

INSTRUCTIONS
for
STABILINE®
Automatic Voltage Regulators

WHR22*D* Series**
Single Phase, Three Wire
240/120 Volt
Individual Phase Control

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

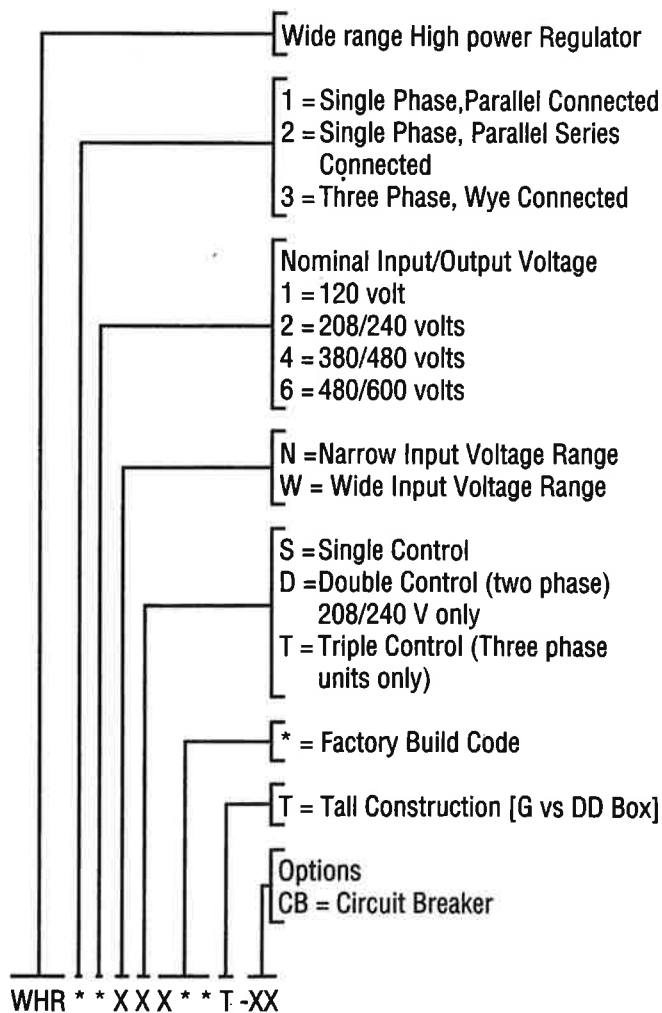
WHR22*D*** Series STABILINE® Automatic Voltage Regulators are single-phase, three-wire 240/120 volt, fast acting electromechanical regulators with ratings from 5 to 500 kVA. WHR Series units regulate each line-to-neutral voltage independently. They have an analog electronic control section for each phase, and have a power section for each phase consisting of one or more motor driven, limited range POWERSTAT® Variable Transformers. Units with the suffix -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 unit.

Advantages of all WHR series regulators include high efficiency (99% typical), high overload capacity and low impedance. They 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 TYPE NUMBER

The model number for 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:

WHR TYPE NUMBERING SYSTEM



1.3 THEORY OF OPERATION

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

Each of the two solid-state control units detects one of the line to neutral output voltages and continually compares it to the output and accuracy settings selected by the user. If either line to neutral voltage is out of specifications, the control unit on that phase drives the POWERSTAT variable transformer on that phase, by means of a synchronous motor, to the required new position.

SECTION 2.0 : INSTALLATION

2.1 TRANSPORTING THE REGULATOR

Due to its weight and size, proper lifting procedures must be followed when transporting the unit and moving it into the location where it is to be installed.

The proper method for moving these units is to place a forklift under the base. A heavy frame is provided in this area to allow lifting the unit in this manner without damage. The 26 inch (559 mm) wide units can also be lifted by removing the top cover and using the lifting eyes provided in the sides of the cabinet.

2.2 MECHANICAL INSTALLATION

The regulator is designed for floor mounting. When mounting the unit, allow a minimum clearance of 4 inches (100 mm) behind the unit for proper ventilation.

2.3 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 front panel of the regulator must be removed to allow access to the input and load terminals. To remove a panel, use a flat blade screw driver to release the fasteners which hold the front panel in place, and lift the panel off the base. A full range of knockouts is provided in the base and rear panel of the unit for wire entry and exit.

On units with an input circuit breaker, input power connections are made directly to the circuit breaker. On units without a circuit breaker, the input connections are located on the POWERSTAT variable transformer. The input power connections are labeled: L1, L2. Load connections are made to the POWERSTAT variable transformer, and are labeled: T1, T2.

The input-output neutral is located on the POWERSTAT variable transformer and is labeled NEUT. The input neutral must be connected.

The ground terminal is a ground stud on the cabinet wall, and

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 each control module to match your application by placing the switch on each control module in either 120 volt position (Both 120 volt positions are the same. Two positions are used so as to standardize the switch). The Output Voltage Adjustment potentiometers 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, place the front panel(s) in position and tighten the fasteners.

Energize the regulator power source and, if provided, place the regulator's circuit breaker in the "ON" position. The voltmeters should indicate the output voltage (approximately 115 volts line-to-neutral), and the POWER pilot lamps and the CONTROL pilot lamps 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

Only units with the suffix -CB at the end of their type numbers are provided with an input circuit breaker. The circuit breaker controls the input power to the regulator and is located on the front of the unit. Placing the circuit breaker in the "ON" position will energize the regulator.

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

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

4.1.3 CONTROL Pilot Lamps, A1-DS2 (On Front Panel)

This lamp, one for each phase, lights when the control unit sense voltage for that phase is energized. The control sense voltage must be energized for automatic correction of voltage changes to occur.

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

These meters show the line-to-neutral output voltages. There is one meter for each phase.

4.1.5 Output Voltage Range Toggle Switches, A1-S1 (Behind Front Panel)

These are three-position switches, and there is one switch for each control module. When a switch is in the center (off) position, the control unit sense voltage for that phase is disconnected, and automatic correction of voltage changes on that phase 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 switches (one for each phase) should be placed in the position that corresponds with the desired nominal output voltage for YOUR application. Since these are single voltage units, both voltage positions are the same (120 volts).

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

These potentiometers set the line-to-neutral output voltages, one for each phase. Their adjustment range is approximately $\pm 10\%$ of selected nominal output voltage.

4.1.7 SENSITIVITY Potentiometers A1-R2 (Behind Front Panel)

These potentiometers adjust the regulator's output accuracy; i.e., set how much the output voltage will change before the unit will correct. There is a SENSITIVITY potentiometer for each phase. Follow the instructions in Section 4.2 to adjust the sensitivity.

4.2 SETTING THE OUTPUT VOLTAGE AND SENSITIVITY POTENTIOMETERS

Normally, the WHR regulator should not be operated without the front panel(s) of the cabinet in place. However, during the initial operation of the regulator the front panel can be removed to allow setting the OUTPUT VOLTAGE and SENSITIVITY potentiometers. To set these potentiometers:

4.2.1 Energize the regulator power source and, if provided, 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 on each phase to the desired nominal output voltage position. Check the voltmeters, these indicate the line to neutral output voltages.

4.2.2 To adjust the output voltage on any phase, turn the OUTPUT VOLTAGE potentiometer clockwise to increase or counterclockwise to decrease the output voltage, as indicated on the voltmeter for that phase.

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

Turning a SENSITIVITY control clockwise increases the sensitivity to maximum (1/2% to 1% output voltage accuracy). For maximum sensitivity, turn the SENSITIVITY control on one phase clockwise to the point where the variable transformer on that phase begins to hunt. Turn the control counterclockwise (CCW) until the hunting stops. Turn the control an additional 1/8 turn CCW. Repeat for the other phase.

4.2.4 Replace the front cover(s).

4.3 REMOTE SENSING

Normally, these regulators sense and regulate each line-to-neutral voltage at the regulator's output terminals. In some cases better control can be obtained by regulating 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 each 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 of the corresponding line to neutral voltage (120 volts) to terminals 7 and 9 on each control module.

Each line to neutral voltage that is sensed must be connected to the control module that controls that phase. If a control unit is not sensing the voltage it controls, the POWERSTAT variable transformer connected to that control unit will drive to the end of its travel when it attempts to correct the voltage it is not controlling. This will result in incorrect output voltages.

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 operation, 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 on page 5 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 on page 5 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	0%, -20%	0%, -33%
(% OF SET OUTPUT VOLTAGE)		
MAXIMUM LOAD CURRENT	77%	72%
(% OF NORMAL RATING)		
NOMINAL INPUT VOLTAGE	200/100 V, 50/60 HZ 240/120 V, 60 HZ	200/100 V, 50/60 HZ 240/120 V, 60 HZ
ALL BUCK OPERATION		
INPUT VOLTAGE RANGE	+25%, 0%	+50%, 0%
(% OF SET OUTPUT VOLTAGE)		
MAXIMUM LOAD CURRENT	100%	100%
(% OF NORMAL RATING)		
NOMINAL INPUT VOLTAGE	15%	25%
(MAX ALLOWABLE INCREASE)		

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 variable transformer center tube(s) to the shaft and the set screws that hold the radiator to the center tube. Adjust as needed.

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

WHR Series 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, replacement parts list and rating charts for further information on the unit.

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

6.2 See if the POWER pilot lamps are on. If a lamp is not on, there is no power to the regulator, or fuses F1 & F2 (POWER LIGHT-MOTOR) on that control module 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 voltmeters. If a meter shows zero output voltage, check the input line, input circuit breaker, control module fuses F3 and F4 (CONTROL fuses), remote sense wiring if applicable (see section 4.3), and input connections.

6.4 Check the CONTROL pilot lamps. If one is not lit, check it's VOLTAGE RANGE 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 4.2.

6.6 If a motor drives a 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, and if applicable, check the remote sense wiring (see section 4.3).

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 from the one 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 a motor drive is functioning correctly: Refer to the unit's schematic diagram and: deenergize the input line to the regulator; place the output voltage RANGE switches in the center (off) position; and remove POWER LIGHT - MOTOR fuses F1 and F2 on each control module.

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 it CCW when viewed from the top) until it

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

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 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.

RATING CHART
SINGLE PHASE 3 WIRE - 240/120 VOLTS - NARROW RANGE - INDIVIDUAL CONTROL

INPUT/OUTPUT VOLTAGE (NOMINAL)
 LINE-LINE & LINE-NEUTRAL FREQUENCY (HZ) SELECTABLE OUTPUT VOLTAGE
 240 V 120 V 50/60 216 TO 264

INPUT CORRECTION RANGE: +7%, -15% OF SELECTED OUTPUT VOLTAGE

OUTPUT ACCURACY: SELECTABLE 0.5% TO 3 %

RATED OUTPUT AMPS	RATED KVA AT 240 V	MODEL NUMBER	MAX INPUT AMPS	RECOVERY TIME (SEC/% @ 60 HZ)	APPROXIMATE WEIGHT		CABINET
					POUNDS NET	KILOGRAMS NET	
30	7.2	WHR22NDD21-CB	37	0.026	312	142	C
50	12	WHR22NDE21-CB	60	0.026	384	174	C
80	19	WHR22NDF21-CB	100	0.056	384	174	C
160	38	WHR22NDF22-CB	200	0.056	605	275	E
240	57	WHR22NDF23	300	0.056	806	366	F
320	75	WHR22NDF24	400	0.084	1176	534	DD
400	95	WHR22NDF25	500	0.084	1380	627	EE
480	115	WHR22NDF26	600	0.084	1530	695	EE
560	130	WHR22NDF27	700	0.110	1778	807	FF
640	150	WHR22NDF28	800	0.110	1928	875	FF
720	175	WHR22NDF29	900	0.110	2154	978	GG
800	190	WHR22NDF45	1000	0.170	2680	1217	2-EE
960	225	WHR22NDF46	1200	0.170	3176	1442	2-FF
1120	250	WHR22NDF47	1400	0.170	3476	1578	2-FF
1280	300	WHR22NDF48	1600	0.340	3776	1714	2-FF
1450	350	WHR22NDF66	1800	0.340	4076	1851	2-FF
1680	400	WHR22NDF67	2100	0.340	4526	2055	2-FF
1900	450	WHR22NDF68	2400	0.340	4976	2259	2-FF
2150	500	WHR22NDF69	2700	0.340	5578	2532	2-GG

RATING CHART
SINGLE PHASE 3 WIRE - 240/120 VOLTS - WIDE RANGE - INDIVIDUAL CONTROL

INPUT/OUTPUT VOLTAGE (NOMINAL)

LINE-LINE & LINE-NEUTRAL
 240 V 120 V

FREQUENCY (HZ)
 50/60

SELECTABLE OUTPUT VOLTAGE
 216 TO 264

INPUT CORRECTION RANGE: +12.5%, -25% OF SELECTED OUTPUT VOLTAGE

OUTPUT ACCURACY: SELECTABLE 1% TO 3 %

RATED OUTPUT AMPS	RATED KVA AT 240 V	MODEL NUMBER	MAX INPUT AMPS	RECOVERY TIME (SEC/% @ 60 HZ)	APPROXIMATE WEIGHT		CABINET		
					POUNDS NET	POUNDS SHIP		KILOGRAMS NET	KILOGRAMS SHIP
21	5	WHR22WDD21-CB	30	0.025	312	362	142	164	C
42	10	WHR22WDE21-CB	60	0.025	384	434	174	197	C
72	17	WHR22WDF21-CB	100	0.066	366	416	166	189	C
145	35	WHR22WDF22-CB	200	0.066	569	616	258	280	E
215	50	WHR22WDF23	300	0.066	744	794	338	360	F
290	70	WHR22WDF24	400	0.099	1104	1204	501	547	DD
360	85	WHR22WDF25	500	0.099	1290	1390	586	631	EE
430	100	WHR22WDF26	600	0.099	1422	1522	646	691	EE
500	120	WHR22WDF27	700	0.130	1652	1752	750	795	FF
575	135	WHR22WDF28	800	0.130	1784	1884	810	855	FF
650	150	WHR22WDF29	900	0.130	1992	2092	904	950	GG
720	175	WHR22WDF45	1000	0.200	2500	2700	1135	1226	2-EE
850	200	WHR22WDF46	1200	0.200	2960	3160	1344	1435	2-FF
1000	240	WHR22WDF47	1400	0.200	3224	3424	1464	1554	2-FF
1150	275	WHR22WDF48	1600	0.390	3488	3688	1584	1674	2-FF
1300	300	WHR22WDF66	1800	0.390	3752	3952	1703	1794	2-FF
1500	350	WHR22WDF67	2100	0.390	4148	4348	1883	1974	2-FF
1700	400	WHR22WDF68	2400	0.390	4544	4744	2063	2154	2-FF
1900	450	WHR22WDF69	2700	0.390	5092	5292	2312	2403	2-GG

REPLACEMENT PARTS for WHR SERIES
STABILINE® AUTOMATIC VOLTAGE REGULATORS
208/240 VOLT WITH INDIVIDUAL PHASE CONTROL

The following parts are supplied on all models covered by this instruction manual.

<u>Reference Symbol</u>	<u>Description</u>	<u>Part Number</u>
A1	Control Module	213243-001
A1-A1	Control Unit, CU-80	209066-001
A1-DS1, DS2	Light, Indicator	052095-002
A1-F1, F2, F3, F4	Fuse, 1 Ampere, 250 Volt	104364-003
A1-M1	Voltmeter	212917-004
A1-R1	Potentiometer, 100 Ohm	103159-011
A1-R2	Potentiometer, 10k Ohm	103159-024
A1-S1	Switch, 3-Position	144665-001
A1-TB1	Terminal Strip, 9-Terminal	104051-009

The following parts are only supplied on units having type numbers that end with the following characters: 27, 28, 29, 47, 48, 66, 67, 68 and 69.

<u>Reference Symbol</u>	<u>Description</u>	<u>Part Number</u>
A2	Auxiliary Power Module	217487-002
A2-F1, F2	Fuse, 1 Ampere, 250 Volt	104364-003
A2-T1	Transformer, Step Down	006736-000
A2-TB1	Terminal Strip, 3-Terminal	007120-016
B2	Fan, 120 Volt	212137-001

REPLACEMENT PARTS, CONT'D.

Model Number	B1, Motor	C1, Motor Capacitor	CB1, Circuit Breaker	R1, Motor Resistor	S1, S2, Limit Switch	T1, POWERSTAT Variable Transformer	T2, Paralleling Choke	TB1, Terminal Strip	Replacement Brush
WHR22NDD21-CB	208168-027	207419-017	213927-001	102088-002	058743-001	216969-002	-	027375-007	176012-001
WHR22NDE21-CB	102154-027	207419-041	213927-003	103788-018	058743-001	216973-002	-	027375-007	017702-003
WHR22NDF21-CB	102154-027	207419-041	213927-005	103788-018	058743-001	216513-003	-	027375-007	017702-011
WHR22NDF22-CB	102154-027	207419-041	213757-002	103788-018	058743-001	216513-003	006724-000	027375-007	017702-011
WHR22NDF23	102154-027	207419-041	-	103788-018	058743-001	216513-003	006724-000	027375-007	017702-011
WHR22NDF24	400022-070	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF25	400022-070	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF26	400022-070	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF27	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF28	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF29	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF45	400022-070	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF46	400022-070	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF47	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF48	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF66	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF67	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF68	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22NDF69	400022-069	207419-041	-	103788-018	005214-000	216513-003	006724-000	007037-007	017702-011
WHR22WDD21-CB	208168-027	207419-017	213927-009	102088-002	058743-001	216969-001	-	027375-007	176012-001
WHR22WE21-CB	102154-027	207419-041	213927-003	103788-018	058743-001	216973-001	-	027375-007	017702-003
WHR22WDF21-CB	102154-027	207419-041	213927-005	103788-018	058743-001	212995-001	-	027375-007	017702-011
WHR22WDF22-CB	102154-027	207419-041	213757-002	103788-018	058743-001	212995-001	006724-000	027375-007	017702-011
WHR22WDF23	102154-027	207419-041	-	103788-018	058743-001	212995-001	006724-000	027375-007	017702-011
WHR22WDF24	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF25	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF26	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF27	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF28	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF29	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF45	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF46	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF47	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF48	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF66	400022-070	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF67	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF68	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011
WHR22WDF69	400022-069	207419-041	-	103788-018	005214-000	212995-001	006724-000	027375-007	017702-011

SPECIFICATIONS

Electrical

Efficiency 97% minimum, 99% typical @ full load
Distortion less than 0.25% added total harmonic distortion
Surge Withstand Capability 6000 volts per IEEE 587-1980, Location Category B

Environmental

Temperature Operating Average 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 24 hour period may be increased to 40°C (104°F) and maximum temperature may be increased to 50°C (122°F) if load is decreased to 90% of standard rating. Minimum temperature is -20°C (-4°F).

Storage -40°C to +70°C (-40°F to +158°F)
Humidity, Operating and Storage 10% to 75% relative humidity continuous
75% to 90% relative humidity intermittent, noncondensing

Altitude

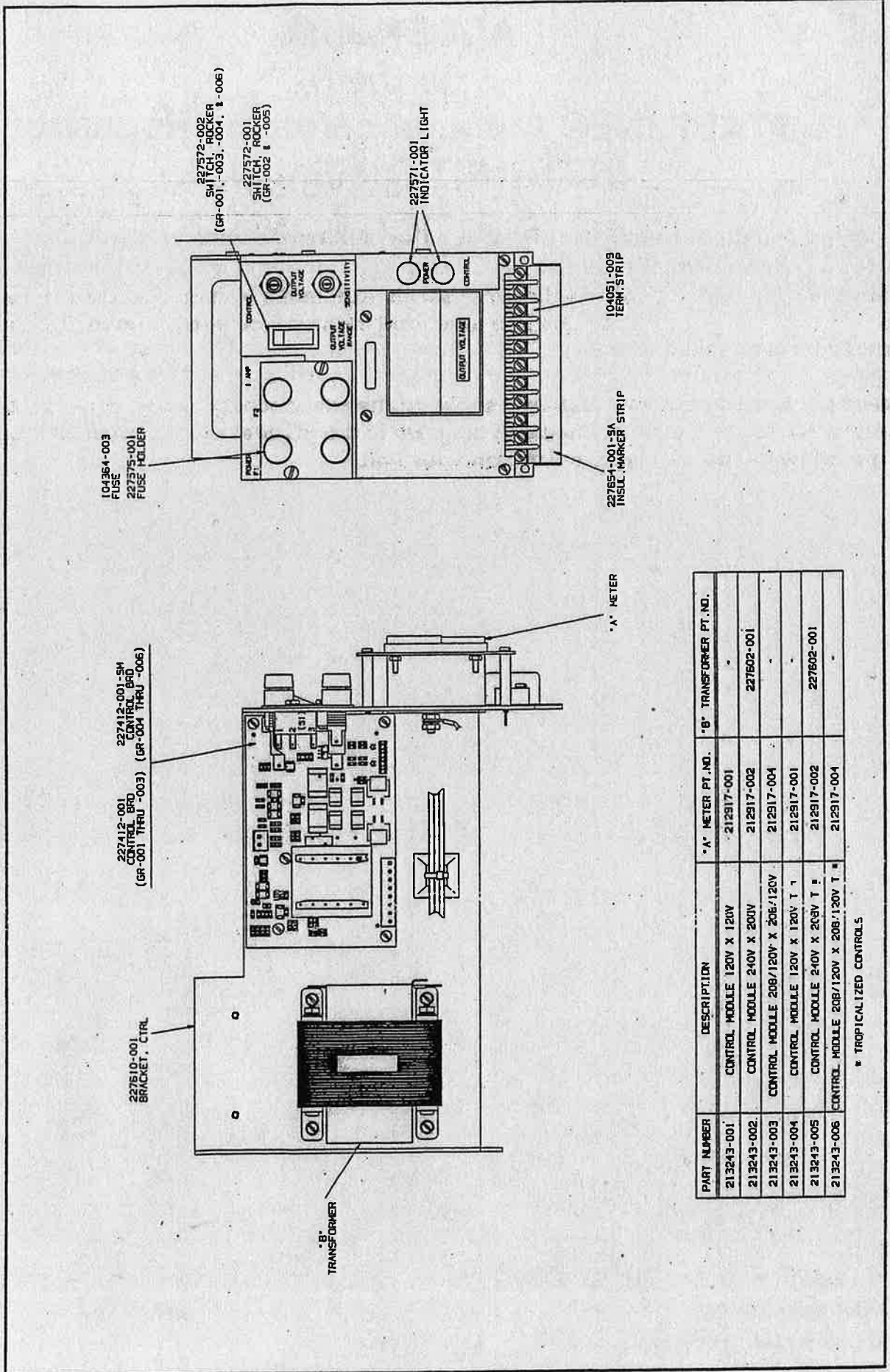
Operating 6,600 feet (2,000 meters) max.
Storage 50,000 feet (15,000 meters) max.

**ADDENDUM
to the
STABILINE® Automatic Voltage Regulator
INSTRUCTION MANUAL**

The control module assembly for the WHR series Automatic Voltage Regulators has been updated as shown here. Please use this amended information when referencing the control modules for this unit.

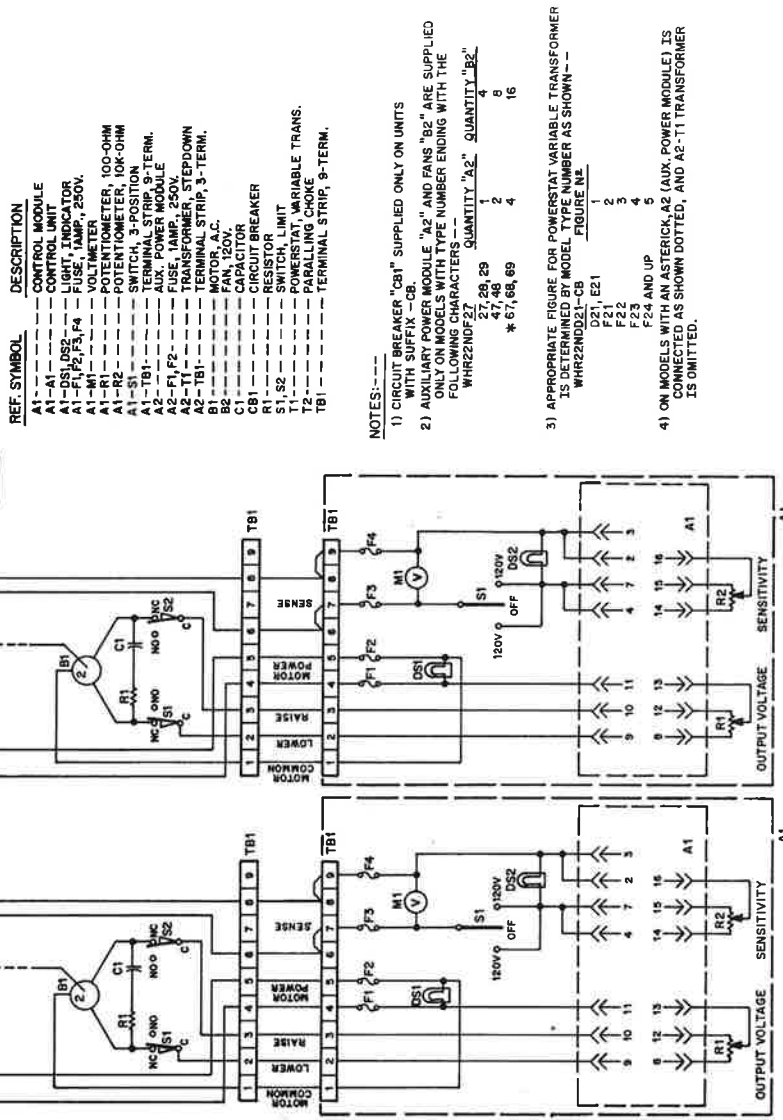
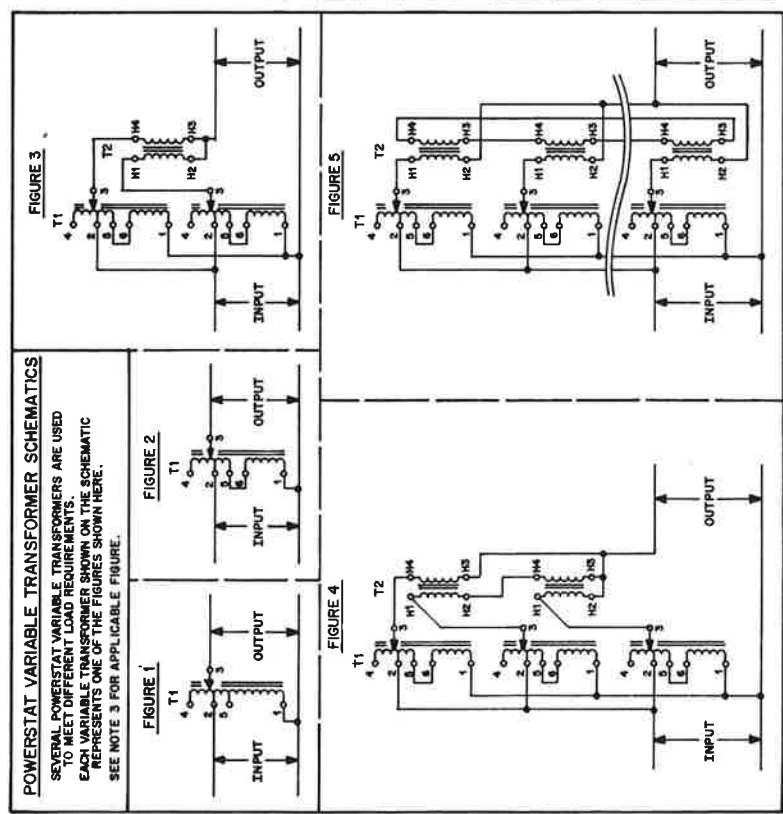
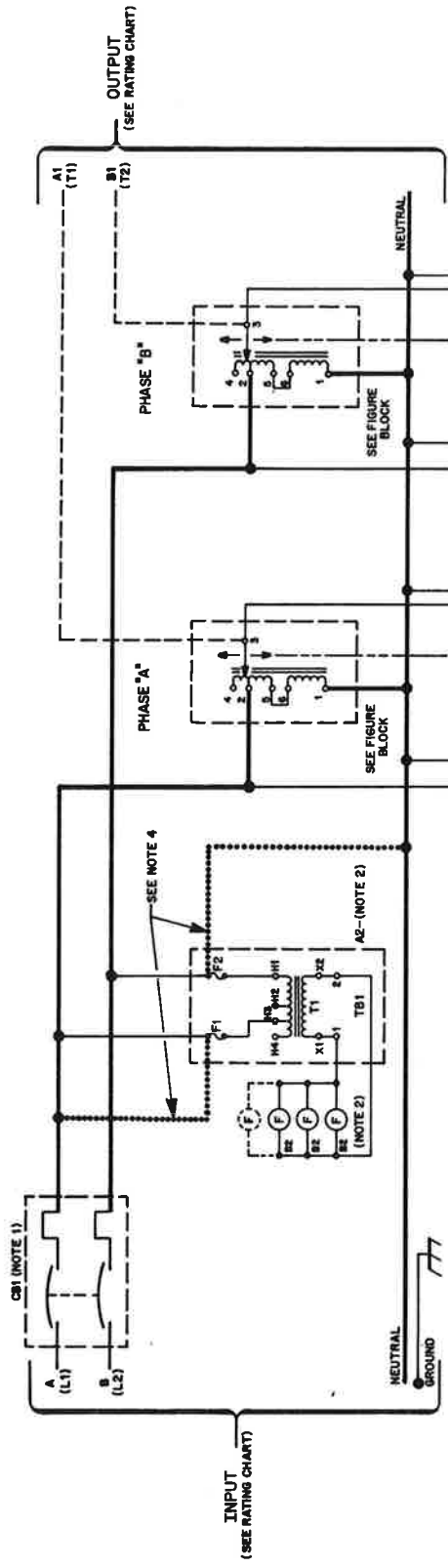
A schematic is supplied with each unit showing the exact configuration of the unit. Use this schematic for reference. The schematic diagram in the manual shows a typical regulator and may not show the options as provided on your unit.

CONTROL MODULE ASSEMBLY



PART NUMBER	DESCRIPTION	*A* METER PT. NO.	*B* TRANSFORMER PT. NO.
213243-001	CONTROL MODULE 120V X 120V	212917-001	-
213243-002	CONTROL MODULE 240V X 200V	212917-002	227602-001
213243-003	CONTROL MODULE 208/120V X 206/120V	212917-004	-
213243-004	CONTROL MODULE 120V X 120V T 1	212917-001	-
213243-005	CONTROL MODULE 240V X 203V T 1	212917-002	227602-001
213243-006	CONTROL MODULE 208/120V X 206/120V T 1	212917-004	-

* TROPICALIZED CONTROLS



REF. SYMBOL	DESCRIPTION	
A1	CONTROL MODULE	
A1	CONTROL UNIT	
A1	DS1, DS2	LIGHT, INDICATOR
A1	F1, F2, F3, F4	FUSE, 1 AMP., 250V.
A1	R1	POTENTIOMETER, 10K-OHM
A1	R2	POTENTIOMETER, 10K-OHM
A1	S1	SWITCH, 3-POSITION
A1	TB1	TERMINAL STRIP, 9-TERM.
A2	F1, F2	AUX. POWER MODULE
A2	T1	TRANSFORMER, 200/250V
A2	TB1	TERMINAL STRIP, 3-TERM.
B1		MOTOR, A.C.
B1		FAN, 120V.
C1		CAPACITOR
CB1		CIRCUIT BREAKER
S1, S2		SWITCH, LIMIT
T1		POWERSTAT, VARIABLE TRANS.
T2		PARALLING CHOKE
TB1		TERMINAL STRIP, 9-TERM.

NOTES:--

- 1) CIRCUIT BREAKER "CB1" SUPPLIED ONLY ON UNITS WITH SUFFIX "CB"
- 2) AUXILIARY POWER MODULE "A2" AND FANS "B2" ARE SUPPLIED ONLY ON MODELS WITH TYPE NUMBER ENDING WITH THE FOLLOWING CHARACTERS -- QUANTITY "A2" QUANTITY "B2"

WHR22NDF 27	QUANTITY "A2"	QUANTITY "B2"
27, 28, 29	1	4
47, 48, 69	2	8
* 67, 68, 69	4	16

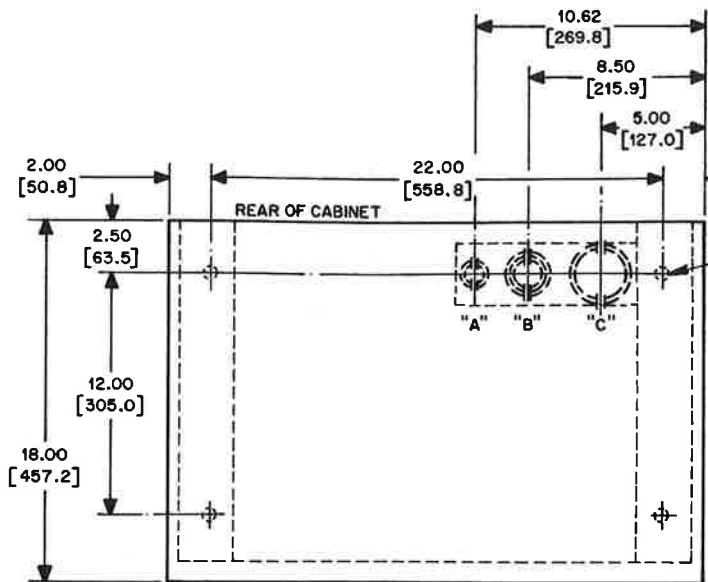
3) APPROPRIATE FIGURE FOR POWERSTAT VARIABLE TRANSFORMER IS DETERMINED BY MODEL TYPE NUMBER AS SHOWN --

WHR22NDF 21-CB	FIGURE NO.
D21, E21	1
F21	2
F22	3
F23	4
F24 AND UP	5

4) ON MODELS WITH AN ASTERISK, A2 (AUX. POWER MODULE), IS CONNECTED AS SHOWN DOTTED, AND A2-T1 TRANSFORMER IS OMITTED.

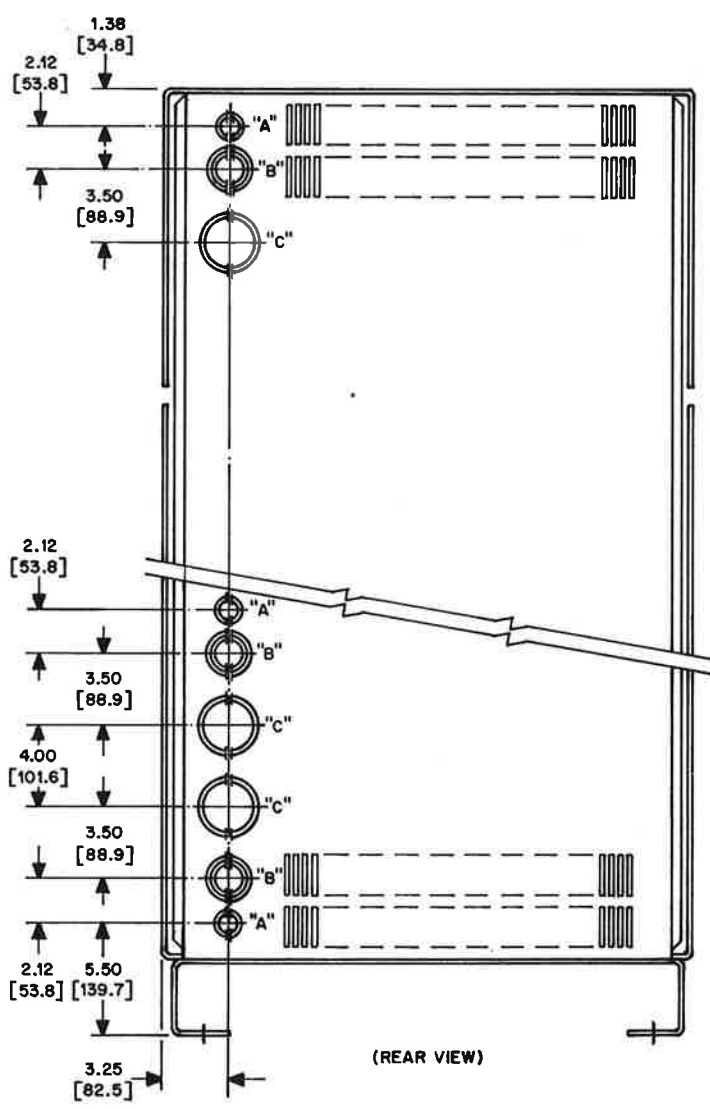
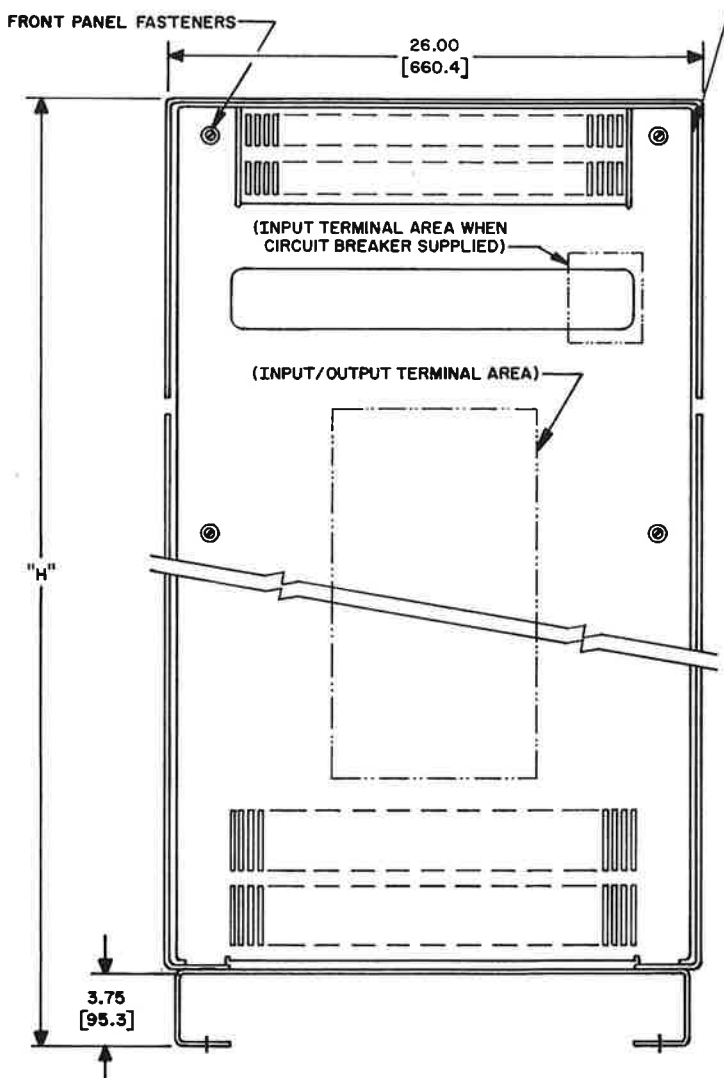
SCHEMATIC DIAGRAM

DIMENSIONS



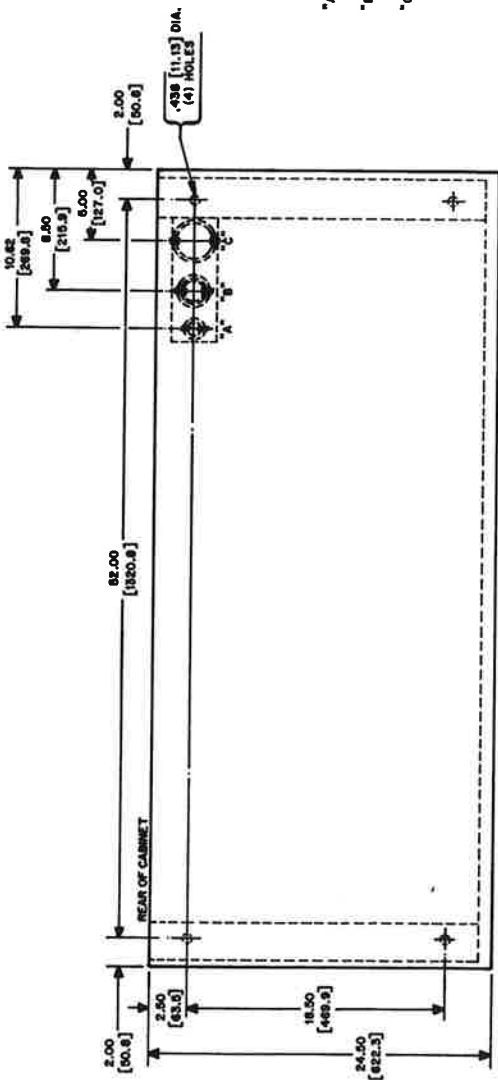
- "A" - .88 [22.3] & 1.12 [28.5] CONCENTRIC KNOCKOUTS
- "B" - 1.38 [35.0], 1.75 [44.5] & 2.00 [50.8] CONCENTRIC KNOCKOUTS
- "C" - 2.50 [63.5] & 3.00 [76.2] CONCENTRIC KNOCKOUTS

2.00 [50.8] DIA. LIFTING HOLES. ACCESS UNDER TOP COVER.

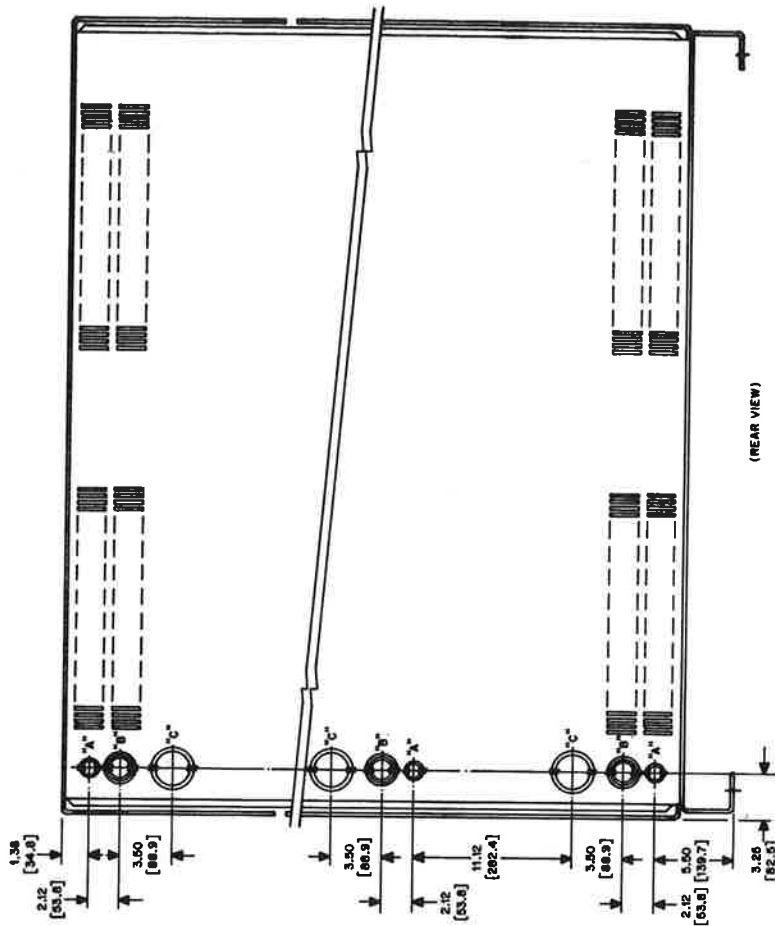
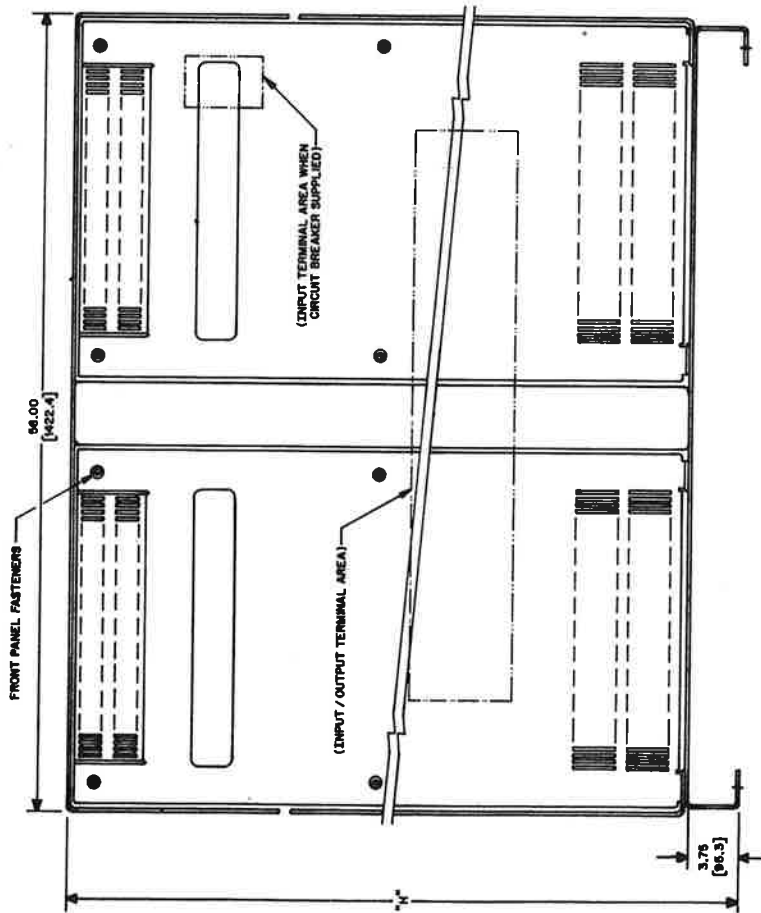


CABINET DESIGNATION	"H"
B	24.25 [616.0]
C	34.25 [870.0]
D	46.25 [1174.8]
E	56.25 [1428.8]
F	74.25 [1886.0]
G	88.25 [2141.6]

Cabinets B through G



- *A* - .88 [22.3] @ 1.12 [28.3] CONCENTRIC KNOCKOUTS
- *B* - 1.38 [35.0] @ 1.75 [44.8] @ 2.00 [50.8] CONCENTRIC KNOCKOUTS
- *C* - 2.00 [50.8] @ 3.00 [76.2] CONCENTRIC KNOCKOUTS



CABINET DESIGNATION	"H"
DD	46.25 [1174.8]
EF	54.25 [1382.6]
FF	74.25 [1886.0]
GG	88.25 [2241.6]

Cabinets DD through GG

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The Superior Electric Company (the "Company"), Bristol, Connecticut, warrants to the first end user purchaser (the "purchaser") of equipment manufactured by the Company 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 the Company's factory or a warehouse of the Company in the event that the equipment is purchased from the Company or for a period of one year from the date of shipment from the business establishment of an authorized distributor of the Company in the event that the equipment is purchased from an authorized distributor.

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