

INSTRUCTIONS
for
STABILINE[®]
Automatic Voltage Regulators

WHR12*S*R Series**
Single-Phase
208 x 240 Volt
Bench/Rack Mount Models



Superior Electric reserves the right to make engineering changes on all its products. Such refinements may affect information given in the instructions. Therefore, **USE ONLY THE INSTRUCTIONS THAT ARE PACKED WITH THE PRODUCT.**

WARNING: High voltages are present inside this unit during operation. Do not operate this unit unless all covers are in place. Installation and servicing should only be done by qualified personnel.

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INSPECTION

When unpacking the unit, examine it carefully for any shipping damage. The "Damage and Shortage" instructions packed with the unit outline the procedure to follow if any parts are missing or damaged.

SECTION 1.0 : DESCRIPTION

1.1 GENERAL

WHR12*S**R Series STABILINE® Automatic Voltage Regulators are single-phase, 208 x 240 volt, fast acting electro-mechanical regulators with ratings from 2.2 to 13.0 kVA. These units have an analog electronic control section and a power section consisting of one or more motor driven, limited range POWERSTAT® Variable Transformers. Units with -CB at the end of the model number are equipped with an input circuit breaker.

See the enclosed rating charts for complete specifications on each model.

Advantages of all WHR series regulators include high efficiency (99% typical), high overload capacity and low impedance. These regulators are insensitive to the magnitude and power factor of the load, and have no effect on system power factor. This means these regulators can be used with any type load.

1.2 MODEL NUMBER

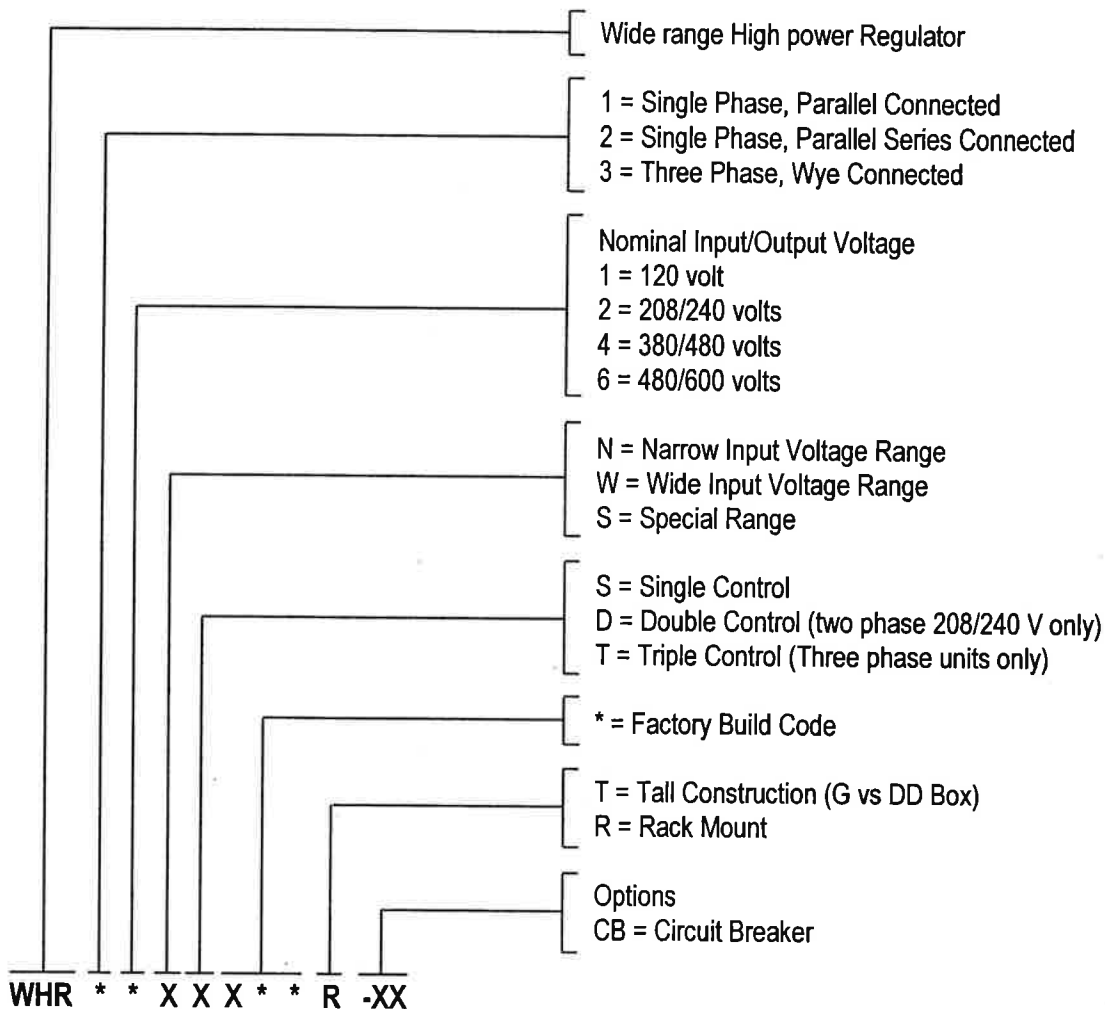
The model number of each WHR series regulator identifies the various characteristics of that specific unit. The following table explains the meaning of each character in the model number.

1.3 THEORY OF OPERATION

These units regulate AC voltage by automatically adjusting limited range POWERSTAT® Variable Transformers to maintain constant output voltage.

The solid state control unit detects the output voltage and continually compares it to the output and accuracy settings selected by the user. If the output is out of specifications, the control unit drives the POWERSTAT® Variable Transformer brush, by means of a synchronous motor, to the required new position.

WHR TYPE NUMBERING SYSTEM



SECTION 2.0: INSTALLATION

2.1 MECHANICAL INSTALLATION

The regulators are designed for bench or rack mounting. When mounting the unit, allow a minimum clearance of 4 inches (100 mm) behind the unit for proper ventilation.

Note: When rack mounting a WHR Series regulator, it is recommended that support be provided for the rear of the unit.

2.2 ELECTRICAL INSTALLATION

All WHR regulators are designed to be hard-wired to the input power and the load using copper wire. When these units increase low input voltage to give nominal output voltage, the input current is substantially higher than the output current. Maximum rated input and output currents for each

unit are given in the enclosed rating charts. Select a wire size that is adequate to carry the maximum rated current as specified by local and national code requirements.

The terminals for input and output connections are located on the rear of the regulator. A ground stud is provided on the chassis of the unit. The terminals for making the input connections are on a separate terminal panel and are labeled L1 and L2-NEUT. The load connections are made to the POWERSTAT Variable Transformer terminal boards. These terminals are labeled: T1 and T2-NEUT.

The ground terminal **must** be connected to a suitable earth ground to reduce the chance of electrical shock.

SECTION 3.0: START UP

Set the Output Voltage Range toggle switch on the front panel of the unit to match YOUR application by placing the switch in either the 208 or the 240 volt position. The Output Voltage Adjustment potentiometer and Sensitivity potentiometer are set at the factory for nominal output voltage and approximately 2% accuracy, and should not be readjusted until the regulator is initially energized.

After completing and checking all input and output connections, energize the regulator power source and place the input circuit breaker (labeled "AC INPUT") in the "ON" position. The voltmeter should indicate the output voltage and the POWER pilot lamp and the CONTROL pilot lamp should be lit. This indicates the voltage regulator is operating properly.

SECTION 4.0: OPERATION

4.1 OPERATING CONTROLS

4.1.1 Circuit Breaker, CB1

The circuit breaker controls the input power to the regulator. It is located on the front of the unit and is labeled "AC INPUT". Placing the circuit breaker in the "ON" position will energize the regulator.

4.1.2 POWER Pilot Lamp, A1-DS1 (On Front Panel)

The POWER lamp lights when power is present for the motor and indicates the regulator is energized.

4.1.3 CONTROL Pilot Lamp, A1 (On Front Panel)

This lamp will light whenever the control unit sense voltage is energized. The control sense voltage must be energized for automatic correction of voltage changes to occur.

4.1.4 Analog Voltmeter, A1-M1 (On Front Panel)

This display shows the output voltage.

4.1.5 Output Voltage Range Toggle Switch, A1-S1 (On Front Panel)

This is a three-position switch. When the switch is in the center (OFF) position, the control unit sense voltage is disconnected, and automatic correction of voltage changes will not take place. Any change in input voltage will be reflected in output voltage.

The upper and lower switch positions select the nominal output voltage. The switch should be placed in the position that corresponds with the desired nominal output voltage for YOUR application.

4.1.6 OUTPUT VOLTAGE Potentiometer A1-R1 (On Front Panel)

This potentiometer sets the output voltage. It's adjustment range is approximately $\pm 10\%$ of the selected nominal output voltage.

4.1.7 SENSITIVITY Potentiometer A1-R2 (On Front Panel)

This potentiometer adjusts the regulators output accuracy, i.e. sets how much the output voltage will change before the unit will correct. Follow the instructions in Section 4.2 to adjust the sensitivity.

4.2 SETTING THE OUTPUT VOLTAGE AND SENSITIVITY POTENTIOMETERS

To set these potentiometers:

4.2.1 Energize the regulator power source and place the regulator's circuit breaker in the "ON" position. The pilot lamps should light, indicating that the regulator is energized and that the control unit is on. If necessary, move the OUTPUT VOLTAGE RANGE switch to the desired nominal output voltage position. Check the voltmeter. This will indicate the output voltage.

4.2.2 To adjust the output voltage, turn the OUTPUT VOLTAGE potentiometer clockwise to increase or counter-clockwise to decrease the output voltage, as indicated on the regulator's voltmeter.

4.2.3 The sensitivity must be adjusted if the regulator hunts (the motor driven variable transformer section of the regulator cycles back and forth) or if the regulator allows too great a change from the set voltage before correction occurs.

Turning the SENSITIVITY control clockwise increases the sensitivity to maximum (1/2% to 1% output voltage accuracy). For maximum sensitivity, turn the SENSITIVITY control clockwise to the point where the regulator begins to hunt. Turn the control counterclockwise (CCW) until the hunting stops. Turn the control an additional 1/8 turn CCW.

For most applications the SENSITIVITY control can be set fully counterclockwise, which will provide approximately 3% accuracy. This setting will provide accurate control of output voltage and will eliminate operation of the regulator due to small voltage or load changes.

4.3 REMOTE SENSING

Normally, WHR regulators sense and regulate the voltage at the regulator's output terminals. In some cases better control can be obtained by monitoring the voltage at another point, such as at the end of long lines between the regulator and the load. This is known as remote sensing. If remote sensing is desired, remove the jumpers between terminals 6 and 7 and between terminals 8 and 9 on the control module terminal panel. This will disconnect the control module sense terminals from the output terminals of the regulator. Connect the wires for remote sensing to terminals 7 and 9 on the control module.

4.4 ALL-BUCK & ALL-BOOST OPERATION

All WHR Series regulators can be connected to provide all-buck (unit will only lower the input voltage) or all-boost (unit will only increase the input voltage) operation. This feature can be used to shift the nominal voltage or to correct input voltages that are always extremely high or extremely low.

4.4.1 All-Boost Operation

When connected for all-boost, these units will bring extra low voltages up to nominal, but will not correct high input voltages. Since operation in the all-boost mode will increase the voltage and heating in the WHR regulator, the rated load current, and in some cases the maximum rated nominal input voltage, must be reduced. The chart below shows the all-boost ratings.

For all-boost operation, the input line to each POWERSTAT Variable Transformer must be moved from terminal 2 to terminal 5.

4.4.2 All-Buck Operation

When connected for all-buck operation, these units will bring extra high input voltages down to nominal, but will not correct low input voltages. Since all-buck operation reduces the voltage in the regulator, the nominal input voltage can be increased. The current ratings remain the same. The chart below shows the all-buck ratings.

All-buck operation requires moving the input line to each POWERSTAT Variable Transformer from terminal 2 to terminal 4.

| NORMAL INPUT VOLTAGE RANGE | NARROW +7%, -15% | WIDE +12.5%, -25% |
|---|---------------------------------|---------------------------------|
| ALL BOOST OPERATION | | |
| INPUT VOLTAGE RANGE (% OF SET OUTPUT VOLTAGE) | 0%, -20% | 0%, -33% |
| MAXIMUM LOAD CURRENT (% OF NORMAL RATING) | 77% | 72% |
| NOMINAL INPUT VOLTAGE (MAX. ALLOWABLE INCREASE) | 208 V, 50/60 HZ 240 V, 60 HZ | 208 V, 50/60 HZ 240 V, 60 HZ |
| ALL BUCK OPERATION | | |
| INPUT VOLTAGE RANGE (% OF SET OUTPUT VOLTAGE) | +25%, 0% | +50%, 0% |
| MAXIMUM LOAD CURRENT (% OF NORMAL RATING) | 100% | 100% |
| NOMINAL INPUT VOLTAGE (MAX. ALLOWABLE INCREASE) | 15% | 25% |

SECTION 5.0: MAINTENANCE

To ensure maximum life of the equipment, the following should be part of an annual maintenance program.



Warning: Deenergize unit before performing maintenance. Voltages are present inside this unit which can cause injury. Therefore, only persons qualified to service electrical equipment should perform maintenance on this unit.

5.1 Vacuum the regulator inside and out to remove accumulated dirt which could lead to overheating or insulation failure.

5.2 Tighten all electrical connections, particularly all power wiring to, and in, the unit.

5.3 Inspect all brushes and commutators for signs of wear or pitting. Replace as required.

Do not attempt to clean a commutator with an abrasive such as sandpaper or a file. This will ruin the soft precious

metal plating on the commutator and will shorten the life of the unit. It is normal for commutators to become black due to carbon brush tracking. If a commutator is to be cleaned, use denatured alcohol and a soft cloth.

5.4 Inspect the variable transformer drive belts, sprockets, gears, cams, etc. for signs of slippage or wear and adjust as required.

5.5 Check the variable transformer radiator(s) (the die cast part that holds the brush assembly) for signs of slippage, and see if all brushes driven by the same motor are aligned with each other. The alignment of the radiator and brushes depends on the set screws that hold the center tube(s) of the variable transformer to the shaft and the set screws that hold the radiator to the center tube. Adjust as required.

5.6 Lubrication of the WHR Series regulator is not required since it has been lubricated at the factory for its lifetime.

SECTION 6.0: TROUBLESHOOTING

These regulators will provide long, reliable service with little attention. Unless the unit is overloaded, there is little likelihood of component failure.



Warning: Voltages are present inside this unit which can cause injury. Therefore, only persons qualified to service electrical equipment should perform trouble-shooting procedures on this unit.

If the regulator fails to operate correctly, the following checks will help locate and correct the problem. Refer to the enclosed schematic diagram replacement parts list and rating charts for further information on the unit.

To aid servicing, the front panel may be removed and slid into horizontal retaining slots provided in the sides of the chassis.

6.1 Check the load connected to the regulator to be sure the output current rating of the unit is not being exceeded.

6.2 See if the POWER pilot lamp is on. If the lamp is not lit, there is no power to the regulator, or fuses F1 & F2 (POWER LIGHT – MOTOR) are blown, or the lamp has burned out. Check the POWER LIGHT – MOTOR fuses (F1 and F2). Check the power input to the unit to be sure the voltage is within the range specified for the selected output voltage.

6.3 Check the output voltmeter. If the meter shows zero output voltage, check the input line, input circuit breaker, control unit fuses F3 and F4 (CONTROL fuses), remote sense wiring if applicable (see section 4.3), and input connections.

6.4 Check the CONTROL pilot lamp. If it is not lit, check the control unit switch to be sure it is on and check for blown CONTROL fuses (F3 and F4). If applicable, check the remote sense wiring (see section 4.3).

6.5 If the motor hunts (cycles continuously), readjust the SENSITIVITY control per section 4.2.

6.6 If the motor drives the POWERSTAT variable transformer to one end of its travel, and the voltage decreases when it should increase or increases when it should decrease, check to see if the input and output power connections to the regulator are reversed.

If the unit has been reworked or repaired, check to see if the leads driving the motor have been reversed so that the motor runs in the wrong direction. If leads driving the motor are changed, check to see that the limit switches turn the motor off in the proper direction, i.e. once a limit switch is actuated the motor should run only in the opposite direction it was running in when it actuated the limit switch.

6.7 If the motor continues to hum or buzz after the OUTPUT VOLTAGE RANGE switch is turned off, the solid-state switch controlling the motor may be defective. Deenergize

the input line to the regulator, and replace the plug-in control unit.

6.8 To see if the motor drive is functioning correctly: Refer to the unit's schematic and; deenergize the input line to the regulator, place the output voltage RANGE switch in the center (OFF) position and remove POWER LIGHT – MOTOR fuses F1 and F2.

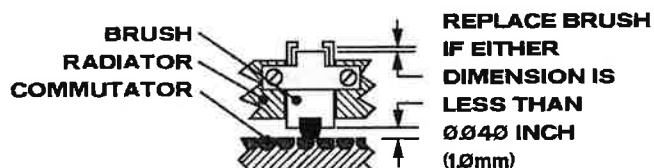
Apply 115 volts between terminals 1 and 2 on the control or the variable transformer motor drive terminal board (TB1) (these terminal boards are connected point for point). The motor should turn the variable transformer so as to lower the output voltage (rotates the variable transformer CCW when viewed from the top) until the variable transformer reaches the end of its travel where the limit switch will prevent further rotation in the CCW direction. Applying 115 volts between terminals 1 and 3 should run the motor in the opposite direction until a limit switch stops the motor at the end of travel. If the motor operates successfully in this test the problem may be with the control unit.

6.9 Inspect the POWERSTAT Variable Transformer brush(s) and commutator(s) for signs of wear or damage. The brush assemblies on the variable transformer section will not need replacement under normal conditions. When excessive brush wear or commutator damage occurs it is usually the result of an overload. If either condition exists, the POWERSTAT Variable Transformer section or the brush must be replaced or repaired.

Do not attempt to clean a commutator with an abrasive such as sandpaper or a file. This will ruin the soft precious metal plating on the commutator and will shorten the life of the unit. It is normal for commutators to become black due to carbon brush tracking. If a commutator is to be cleaned, use denatured alcohol and a soft cloth.

Check the radiator(s) (the die cast part that holds the brush assembly) for signs of slippage, and see if all brushes driven by the same motor are aligned with each other. The alignment of the radiator and brushes depends on the set screws that hold the variable transformer center tube(s) to the shaft and the set screws that hold the radiator to the center tube. Adjust as required.

Check the load connected to the voltage regulator to be sure the regulators output current rating is not being exceeded.



SECTION 7.0: RATINGS AND SPECIFICATIONS

7.1 GENERAL SPECIFICATIONS

| | |
|----------------------------|---|
| Phase Configuration | 1-phase, 2-wire plus ground |
| Efficiency | 97% minimum, 99% typical @ full load |
| Load Capacity | 100% rated – continuous 200% rated – 60 seconds 400% rated – 3 seconds 600% rated – 1 second 800% rated – 0.5 second 1000% to 2500% rated – ½ cycle inrush |
| Distortion | less than 0.25% added total harmonic distortion |
| Surge Withstand Capability | 600 volts per IEEE 587-1980, Location Category B |
| Load Power Factor | 0 lagging to 0 leading |
| Load Crest Factor | 6 max. (I peak/I rms) |
| Heat Generated | BTU (typical) = 55 x rated kVA |
| Input/Output Connection | hardwired, rear panel terminals |
| Controls | Input Circuit Breaker Output Voltage Range Toggle Switch Output Voltage Adjustment Potentiometer Sensitivity Adjustment Potentiometer |
| Visual Indicators | Power Pilot Lamp Control Power Pilot Lamp Output Voltmeter (analog) |
| Warranty | one year |
| Independent Certification | designed for UL and CSA certification |

7.2 ELECTRICAL RATINGS

**RATING CHART
SINGLE PHASE – 208 X 240 VOLTS – NARROW RANGE**

| | | | | |
|---------------------------------------|--|--|--------------------------------------|----------------------------------|
| INPUT/OUTPUT VOLTAGE (NOMINAL) | | | FREQUENCY | SELECTABLE OUTPUT VOLTAGE |
| LINE-LINE & LINE-NEUTRAL | | | 50/60 | 187 TO 229 |
| 208 V | | | 50/60 | 216 TO 264 |
| 220-230-240 V | | | +7%, -15% OF SELECTED OUTPUT VOLTAGE | |
| INPUT CORRECTION RANGE: | | | SELECTABLE 1% TO 3% | |
| OUTPUT ACCURACY: | | | | |

| RATED OUTPUT AMPS | RATED KVA AT | | MODEL NUMBER | MAX INPUT AMPS | RECOVERY TIME (SEC/% @ 60 HZ) | APPROXIMATE WEIGHT NET-SHIP | | ENCLOSURE | | |
|-------------------------|-----------------|-------|----------------|----------------------|--|-----------------------------------|-----------|-----------|----|--------|
| | 208 V | 240 V | | | | POUNDS | KILOGRAMS | | | |
| 15 | 3.1 | 3.6 | WHR12NSR11R-CB | 20 | .026 | 65 | 90 | 29.5 | 41 | WHR R1 |
| 28 | 5.8 | 6.7 | WHR12NSS11R-CB | 35 | .026 | 120 | 150 | 54 | 68 | WHR R1 |
| 65 | 13 | 15 | WHR12NST11R-CB | 80 | .056 | 120 | 150 | 54 | 68 | WHR R1 |

**RATING CHART
SINGLE PHASE – 208 X 240 VOLTS – WIDE RANGE**

| | | | | |
|---------------------------------------|--|--|---|----------------------------------|
| INPUT/OUTPUT VOLTAGE (NOMINAL) | | | FREQUENCY | SELECTABLE OUTPUT VOLTAGE |
| LINE-LINE & LINE-NEUTRAL | | | 50/60 | 187 TO 229 |
| 208 V | | | 50/60 | 216 TO 264 |
| 220-230-240 V | | | +12.5%, -25% OF SELECTED OUTPUT VOLTAGE | |
| INPUT CORRECTION RANGE: | | | SELECTABLE 1% TO 3% | |
| OUTPUT ACCURACY: | | | | |

| RATED OUTPUT AMPS | RATED KVA AT | | MODEL NUMBER | MAX INPUT AMPS | RECOVERY TIME (SEC/% @ 60 HZ) | APPROXIMATE WEIGHT NET-SHIP | | ENCLOSURE | | |
|-------------------------|-----------------|-------|----------------|----------------------|--|-----------------------------------|-----------|-----------|----|--------|
| | 208 V | 240 V | | | | POUNDS | KILOGRAMS | | | |
| 11 | 2.2 | 2.5 | WHR12WSR11R-CB | 15 | .025 | 65 | 90 | 29.5 | 41 | WHR R1 |
| 21 | 4.3 | 5.0 | WHR12WSS11R-CB | 30 | .025 | 120 | 150 | 54 | 68 | WHR R1 |
| 36 | 7.5 | 8.6 | WHR12WST11R-CB | 50 | .066 | 120 | 150 | 54 | 68 | WHR R1 |

**RATING CHART
SINGLE-PHASE - 208 X 240 VOLTS – NARROW RANGE**

| RATED OUTPUT AMPS | RATED KVA AT 120 V | MODEL NUMBER | MAX INPUT AMPS | RECOVERY TIME (SEC/% @ 60 HZ) | APPROXIMATE WEIGHT NET-SHIP | | CABINET | | |
|-------------------------|--------------------------|--------------|----------------------|--|-----------------------------------|-----------|---------|-----|--------|
| | | | | | POUNDS | KILOGRAMS | | | |
| 130 | 25 | WHR12NST12R | 160 | 0.110 | 190 | 220 | 86 | 100 | WHR-R2 |

**RATING CHART
SINGLE-PHASE - 208 X 240 VOLTS WIDE RANGE**

| RATED OUTPUT AMPS | RATED KVA AT 120 V | MODEL NUMBER | MAX INPUT AMPS | RECOVERY TIME (SEC/% @ 60 HZ) | APPROXIMATE WEIGHT NET-SHIP | | CABINET | | |
|-------------------------|--------------------------|--------------|----------------------|--|-----------------------------------|-----------|---------|-----|--------|
| | | | | | POUNDS | KILOGRAMS | | | |
| 72 | 15 | WHR12WST12R | 100 | 0.066 | 190 | 220 | 86 | 100 | WHR-R2 |

7.3 ENVIRONMENTAL SPECIFICATIONS

Temperature

Operating: -20° C to +50° C (-4° F to +122° F) *
Storage: -40° C to +70° C (-40° F to +158° F)

* Average ambient temperature for any 24 hour period not to exceed 30° C (86° F) and maximum temperature not to exceed 40° C (104° F). Average temperature for a 24 hour period can be increased to 50° C (122° F) if load is decreased to 90% of standard rating. Minimum ambient temperature is -20° C (-4° F).

Humidity, Operating And Storage:

10% to 75% average relative humidity for any 7 day period and maximum relative humidity not to exceed 95% non-condensing.

Altitude

| | Max. Altitude | Derating |
|-------------------|---|---|
| Operating: | 6,600 ft (2,000 m) 10,000 ft (3,000 m) 15,000 ft (4,500m) | no derating load to 95%, ambient to 30° C load to 90%, ambient to 20° C |
| Storage: | 50,000 ft (15,000 m) max. | |

SECTION 8.0: REPLACEMENT PARTS

SINGLE PHASE – 208 X 240 VOLT

The following Control Module parts are supplied on all models listed below.

| Reference Symbol | Description | Part Number |
|-------------------|------------------------------------|-------------|
| A1 | Control Module | 219760-001* |
| A1-A1 | Control Unit, CU80 | 209066-001 |
| A1-DS1, DS2 | Light, Indicating | 052095-002 |
| A1-F1, F2, F3, F4 | Fuse, 1 Ampere, 250 Volt | 104364-003 |
| A1-M1 | Voltmeter | 212917-002 |
| A1-R1 | Potentiometer, 150 Ohm | 103159-012 |
| A1-R2 | Sensitivity Potentiometer, 10k Ohm | 103159-024 |
| A1-S1 | Switch, Rocker | 219740-002 |
| A1-T1 | Transformer, Power | 006736-000 |
| A1-TB1 | Terminal Strip, 9-Terminal | 104051-009 |

* The 120 V Control Module, less Circuit Breaker, is part number 219760-004.

REPLACEMENT PARTS

| Model Number | B1 Motor | C1, Motor Capacitor | CB1, Circuit Breaker | R1, Motor Resistor | S1, S2 Limit Switch | T1, POWERSTAT Variable Transformer | TB1, Terminal Strip | Replacement Brush |
|-----------------|------------|---------------------|----------------------|--------------------|---------------------|------------------------------------|---------------------|-------------------|
| WHR-12NSR11R-CB | 208168-027 | 207419-017 | 213927-007 | 102088-002 | 058743-001 | 216971-002 | 027375-007 | 176012-002 |
| WHR12NSS11R-CB | 102154-027 | 207419-041 | 213927-001 | 103788-018 | 058734-001 | 216975-002 | 027375-007 | 017702-004 |
| WHR12NST11R-CB | 102154-027 | 207419-041 | 213927-003 | 103788-018 | 058743-001 | 212995-003 | 027375-007 | 017702-011 |
| WHR12WSR11R-CB | 208168-027 | 207419-017 | 213927-007 | 102088-002 | 058743-001 | 212995-002 | 027375-007 | 017702-004 |
| WHR12WSS11R-CB | 102154-027 | 207419-041 | 213927-009 | 103788-018 | 058743-001 | 212995-002 | 027375-007 | 017702-003 |
| WHR12WST11R-CB | 102154-027 | 207419-041 | 213927-001 | 103788-018 | 058743-001 | 212995-002 | 027375-007 | 017702-003 |

REPLACEMENT PARTS

| Model Number | B1 Motor | C1, Motor Capacitor | Paralleling Choke (T2) | R1, Motor Resistor | S1, S2 Limit Switch | T1, POWERSTAT Variable Transformer | TB1, Terminal Strip | Replacement Brush |
|--------------|------------|---------------------|------------------------|--------------------|---------------------|------------------------------------|---------------------|-------------------|
| WHR12NST12R | 102154-027 | 207419-041 | 006724-000 | 103788-018 | 058743-001 | 212995-003 | 027375-007 | 017702-011 |
| WHR12WST12R | 102154-027 | 207419-041 | 005587-000 | 103788-018 | 058743-001 | 212995-002 | 027375-007 | 017702-003 |

INPUT
(SEE RATING CHART)

A
(L1)

NEUTRAL
(NEUT)

GROUND
(GND)

PHASE A
SEE FIG. BLOCK

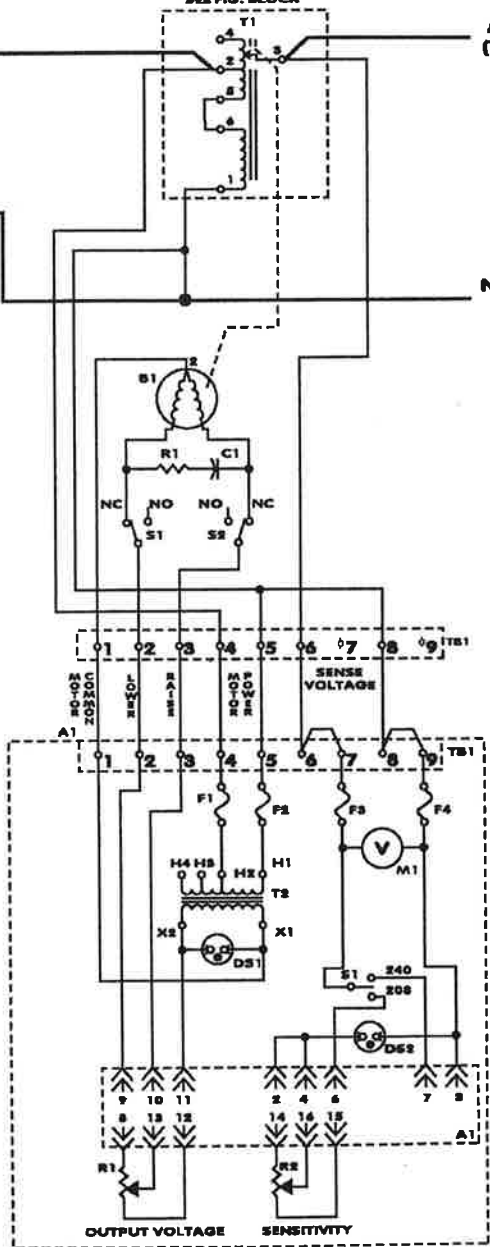
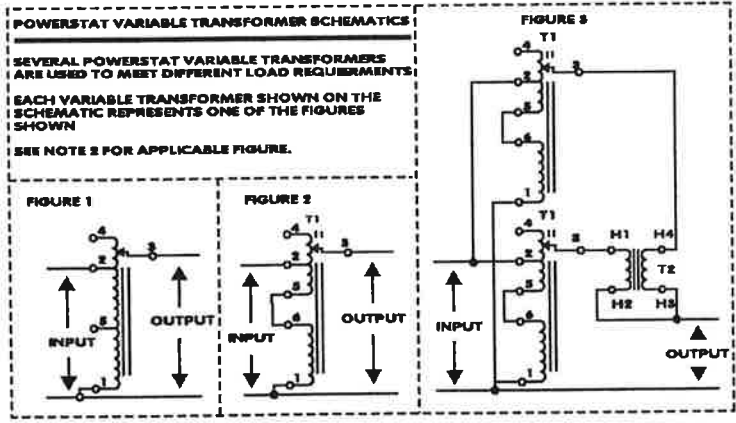
OUTPUT
(SEE RATING CHART)

A1
(T1)

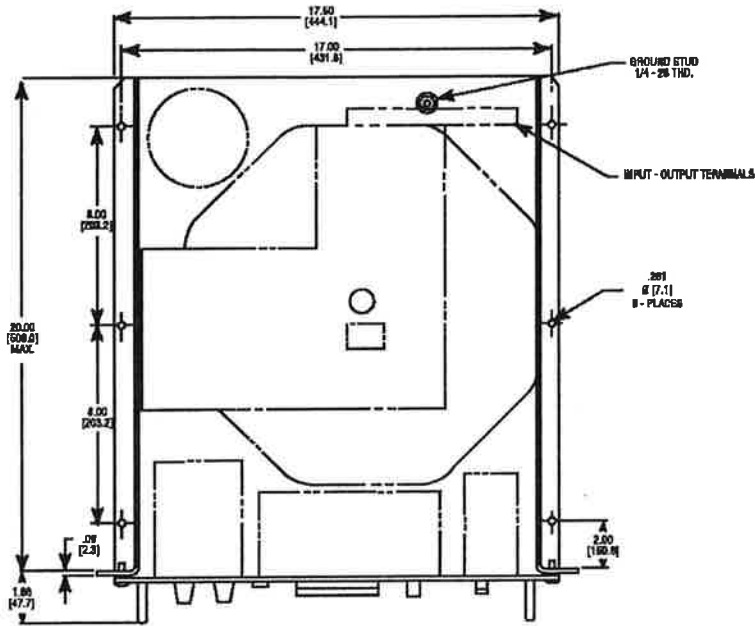
NEUTRAL
(NEUT)

| REFERENCE SYMBOL | PART DESCRIPTION |
|------------------|--|
| A1 | CONTROL MODULE |
| - A1 | CONTROL UNIT |
| - DS1, DS2 | LIGHT, INDICATOR |
| - F1, F2, F3, F4 | FUSE, 1 AMP 100V |
| - M1 | VOLTMETER |
| - R1 | POTENTIOMETER 150 OHM |
| - R2 | POTENTIOMETER 10K OHM |
| - S1 | SWITCH, ROCKER ON OFF ON |
| - T2 | TRANSFORMER, SENSE |
| - TB1 | TERMINAL STRIP, 9 TERM. |
| B1 | MOTOR, AC |
| C1 | CAPACITOR |
| CB1 | CIRCUIT BREAKER |
| R1 | RESISTOR |
| S1, S2 | SWITCH, LIMIT |
| T1 | POWERSTAT, VARIABLE TRANSFORMER |
| T2 | CHOKE PARALLING |
| TB1 | TERMINAL STRIP, 9 TERM. |

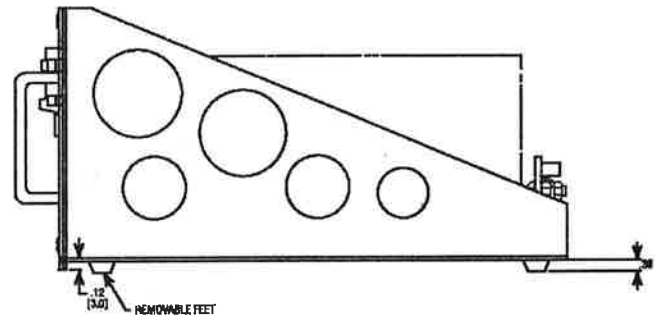
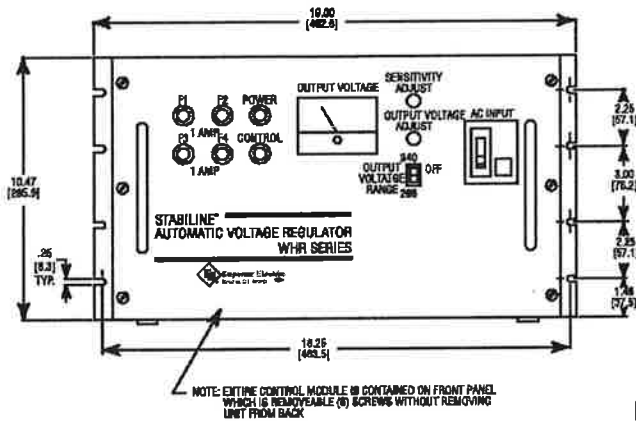
- NOTES:**
- 1) CIRCUIT BREAKER "CB1" SUPPLIED ONLY ON UNITS WITH SUFFIX -CB
 - 2) APPROPRIATE FIGURE FOR POWERSTAT VARIABLE TRANSFORMER IS DETERMINED BY UNIT MODEL NUMBER AS SHOWN
WHR12NSR11R FIGURE No.
R11, S11 1
T11 2
T12 3



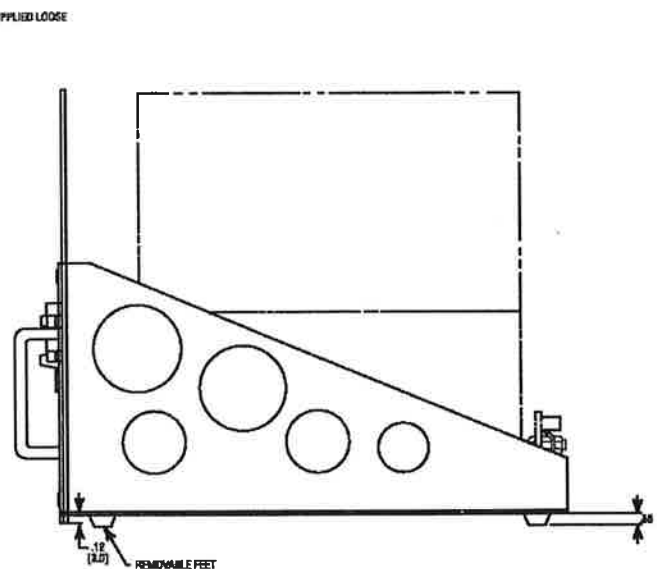
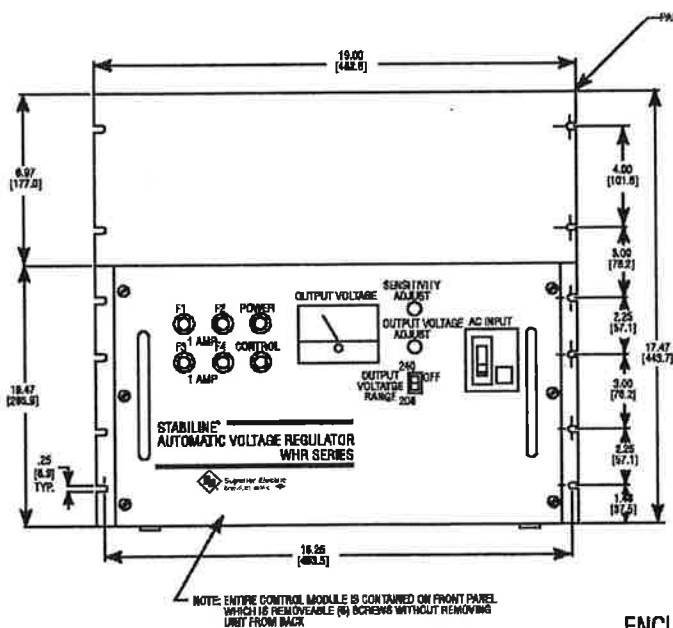
SCHEMATIC DIAGRAM



NOTE: TOP VIEW SAME FOR BOTH R1 AND R21 ENCLOSURES



ENCLOSURE R1



ENCLOSURE R2

DIMENSIONS



WARRANTY AND LIMITATION OF LIABILITY

Superior Electric, Bristol, Connecticut, warrants to the first end user purchaser (the "purchaser") of equipment manufactured by Superior Electric that such equipment, if new, unused and in original unopened cartons at the time of purchase, will be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from Superior Electric's factory or a warehouse of Superior Electric in the event that the equipment is purchased from Superior Electric or for a period of one year from the date of shipment from the business establishment of an authorized distributor of Superior Electric in the event that the equipment is purchased from an authorized distributor.

SUPERIOR ELECTRIC'S OBLIGATION UNDER THIS WARRANTY SHALL BE STRICTLY AND EXCLUSIVELY LIMITED TO REPAIRING OR REPLACING, AT THE FACTORY OR A SERVICE CENTER OF SUPERIOR ELECTRIC, ANY SUCH EQUIPMENT OF PARTS THEREOF WHICH AN AUTHORIZED REPRESENTATIVE OF THE COMPANY FINDS TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP UNDER NORMAL USE AND SERVICE WITHIN SUCH PERIOD OF ONE YEAR. SUPERIOR ELECTRIC RESERVES THE RIGHT TO SATISFY SUCH OBLIGATION IN FULL BY REFUNDING THE FULL PURCHASE PRICE OF ANY SUCH DEFECTIVE EQUIPMENT. This warranty does not apply to any equipment which has been tampered with or altered in any way, which has been improperly installed or which has been subject to misuse, neglect or accident.

THE FOREGOING WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, and of any other obligations or liabilities on the part of Superior Electric; and no person is authorized to assume for Superior Electric any other liability with respect to equipment manufactured by Superior Electric. Superior Electric shall have no liability with respect to equipment not of its manufacture. SUPERIOR ELECTRIC SHALL HAVE NO LIABILITY WHATSOEVER IN ANY EVENT FOR PAYMENT OF ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR INJURY TO ANY PERSON OR PROPERTY.

Written authorization to return any equipment or parts thereof must be obtained from Superior Electric. Superior Electric shall not be responsible for any transportation charges.

IF FOR ANY REASON ANY OF THE FOREGOING PROVISIONS SHALL BE INEFFECTIVE, SUPERIOR ELECTRIC'S LIABILITY FOR DAMAGES ARISING OUT OF ITS MANUFACTURE OR SALE OF EQUIPMENT, OR USE THEREOF, WHETHER SUCH LIABILITY IS BASED ON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, SHALL NOT IN ANY EVENT EXCEED THE FULL PURCHASE PRICE OF SUCH EQUIPMENT.

Any action against Superior Electric based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment, or the use thereof, must be commenced within one year after the cause of such action arises.

The right to make engineering refinements on all products is reserved. Dimensions and other details are subject to change.
