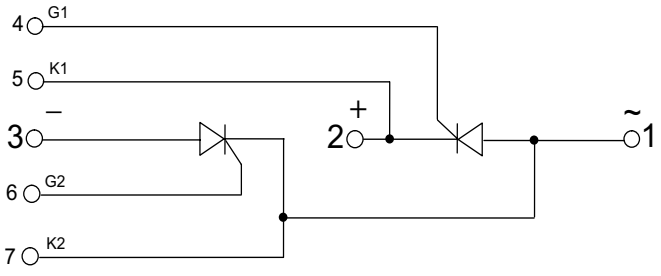
* NOTE: Remove fuses from circuit when checking to avoid false readings.

POWER MODULES (SCR's)

Refer to the diagram below and the diagram in Appendix A, Page 38.

1. Unplug the connections to the control cards Part #414921 labeled TB1, TB2 and TB3.
2. Disconnect any cooling fans in the unit so your SCR resistance checks are not interfered by fan motor coils. Also remove main semi-conductor fuse located on all 3 SCR assemblies and any wires attached to the fuse. Each power mod contains 2 inverse parallel SCR's.

60K(i) Power Mod (SCR)



TROUBLESHOOTING (continued)

3. Measure the following resistance on each power module. There are 7 per phase or 21 for all three phases. *Refer to the circuit diagrams received with your unit.

Note: When checking the power module assembly, if more than one defective power module is present it will appear as if all the power modules are defective. If this is the case, the individual power module must be isolated from the power transformer.

A. K1-1 to K2-1 thru K1-7 to K2-7=High resistance, 1 Meg Ohm.

B. K1-1 to G1-1 thru K1-7 to G1-7=10 to 90 Ohms.
K1-1 to G2-1 thru K1-7 to G2-7=1 Meg Ohm.

C. K2-1 to G2-2 thru K2-7 to G2-7=10 to 90 Ohms.
K2-1 to G1-1 thru K2-7 to G1-7=1 Meg Ohm.

D. G1-1 to G2-1 thru G1-7 to G2-7=1 Meg Ohm.

4. Replace any defective power mods. This may require removing the shunt and loosening the K1 bus from all the power modules to get the defective power module out. Use only equivalent hardware and heat sink grease when replacing power modules.

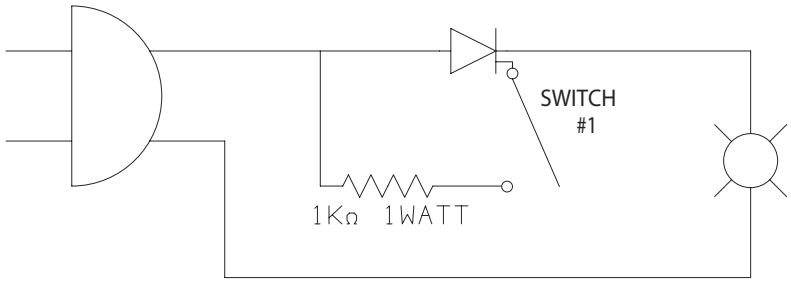
5. If a resistance measure is questionable, a more thorough test will assure an SCR is good or bad by using the following test procedure.

A. Completely isolate SCR under test by removing all connections to the device.

B. Hook up the following test circuit to each individual SCR.

C. Plug in SCR tester. With Switch #1 open light bulb should be off. If not, replace SCR.

D. Close Switch #1. Light bulb should illuminate to about 3/4 brilliance. If not, replace SCR.



6. Re-assemble the power module assembly, make sure all connections are tight.

DO NOT CONNECT THE SEMICONDUCTOR FUSES, WIRES OR FAN WIRES AT THIS POINT.

TROUBLESHOOTING (continued)

CHECK THE SCR SNUBBER CARD

1. Three components make up the SCR snubber. (Resistors, MOVs and Capacitors). Check for open resistors. Check MOVs for shorts, they should read high resistance when ohm meter is placed across them. Resistance check each capacitor. The DC resistance across the snubber capacitor should look capacitive-that is high resistance after the meter charges the capacitor. If it measures open or shorted, replace the snubber card.
2. RE-CONNECT SEMICONDUCTOR FUSES, ALL WIRES AND FANS.DOUBLE CHECK THAT ALL CONNECTIONS ARE SECURE.

   DO NOT CONNECT TB1, TB2, and TB3 CONNECTORS FROM THE CONTROL CARDS #414921 YET!

CHECK CONTROL CARD AND FILTER CARD

1. Verify input to the Power Processor matches the units specification. Also verify correct control board #414921 jumper setup in Appendix A, Page 40.
2. Disable the over/under voltage shutdown card #35867 (optional card) by removing connectors K1 and K2 on the card.
3. Turn on AC input breaker to unit.

   IMPORTANT: Extreme caution must be taken when measuring voltages on Molex connectors. Do not press meter leads into connectors or bend connectors back.
4. Measure the following voltages on wires feeding the TB1 Molex connector to the control card on all 3 phases.

   Pins 1 & 3 = 4-6 VAC.

   NOTE: When the connector is plugged in this voltage is around 3 VAC.

   Pins 7 & 8 = 120 VAC

If this voltage is incorrect or not present, then check the fuses associated with the filter card or replace filter card and re-check voltages.

5. Turn main AC circuit breaker off. Plug in connectors TB1 and TB3 ONLY!!! on the control card #414921 on all 3 phases.

TROUBLESHOOTING (continued)

6. Turn main AC on. With DC voltmeter on the millivolt scale check between TP1 and TP GND of the control card and adjust pot P2 so meter reads “0” millivolts or close as possible.

   NOTE: Refer to Appendix A Page 40 for test points and pot locations on control card.

7. Use the following formula to calculate the next adjustments. You must calculate each input phase for each control card or a total of 3 calculations.

   A. For phase 1 control card measure AC input at Line 1 to Line 2.

   B. For phase 2 control card measure AC input at Line 2 to Line 3.

   C. For phase 3 control card measure AC input at Line 1 to Line 3.

FORMULA

Example:

$$\frac{\text{Actual AC Input} \times 2.47}{480\ (\text{Nominal})} = \text{Volts DC at TP2}$$

$$\frac{475\ \text{Volts AC Input} \times 2.47}{480\ (\text{Nominal})} = 2.44\ \text{Volts DC at TP2}$$

8. After calculations are complete, place DC voltmeter on the 20 volt scale and check between TP2 and TP GND on control card. Adjust pot P1 so meter reads DC level calculated in Step 7 for all three phases.

   NOTE: If adjustments in Steps 6 and 7 are not possible, replace control card #414921 and repeat Steps 6 and 8.

   NOTE: Be sure to turn power off when replacing circuit boards.

   NOTE: Be sure AC input is stable when making this adjustment. If the input changes, you must re-calculate.

   NOTE: Output voltage correction is a “stepped correction”, adjusting P1 will not cause a smooth change in output voltage as it is adjusted.

9. Turn the unit off. Plug in TB2 Molex connectors to all the control cards #414921.

10. Replace connectors K1 and K2 on over/under detect #35867.

    NOTE: P1 pot turned clockwise = decrease in output voltage and counter-clockwise = increase in output voltage. By changing this adjustment on phase1 you may see the output voltage change from line to neutral on two phases. It is best to use procedures in Steps 1 – 9 adjusting.

TROUBLESHOOTING (continued)

FINAL TESTING & ADJUSTMENT

1. Connect AC voltmeter to output of system with proper meter scale selected.

   NOTE: On 3 phase systems, connect your AC voltmeter across the output phase to neutral.

2. Disconnect customers loads.
3. Energize system.
4. Verify the output is within specifications. If not, adjust P1 on control board, for the appropriate phase. See adjustment procedure on Pages 28-29.

   NOTE: On 3 phase systems, be sure and check all 3 phases.

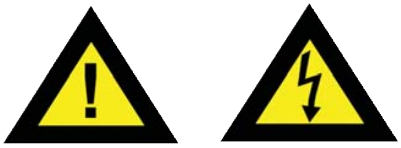
   NOTE: If the main AC breaker trips or there is no output voltage, disable the over/under detect circuit #35867 by disconnecting K1 and K2 connectors and then calibrate the control boards if the output voltage is out of spec. See control card adjustment procedure on Pages 28-29.

5. Turn the input circuit breaker off.
6. Connect customers equipment.
7. Energize system.
8. Repeat step #4 and adjust as needed.
9. Be sure over/under detect is connected and if input breaker trips or there is no output voltage recalibrate the detect board or replace board if defective. (See adjustment procedure on Pages 28-29).

CONTROL BOARD ADJUSTMENTS

CONTROL BOARD ADJUSTMENTS (#414921)

FIELD ADJUSTMENT PROCEDURE



*****WARNING*****

THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT WITHIN THE ENCLOSURE OF THE POWER SUPPLY SYSTEM. UNDER NO CIRCUMSTANCES SHOULD ANY PERSON REACH WITHIN THE ENCLOSURE OF THIS EQUIPMENT. ALL SERVICE TO THIS PIECE OF EQUIPMENT SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

*****CAUTION*****

The control board (#414921) is electrically referenced to high voltage, not earth or chassis ground. Extreme care must be used when taking measurements on the control board. Any AC powered instruments must be ground isolated prior to taking measurements. A ground isolated instrument case will be at the high voltage line potential.

ADJUSTMENT PROCEDURE

1. Prior to attempting any adjustment, measure the incoming voltage to the unit. Assure thevoltage level is within the specified input range of the unit.
2. Turn off power to unit.
3. Remove all loads from the output of unit under adjustment.
4. Remove both TB2 connectors on all control boards #414921 (See Appendix A, Page 40). Turn the power on.
5. With DC voltmeter on the millivolt scale check between TP1 and TP GND and adjust P2 so meter reads “0” millivolts or as close as possible.

   NOTE: Refer to Appendix A, Page 40 for test points and pot locations.
6. Use Formula X to calculate the next adjustments. You must calculate each input phase for each control card or a total of 3 calculations.

   A. For phase 1 control card, measure AC input at Line 1 to Line 2.

   B. For phase 2 control card, measure AC input at Line 2 to Line 3.

   C. For phase 3 control card, measure AC input at Line 1 to Line 3.

CONTROL BOARD ADJUSTMENTS (continued)

CONTROL BOARD ADJUSTMENTS (#414921)

FIELD ADJUSTMENT PROCEDURE continued

FORMULA X

Example:

$$\frac{\text{Actual AC Input} \times 2.47}{480 \text{ (Nominal)}} = \text{Volts DC at TP2}$$

$$\frac{475 \text{ Volts AC Input} \times 2.47}{480 \text{ (Nominal)}} = 2.44 \text{ Volts DC at TP2}$$

- NOTE: Be sure AC input is stable when making this adjustment. If the input changes, you must re-calculate.

7. After calculations are complete, place DC voltmeter on 20 volt scale and check between TP2 and TP GND on control card. Adjust pot P1 so meter reads DC level calculated in Step 6 for all 3 phases.

   NOTE: Output voltage correction is a “stepped correction”, adjusting P1 will not cause a smooth change in output voltage as it is adjusted.

8. Turn unit off and reconnect TB2 connectors on all control boards.

9. Turn unit on, verify output is correct by monitoring the output from each line to neutral. If not, make sure input power is stable and repeat adjustment procedure.

   NOTE: P1 Pot turned clockwise =decrease in output voltage and counter clockwise = increase in output voltage. By changing this adjustment on 1 phase you may see the output voltage change from line to neutral on 2 phases. It is best to use procedures in Steps 1-9 when adjusting.

OVER / UNDER VOLTAGE DETECTION ADJUSTMENTS

OPTIONAL OVER/UNDER VOLTAGE DETECTION BOARD #35867

(See Appendix A - Page 40 for Board Layout)

NOTE: Adjustments are referenced from the units output.

UNDERVOLTAGE ADJUSTMENT

1. The under voltage adjustment can be adjusted from -1% (118.5 VAC) to -20% (95 VAC). The standard setpoint is -10% (108 VAC).
2. P2 will adjust the undervoltage set point. One turn on P2 will change the voltage level approximately 1 volt.
   - Clockwise = Increase in Sensitivity.
   - Counter-Clockwise = Decrease in Sensitivity.

OVERVOLTAGE ADJUSTMENT

1. The over voltage adjustment can be adjusted from +1% (121 VAC) to +20% (145 VAC). The standard set point is +10% (132 VAC).
2. P1 will adjust the overvoltage set point. One turn on P1 will change the voltage level approximately 1 volt.
   - Clockwise = Decrease Sensitivity.
   - Counter-Clockwise = Increase Sensitivity.

DELAY ADJUSTMENT

1. The delay adjustment can be adjusted for a minimum of 5 cycles to a maximum of 15 seconds. The standard set point is 6 seconds.
2. P3 adjusts the delay.
   - All the way Counter-Clockwise = 5 cycles.
   - All the way Clockwise = 15 seconds.

After two turns clockwise from the full counter-clockwise position, each turn will approximate ½ second.

PARTS LIST - 60K(I)

QTY	208V INPUT PART #	240V INPUT PART #	480V INPUT PART #	600V INPUT PART #	DESCRIPTION
1	202504	202504	202504	203792	MAIN TRANSFORMER
1	16793	16794	104022	104027	MAIN INPUT BREAKER
3	18276	18276	18276	18276	FILTER CAPACITOR
3	17538	17538	17538	17538	FILTER RESISTOR
3	17588	17588	17588	17588	SEMICONDUCTOR FUSE
3	16363	16363	16363	16363	TAP RESISTOR
3	16638	16638	16638	16638	SENSE FUSE (.75A)
1	13789	13789	13789	13789	CONTROL RELAY
1	13696	13696	13696	13696	PILOT LIGHT - RED
3	23943	23943	23943	23943	SENSE BOARD
3	18702	18702	18702	18702	CONTROL FUSE
3	19149	19149	19149	103124	CONTROL FUSE
3	25723	25723	25723	25723	SNUBBER BOARD
3	414921	414921	414921	414921	MAIN CONTROL BOARD
3	109054	109054	109054	109054	PILOT LIGHT - GREEN
1	100810	100810	100810	100810	BYPASS SWITCH
3	39973	39973	39973	39973	HEAT SINK ASSEMBLY
3	400392	400392	400392	400392	HEAT SINK
21	17690	17690	17690	17690	POWER MODULE (SCR)
3	13319	13319	13319	13319	THERMAL SENSOR
1	104262	11330	11330	104270	CONTROL TRANSFORMER
3	109006	109006	109006	109232	Z-MOV
3			109007		Z-MOV
6	104607	104607	104607	104607	FUSIBLE LINK
3	104561	104561	104561	104561	DIODE
2	13695	13695	13695	13695	FAN MOTOR

SPECIFICATIONS - 60K(I)

1.0 SCOPE

This specification covers the electrical characteristics of the 60 K(I) Power Conditioner which provides clean regulated power for Varian On Board Imager™ or peripherals.

2.0 GENERAL

The Power Line Conditioner consists of an all copper, multiple tapped, triple shield isolation transformer. The low output impedance of the transformer in conjunction with the electrostatic shields assures precision hospital grade performance with excellent noise and transient attenuation. Independently controlled inverse parallel electronic switches for each of the 7 taps per phase provide tight regulation over a wide input range. Linear devices are used for line synchronization to prevent phase shift errors normally associated with simple CT zero current crossing acquisition. The microprocessor control accurately selects the correct tap to maintain the output no greater than +2.0 % of nominal, correcting for voltage disturbances within one cycle. Digital processing technique provides fast and accurate regulation without output voltage over or undershoot.

2.0.1 MODEL NUMBERS

MODEL INPUT VOLTAGE OUTPUT VOLTAGE

Model	Input Voltage	Output Voltages
8BNX-60KI-700AV/T	208 volts nominal input	480.277 volts output
8CNX-60KI-700AV/T	240 volts nominal input	480/277 volts output
8DNX-60KI-700AV/T	480 volts nominal input	480/277 volts output
8ENX-60KI-700AV/T	600 volts nominal input	480/277 volts output

2.1 AGENCIES

2.1.1 STANDARDS

The systems shall be designed in accordance with:

- American National Standards Institute
- Institute of Electrical and Electronic Engineers
- National Electric Code (NEC)
- National Fire Protection Association (NFPA Article 70)
- UL 1449, 1012
- FCC Article 15, Section J, Class A
- ISO 9001

2.1.2 LISTINGS / COMPLIANCE

- The system shall be listed to UL/cUL standards UL1012 or ESA approved
- The system shall comply to: FCC Article 15, Section J, Class A and
- ANSI C62.14 (electromagnetic compatibility)

3.0 DYNAMIC ELECTRICAL CHARACTERISTICS

3.1 OPERATING VOLTAGE

The input voltage shall be 208 VAC, 240 VAC, 480 VAC or 600 VAC input, three phase 60 Hz. The output shall be a WYE derived 7 tap regulating system at 480/277VAC, rated for 60 KVA intermittent load and 30 KVA continuous load. The standard transformer design shall be capable of accepting three (3) input voltages, 208 VAC, 240 VAC or 480 VAC. Each unit will be pre-wired at the factory to accommodate the alternative nominal input voltage. The input voltage and input breaker can be changed in the field to accommodate an alternative input voltage.

3.2 LINE VOLTAGE REGULATION

Usable Input Line Voltage +15 %, -23 %.

Output Line Voltage ±2.0 % typical.

The design of the system shall indicate that with an input voltage of -10 % of nominal, increasing the load to 1000 % shall cause the output voltage to fall no lower than -6 %.

3.3 OUTPUT VOLTAGE

Output voltage shall be 480/277 VAC derived from a WYE configuration.

3.4 OUTPUT CONNECTIONS

An output terminal strip is provided for the 480/277 VAC three phase power.

3.5 INPUT/OUTPUT WIRING

The Allen Bradley 1492-CE 2 terminals allow wire sizes from # 12 to # 1/0 to be connected to the input and output terminals. The ILSCO TA-2/0 terminal allows wire sizes from # 14 to #2/0 to be connected to the ground.

3.6 RESPONSE TIME

Response time is less than 1/2 cycle.

3.7 CORRECTION TIME

The output voltage is corrected within 1 cycle.

3.8 LOAD REGULATION

The output is maintained to within 2 % of nominal or less, from no load to full load.

3.9 IMPEDANCE

Output impedance shall be less than 2 %.

3.10 OPERATING FREQUENCY

60 Hertz ±3 Hertz

3.11 HARMONIC DISTORTION

Less than 1 % THD added to the output waveform under any dynamic linear loading conditions presented to the line regulator.

3.12 TURN-ON CHARACTERISTICS

When energized the voltage overshoot is 5 % or less of the nominal voltage for less than 1 cycle.

3.13 OVERLOAD RATING

200 % for ten minutes.
1000 % for one cycle.

3.14 NOISE ATTENUATION

Common mode noise attenuation is typically 140 dB or greater.
Transverse mode noise attenuation is 3 dB down at 1000 Hertz, 40 dB down per decade to below 50 dB with a resistive load.

3.15 AUDIBLE NOISE

Not to exceed 55 dB measured @1 meter

3.16 EFFICIENCY

98 % Typical at full load. Excitation losses shall be less than 0.75 % of KVA rating

3.17 BTU

The Power Line conditioner shall generate no more than 3,090 BTU/Hour @ full load.

3.18 POWER FACTOR

Input power factor shall be greater than .95 with a resistive load and reflect no triplen harmonics to the utility under non-linear loads.

3.19 LINE to LINE BALANCE

The Power Line Conditioner shall not produce more than a 2 % phase to phase unbalance

3.20 MTBF

The system shall exhibit a MTBF > 10,000 hours.

3.21 SURGE and SPIKE SUPPRESSION

A Transtector model SPD SP 60 TVSS shall be installed parallel to the secondary output of the power line conditioner to provide all-mode, bi-directional and bi-polar surge protection. The SPD is rated for 120 kA per phase, 60 kA per mode capacity. (L-L, L-N, L-G, N-G) The suppression network system shall conform to UL 1449 ratings when subjected to ANSI/IEEE C62.41-1991 category C3 waveforms. Unit shall be UL 1283 listed as an electromagnetic interference filter. Units shall provide attenuation against EMI/RFI noise up to 50 dB at 1 MHz. The surge suppressor is installed on the load side of the transformer, connected in parallel by a 30 Amp circuit breaker.

4.0 MAIN TRANSFORMER

4.1 BASIC CONSTRUCTION

The transformer windings are of all copper conductor construction with separate primary and secondary isolated windings.

4.2 MAGNETIC

Grain oriented, M6 grade, stress relieved silicon transformer steel is utilized to minimize losses and provide maximum efficiency. Flux density will not exceed 15 k gauss.

4.3 INSULATION

Class N (200° C) insulation is utilized throughout.

4.4 SHIELDING

The transformer has multiple (three) copper shields to minimize inner winding capacitance, transient and noise coupling between primary and secondary windings. Inner winding capacitance is limited to .001 pf or less.

4.5 COOLING

The transformer is designed for natural convection cooling. Fans are located on the front of the unit.

4.6 OPERATING TEMPERATURE

The system operating range: 0 to 40 degrees C, 32 to 104 degrees Fahrenheit

4.7 OPERATING HUMIDITY

0-95 % relative humidity non-condensing.

5.0 MAIN INPUT BREAKER

A main input molded case, thermal magnetic circuit breaker, rated at 125 % of the full load input current, is furnished as an integral part of the unit. For example, a 110 Amp breaker will be provided for 208 VAC input, a 100 Amp breaker will be provided for a 240 VAC input and a 60 Amp breaker will be provided for a 480 VAC input.

6.0 BY-PASS SWITCH

A manually operated rotary bypass switch provides bypassing of the regulator portion of the Power Line Conditioner. The regulator can be either on-line or bypassed with one turn of the switch. The transformer and suppression circuitry remains in the circuit when in the bypass mode. The bypass switch is located on the front of the unit.

7.0 MONITORING

7.1 ALERT LIGHT

An indicator light shall annunciate that the output has been disabled by one of the following conditions:

(1) Transformer over-temperature
(2) SCR thermal over-temperature

7.2 INDICATING LAMPS

Output ON indicating lamps shall provided for each phase.

8.0 CABINET

8.1 TERMINATION

Termination is front access with input and output connections made of copper stand off bus.
The unit is constructed using an isolation transformer and is considered to be a “separately derived system”. It should be grounded in accordance with the NFPA 70 article 250.20 “Alternating-Current Circuits and Systems to be Grounded”, article 250.20 (D) “Separately Derived Systems” and article 250.30 “Grounding Separately Derived Alternating-Current Systems”.

8.2 VENTILATION

Ventilation originates from the bottom of the cabinet and exhausts at the front of the cabinet.

8.3 MOBILITY

The Power Line Conditioner cabinets are equipped with fixed casters located so as not to exceed 600 lbs/sq inch on any one caster.

8.4 ACCESSIBILITY

The cabinet is constructed with lift off side panels for ease of access. The right side is the access panel for the SCR controller boards.

8.5 WEIGHT

Unit weight: 720 lbs.

8.6 DIMENSIONS

21.5” W X 29” D X 44” H

9.0 CONTROLS

The control portion of the cabinet containing the circuit boards and connection to the semiconductor devices is separate from the transformer and input / output termination.

10.0 WARRANTY

All units shall be covered under a standard commercial two year warranty covering parts and workmanship. Units within the contiguous US shall include a comprehensive warranty in the first year covering on site labor and expenses.

11.0 SERVICE

Transtector shall provide immediate phone support/consultation and if possible, same day parts shipment. (Contact must be prior to 12:00 PM PST). If necessary, on site service shall be scheduled the same day for service to be conducted within 24 to 48 hours, based on customer requirements. Typical service hours are 8 AM to 5 PM Monday through Friday.

12.0 CONTACT

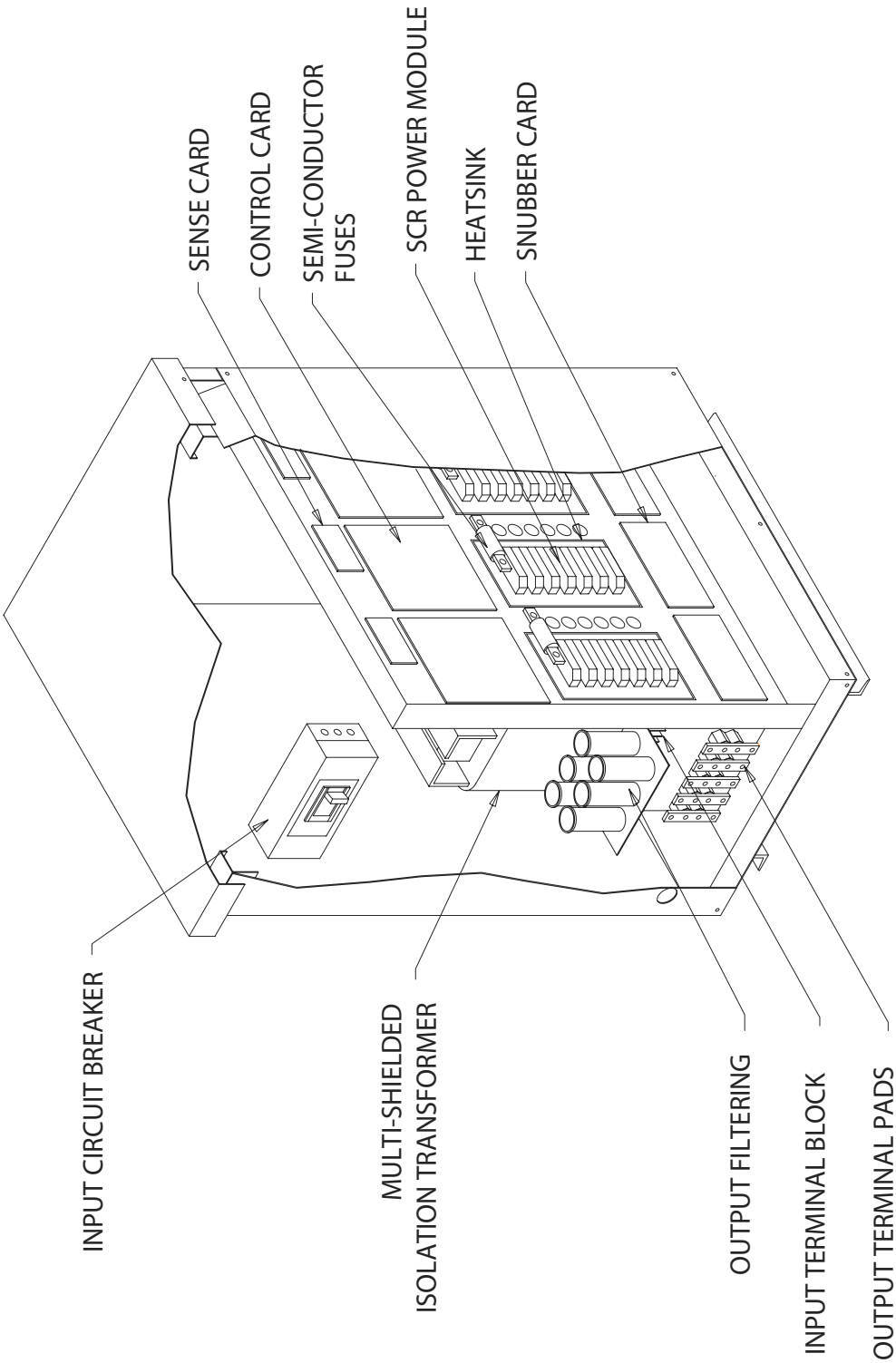
Rick Ribbeck
Phone: (O) 208-635-6400 Ext. 5867 | (M) 208-762-6112
E-mail: rribbeck@infiniteelectronics.com
E-mail: rribbeck@transtector.com

Transtector Systems
10701 Airport Dr.
Hayden Lake ID 83835

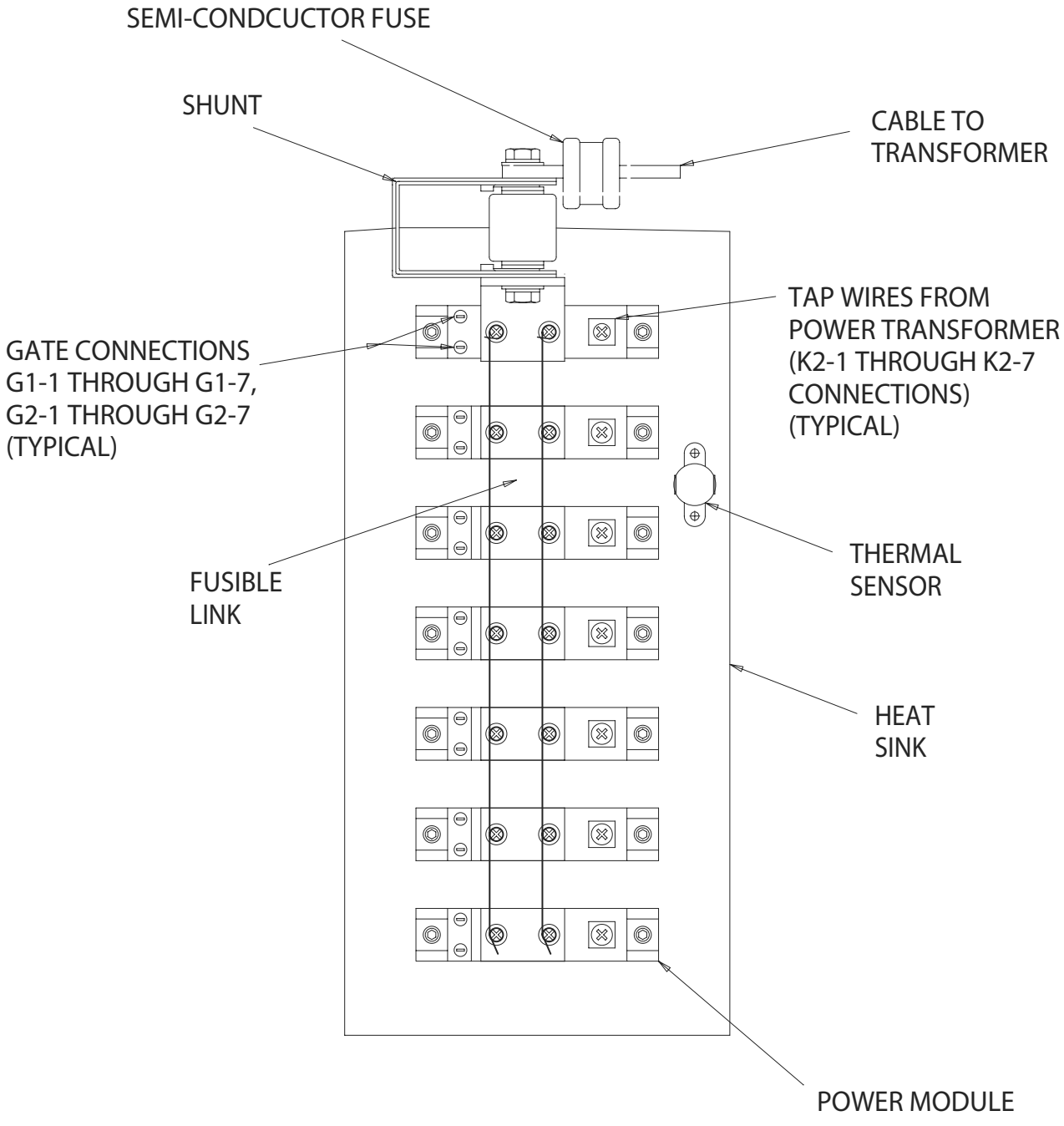
Appendix A

Relative Drawings and Schematics

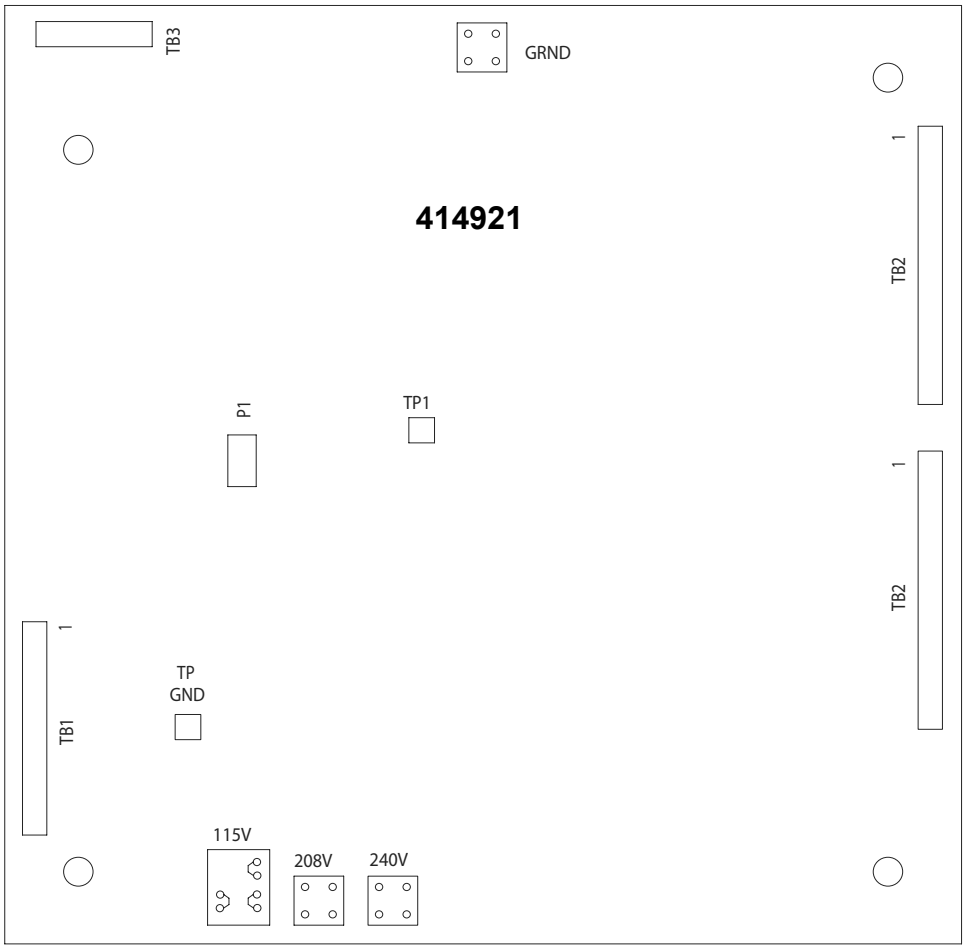
COMPONENT LOCATION DIAGRAM



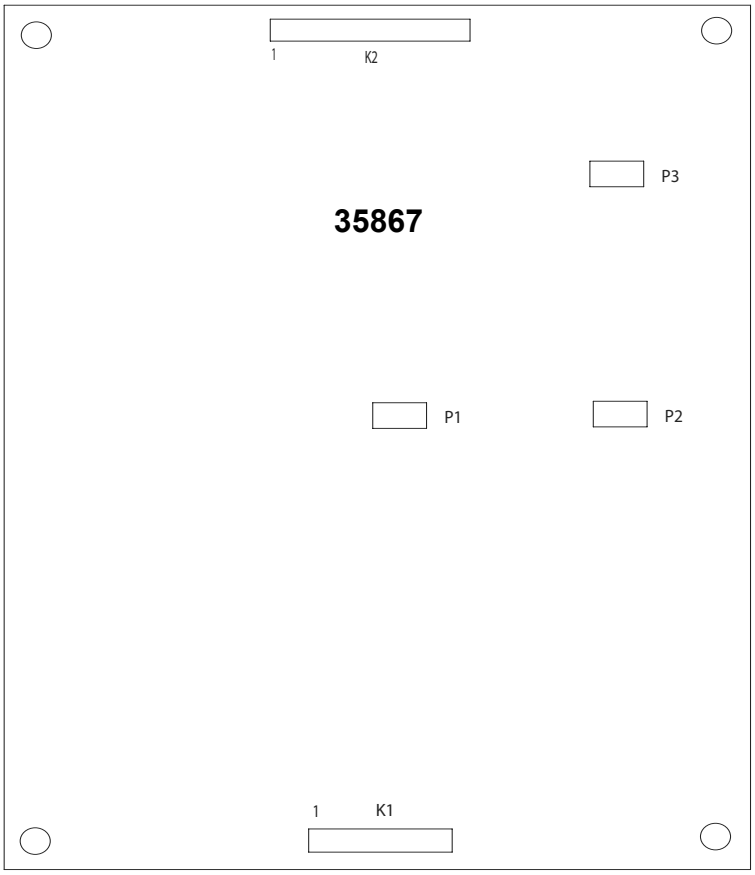
HEAT SINK ASSEMBLY



CONTROL BOARD LAYOUT

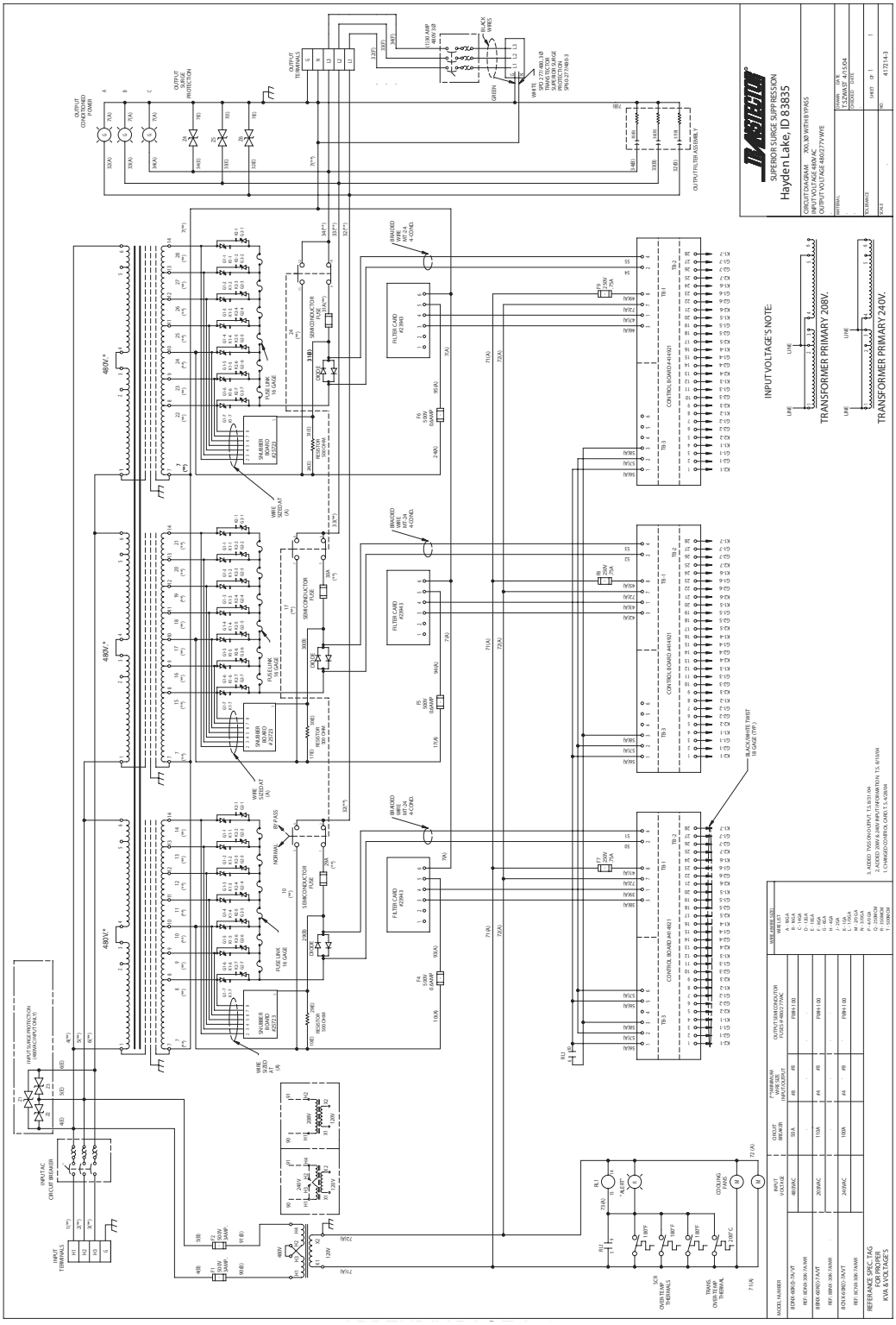


OVER/UNDER BOARD LAYOUT



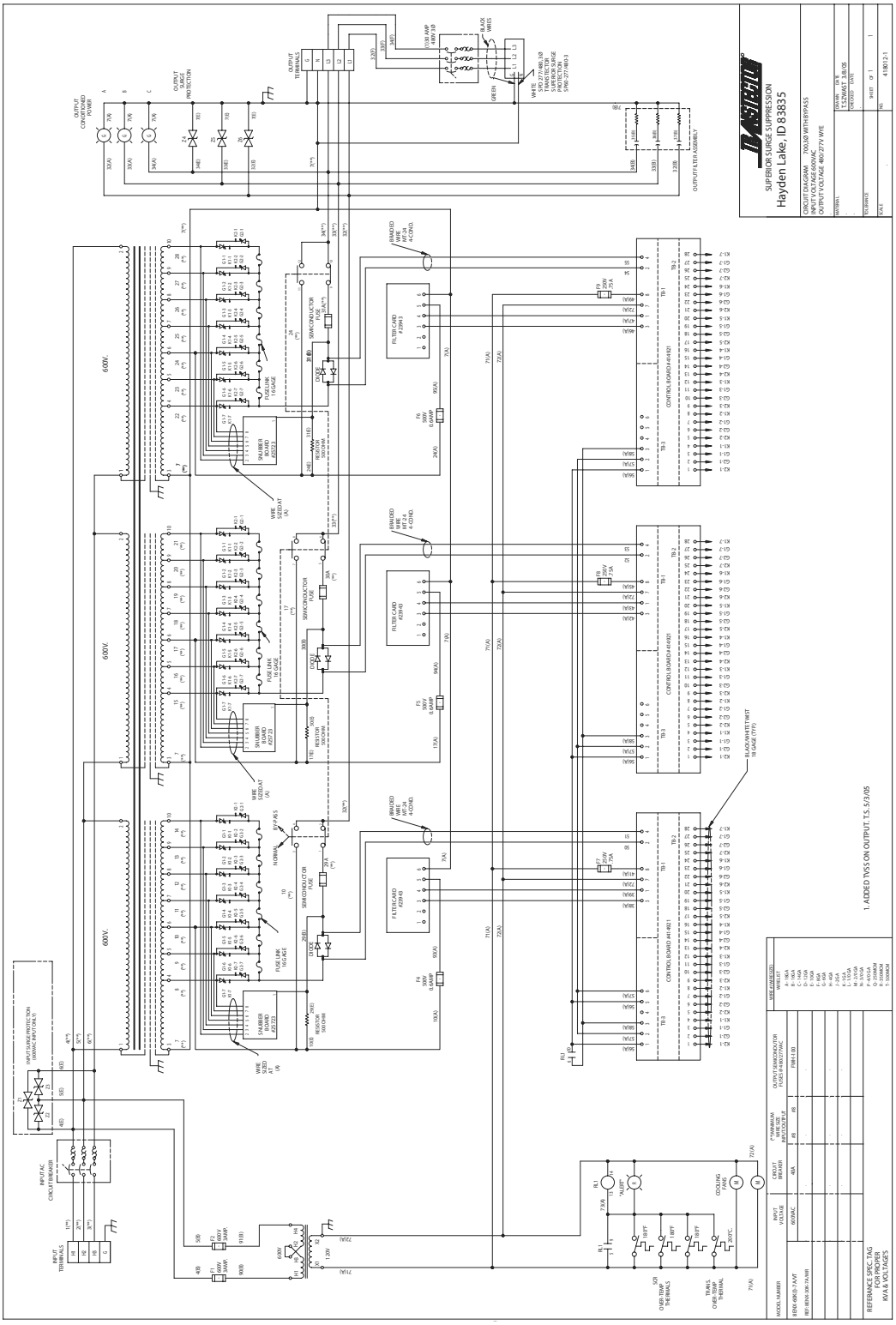
CIRCUIT DIAGRAM

60K(I) - (208, 240, 480 V Input)



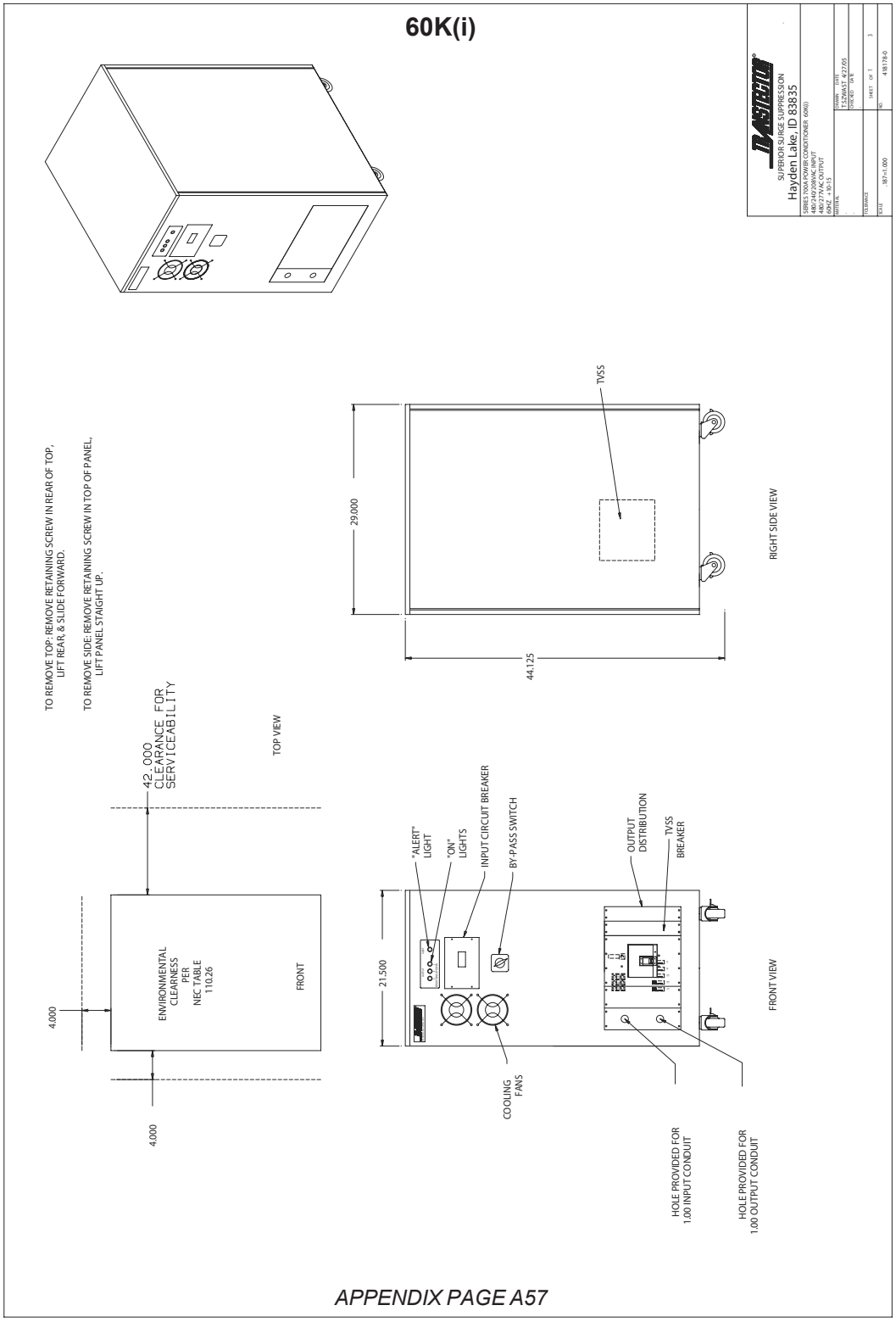
CIRCUIT DIAGRAM

60K(I) - (600 V Input)



CABINET LAYOUT

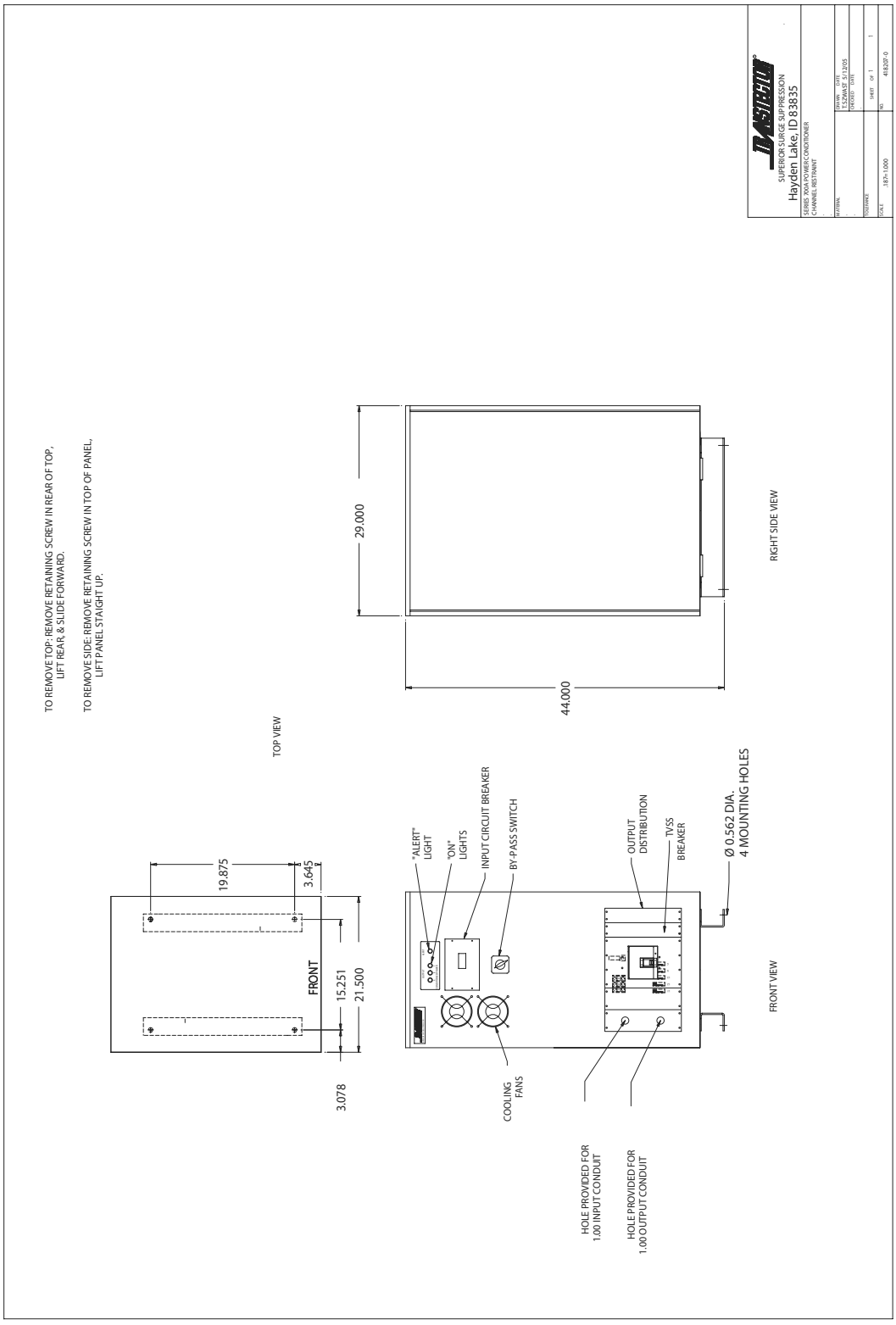
60K(I)



APPENDIX PAGE A57

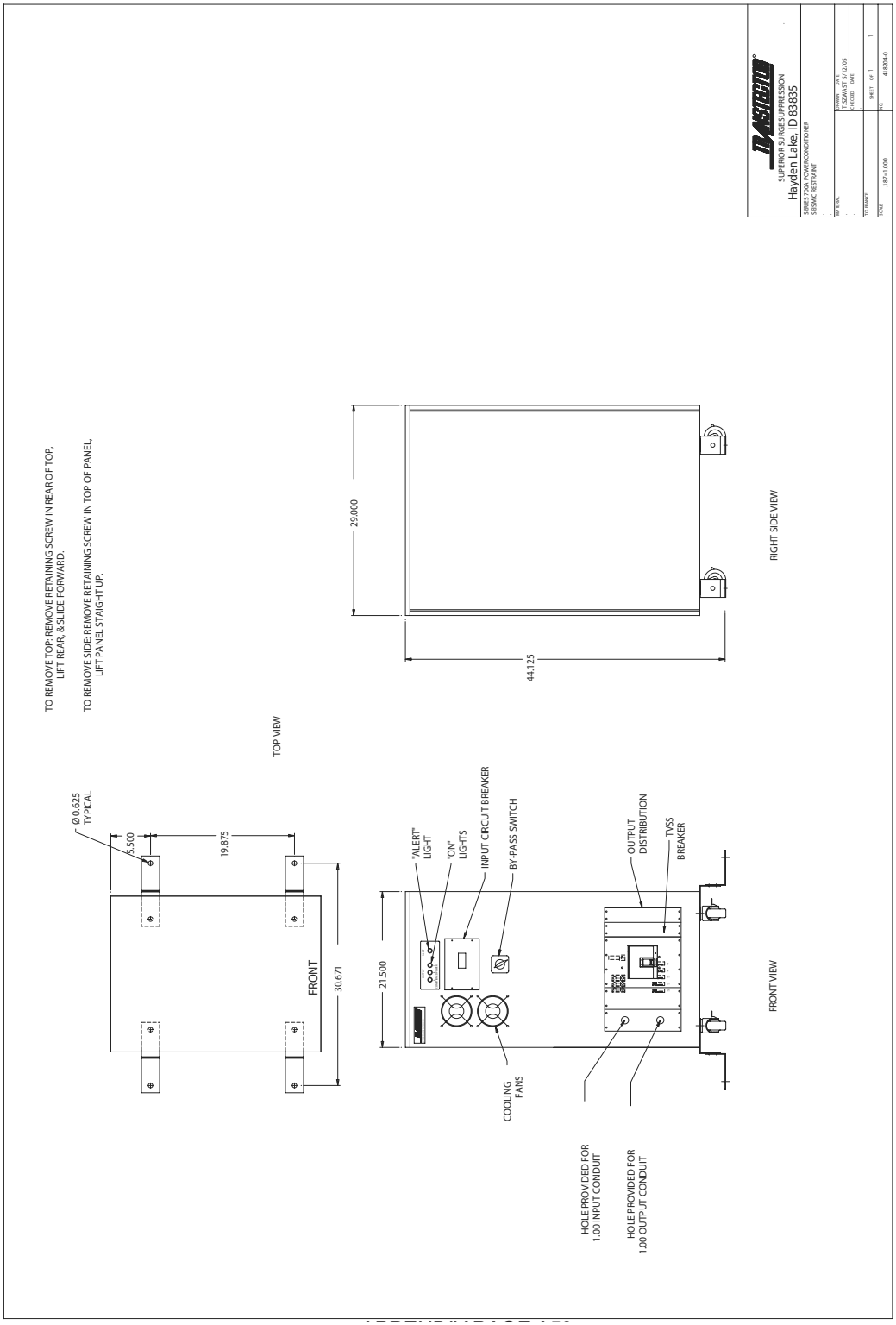
CABINET LAYOUT

60K(I)



CABINET LAYOUT

60K(I)



SYMBOL LIBRARY

Caution

The following symbol indicates that caution should be taken when performing the process required in this manual. Damage to the unit or personal harm could happen if proper precautions are not taken.

Shock Hazard

The following symbol indicates that there is a risk of electrical shock if proper precautions are not followed. Only qualified personnel should perform the actions required in this manual.