GEK-36393B

INSTRUCTIONS

STATOTROL* JR DC DRIVES

3HP AND 5 HP

3SJRB AND 3SJRC SERIES

*Trademark of General Electric Co., USA

GENERAL ELECTRIC

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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company.

STATOTROL JR DC DRIVES 3HP AND 5 HP

INTRODUCTION AND DESCRIPTION

This manual contains general information on General Electric Statotrol JR DC drives. Additional information and diagrams may be supplied with the equipment when necessary. The Statotrol JR drive is a compact, reliable, full wave DC motor control specially designed for applications requiring only the basic start, stop, and speed control functions. The motor is a shunt wound field DC motor designed for use with a full wave phase controlled SCR power supply. Standard features of the Statotrol JR drive include speed control, protective current limit, line circuit breaker, stop-start switch, and maximum speed and minimum speed adjustments.

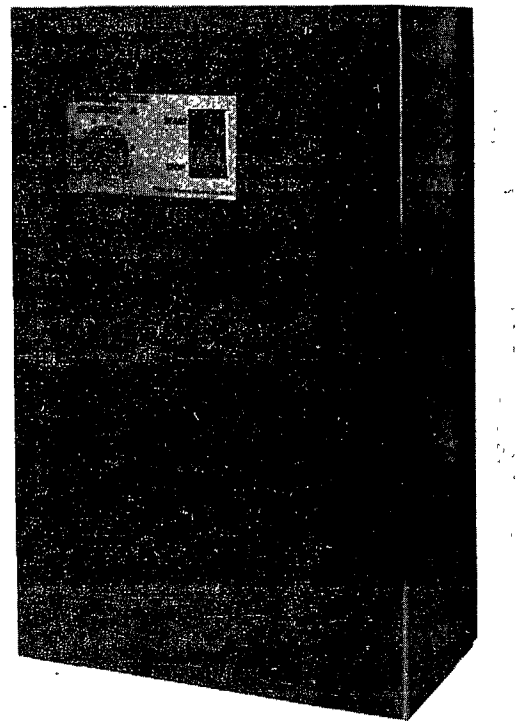


Figure 1. Statotrol JR Fullwave DC Motor Control

RECEIVING AND STORAGE

As soon as the equipment is received, it should be unpacked and examined for damage sustained in transit. If damage is evident, a damage claim should be filed immediately with the transportation company, and the local General Electric Co. Sales Office should be promptly notified.

If the equipment is not to be used as soon as it is unpacked, it should be stored in a clean, dry place and protected against accidental damage. Avoid storage in a location where construction work is in progress.

INSTALLATION

CONTROLLER INSTALLATION

The Statotrol JR Control should be wall mounted in a location which will allow free flow of cooling air over the fins on the heat sink. Maximum ambient temperature around the controller must not exceed 40°C (104°F). Figures 2 and 3 give mounting dimensions and outline dimensions. It is recommended that two or more inches of clearance be provided all around the controller to assure adequate air flow for cooling.

MOTOR INSTALLATION

The motor must be firmly mounted and properly aligned to prevent vibration. Excessive vibration causes rapid wear and audible noise. Heat dissipated by the motor will raise the ambient temperature around the motor if the motor is installed in an enclosed space. Since a lower ambient temperature will extend the motor life, it is always desirable to mount the motor in a well ventilated location. The motor should never be used where the ambient temperature exceeds 40°C (104°F) unless an oversized motor has been specially selected. Refer to the instruction book provided with the motor for specific installation instructions.

When 5 HP TENV motors (258ATC and 259ATC frames) are coupled to C Face gear reducers, it may be necessary to support the motor weight with shims under the motor feet. Check the specifications on the reducers to be used.

WARNING

If the motor is accessable while it is running, a protective guard should be installed around all exposed rotating parts.

ELECTRICAL CONNECTIONS

PROPER LINE VOLTAGE CONNECTION

The controller operates on 50/60 Hz 230 VAC. A transformer is required where supply voltage deviates more than 10% from the controller rating.

A calibration resistor, 140R must be removed from the main component board if 50 Hz power is to be used. Refer to Figure 6.

GROUNDING

WARNING

Personnel safety considerations and the National Electric Code require that electrical apparatus enclosures be solidly connected to building ground.

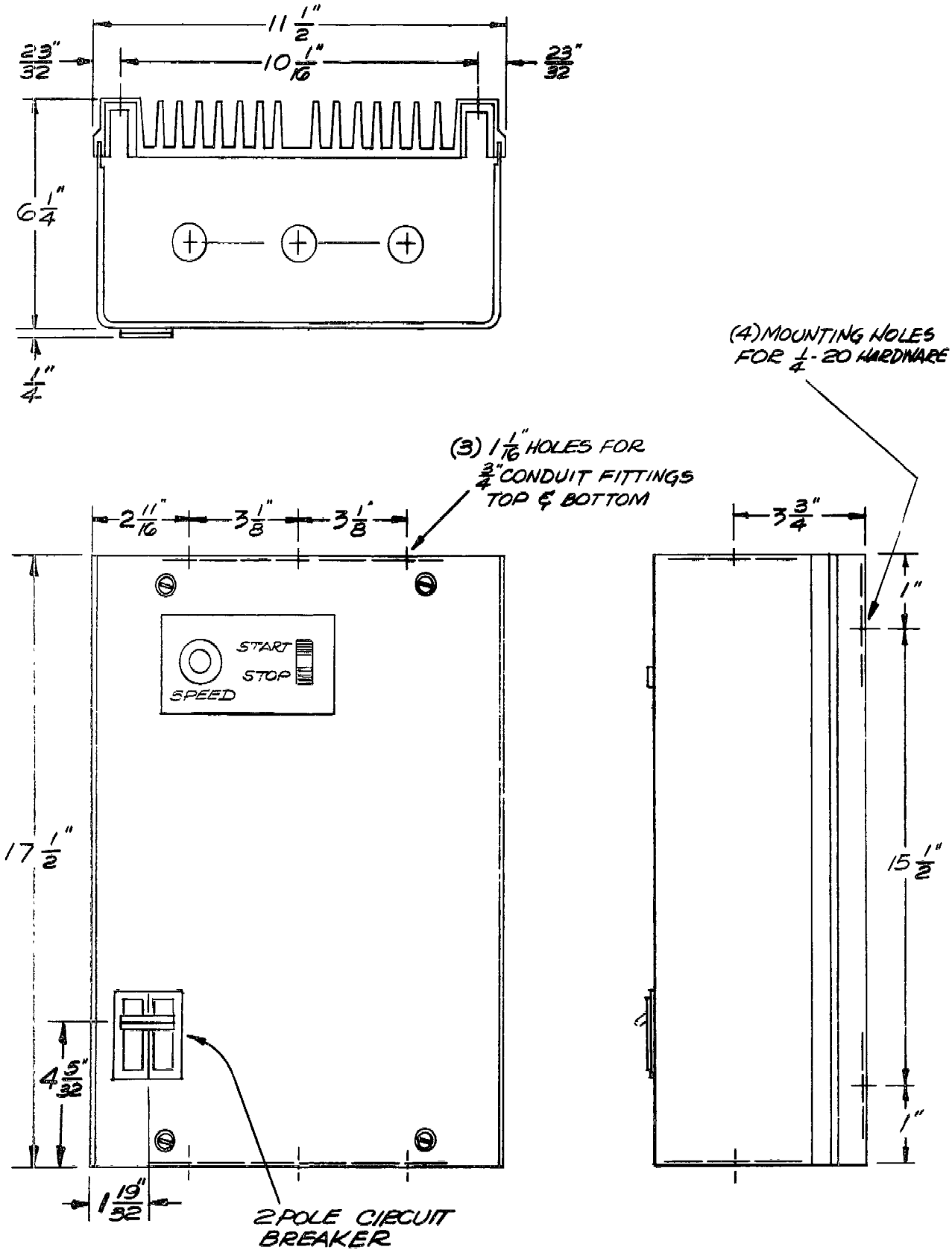


Figure 2. Outline and Mounting Dimensions for Enclosed Controller (3 and 5 HP) With Local Control Station

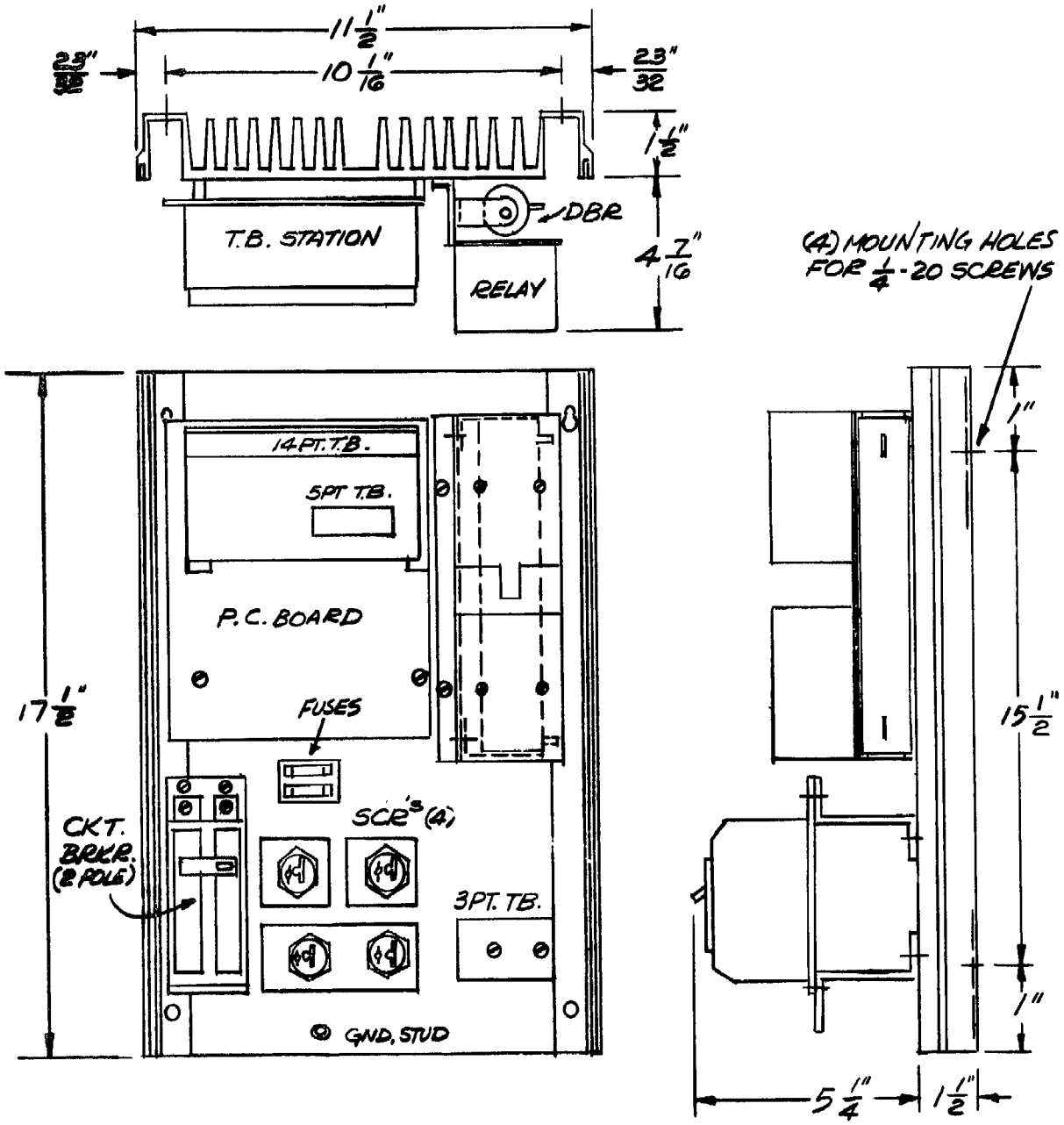


Figure 3. Outline and Mounting Dimensions for Chassis Mount Controller (3 and 5 HP) for use with Remote Control Station

The necessary wire gauge of the ground wire is determined by the rating of the branch circuit breaker. Connect a suitably grounded lead to the ground connection terminal provided in the controller enclosure.

WARNING

Proper motor grounding is also essential for personnel safety. Do not depend upon motor mounting bolts to ground the motor frame. A 1/4-20 bolt in a tapped hole in the motor endshield is provided for the ground connection.

POWER WIRING

Connect 230 V 50 or 60 Hz lines to the controller circuit breaker. The AC power must not vary more than 10% from the nominal 230 volts. Resistor 140R (see figure 5) must be cut out of the circuit before 50 Hz power is connected. Table 1 gives minimum required circuit breaker and wire sizes.

Figure 4 shows the wiring diagram for the power connections. When the motor is connected as shown in Figure 4, the motor will rotate CCW as viewed from the end which has no shaft. Turn off the circuit breaker and reverse leads A1 and A2 for clockwise rotation. All power wires should be kept away from the component board.

CAUTION

A connection error in the power wiring can damage the control. Recheck the connections before power is applied.

If there is any doubt about motor lead identification, the problem can be resolved with a simple resistance check. The motor armature resistance will be about 0.3 ohms to 1 ohm, while field resistance will be about 200 to 500 ohms. There must be no continuity between armature and field.

Refer to the instruction book provided with the motor for specific motor connection instructions. If the motor has leads marked C1 and C2, these leads should be well insulated and left unconnected.

The branch circuit breaker must be large enough to eliminate nuisance tripping and small enough to protect the branch circuit and motor connection conductors. Refer to the National Electric Code (1971, section 310-20) and Table 1 for minimum circuit breaker and wire sizes. Wherever local codes are more restrictive, the local codes take precendence over the National Electric Code. Special requirements exist for installations in hazardous locations and other special situations.

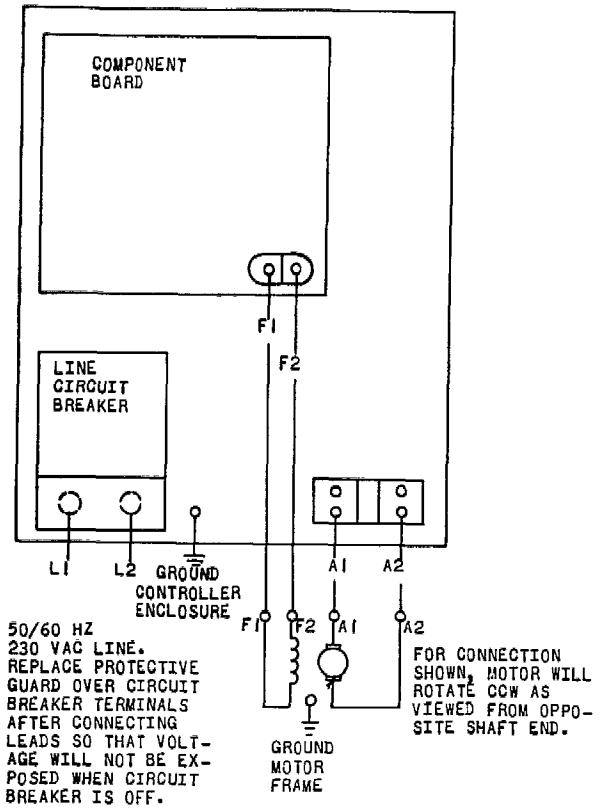


Figure 4. Power Wiring Connection Diagram

A line power isolation transformer must be used when the Statotrol drive is connected to an instrument signal source which is not isolated from ground. When a line power transformer is used, any line switch used to disconnect the controller should be on the load side of the transformer.

REMOTE CONTROL STATION WIRING

If the controller is one of the 3SJRC series, it is intended for use with a remote control station. The remote control station should be connected as shown in figure 5.

The three wires to the stop and start switches are class II control circuits as defined in Article 725 of the National Electric Code (1971).

The speed control potentiometer conductors should be installed in accordance with the Class I control and signal circuit requirements of the code. Wherever local codes are more restrictive, the local codes take precedence.

TABLE 1

RATED HORSEPOWER	MINIMUM WIRE AND CIRCUIT BREAKER SIZE
3 Horsepower	75°C #14 AWG copper wire for motor field 75°C #10 AWG copper wire for line and armature 30 amp circuit breaker
5 Horsepower	75°C #14 AWG copper wire for motor field 75°C #8 AWG copper wire for line and armature 45 amp circuit breaker

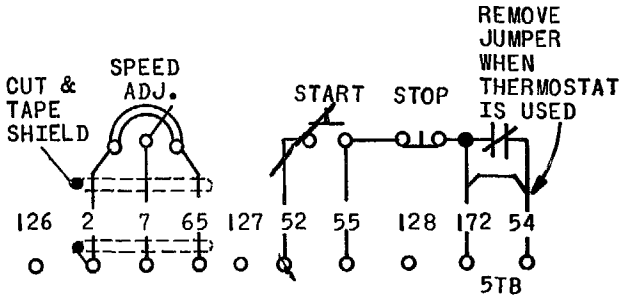


Figure 5. Remote Control Station Connection Diagram

To avoid electrical noise pickup, it is necessary to keep the speed potentiometer wires separate from all other wires. Do not run these wires through conduits with power conductors or relay coil wiring. Do not allow any wiring to contact building ground unless a line power isolation transformer is used. In no case should more than one circuit point be grounded. If speed potentiometer leads are run in shielded cable, the cable must be tied to Ckt. No. 2 at the controller only. The cable shield must be insulated and must not come into contact with building ground at any point.

MOTOR THERMOSTAT CONNECTIONS

Figure 5 shows thermostat connections when a remote control station is used. When a local control station is used, the motor thermostat may be connected to points 54 and 172 on the small terminal board on the side of the control station bracket. Remove the jumper when connecting the thermostat.

PREPOWER CHECKS AND ADJUSTMENTS

WARNING

This section contains cautions and warnings which must be observed during installation of the control. Failure to observe these cautions and warnings may lead to safety hazards or equipment damage. Read this section carefully and make all necessary checks and adjustments before power is applied to the control.

CURRENT LIMIT SETTING

The current limit circuit is factory adjusted for low impedance motors. If a medium or high impedance motor is to be used, the current limit must be adjusted at the time of installation. To set the current limit, first refer to Table 2 and locate the motor which is to be used. After finding the relative impedance of the motor to be used, refer to Figure 6 for instructions on how to position the current limit setting jumper.

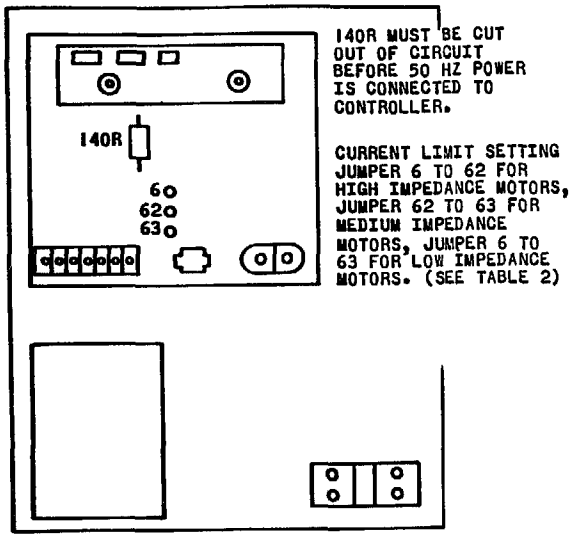


Figure 6. Current Limit Setting and 50 Hz Adjustment

50 CYCLE POWER ADJUSTMENT

The Statotrol JR controller is factory adjusted for use with 60 Hz AC power. If 50 Hz power is to be used, resistor 140 R must be cut out of the circuit before 50 Hz power is applied. See Figure 6 for the location of 140R.

TABLE 2

CURRENT LIMIT SETTINGS FOR 3 HP and 5 HP MOTORS WITH "3SFM....." CATALOG NUMBER ON NAMEPLATE

All motors which do not have "3SFM....." number on nameplate and all 1150 RPM and all 3500 RPM motors.	See special instructions provided with control or consult factory.
3HP and 5HP 2500 RPM dripproof	high impedance motors (jumper 6 to 62)
3HP and 5HP 1750 RPM dripproof and 3HP 2500 RPM TENV	medium impedance motors (jumper 62 to 63)
3HP and 5HP 1750 RPM TENV and 5HP 2500 RPM TENV	low impedance motors (jumper 6 to 63)

MOTOR CHECKS

If the motor is accessable while running, a protective guard should be installed around all exposed rotating parts.

The "Inspection Before Starting" section of the motor instruction book must be carefully followed.

WIRING CHECK

Any connection error in the power wiring can damage the control as soon as power is applied. Any short to building ground in the wiring can cause damage as soon as power is applied, unless the controller is connected to a line power isolation transformer. If the controller is connected to any instruments or equipment which may be grounded, a line isolation transformer must be used. In no case should the circuit be grounded at more than one point. It is advisable to recheck all wiring before power is applied. Make certain that all screw terminals are tight. If an ohmmeter is available, the simple resistance checks shown in Table 3 should be performed to verify that the wiring is correct.

GROUNDING

Safety considerations and the National Electric code require the motor frame and the controller enclosure to be connected solidly to building ground. Do not rely on mounting bolts for grounding. Refer to the "Electrical Connections" section of this instruction book for ground lead connections.

TABLE 3

PREPOWER WIRING CHECKS

TERMINALS	APPROPRIATE RESISTANCE
Load side of open circuit breaker	500 to 1000 ohms
F1 to F2	200 to 500 ohms
A1 to A2	0.3 to 1.0 ohms
F1 to A1 or F2 to A2	500,000 ohms or more
Control Circuit to Ground	500,000 ohms or more (see exceptions in preceding paragraphs)

INITIAL OPERATION AND ADJUSTMENT

When the control has been mounted and connected, and the prepower checks and adjustments are complete, apply power to the control, turn the speed control knob to zero, and press the "Start" button on the control station. Slowly turn the speed control knob until the motor starts to turn. Check the direction of motor rotation to be sure it is correct. If the motor turns the wrong way, disconnect power from the control and reverse the motor armature leads.

The inspection After Starting" section of the motor instruction book should be carefully followed at this time.

The control is now ready for normal operation. Some applications may require special settings for maximum and minimum speed. Potentiometers for adjusting these functions are on the main component board inside the controller. Remove the Statotrol JR controller cover and use a small screwdriver to adjust the potentiometers as described in the following instructions.

WARNING

Line voltage is exposed if the line circuit breaker is on while the cover is removed. Always turn off the circuit breaker before performing any work other than potentiometer adjustments inside the controller. Internal adjustments should be made by qualified electricians and not by machine operators.

MINIMUM SPEED ADJUSTMENT (4P)

The minimum speed adjustment is factory set so that the motor will start to run when the speed control knob is turned just slightly off zero. To change this setting, first turn the speed control knob to zero and then rotate the minimum speed potentiometer until the motor runs at the desired minimum speed.

Adjusting the minumum speed will change the maximum speed setting, so the minimum speed potentiometer should be adjusted before the maximum speed potentiometer is adjusted. The maximum speed adjustment must be reset each time the minimum speed is reset.

MAXIMUM SPEED ADJUSTMENT (3P)

The maximum speed adjustment is factory set to a speed slightly higher than rated motor speed. To change the maximum speed, first turn the speed control knob to its highest speed setting. Then adjust the maximum speed potentiometer until the motor runs at the highest speed needed for the particular application.

The Statotrol JR drive may not meet its performance specifications when the motor is run above its rated speed. It is, therefore, recommended that the maximum speed be set for rated motor speed or less.

OPERATOR CONTROLS, NORMAL OPERATION

The operator controls have been made as simple and foolproof as possible. However, in certain applications, it may be necessary to warn the machine operator against operation sequences which may damage the machinery or process driven by the Statotrol motor. The following instructions apply only when the customer's load requires no special operating sequences.

The speed control knob may be at any desired setting when the drive is started. The motor will accelerate smoothly to the speed set by the speed control knob. Motor current is automatically limited to a safe value. No warmup is required, and motor response is immediate. The speed control knob may be turned to any desired setting at any time, and the motor will respond smoothly. Turning the speed control knob clockwise will increase the motor speed. The controller "stop" switch may be pressed at any time, regardless of the speed setting.

MAINTENANCE

CONTROLLER

The controller enclosure should be periodically inspected to prevent an accumulation of materials which might block the flow of cooling air through the heat sink fins. The control must be protected from dripping or sprayed moisture and oil.

MOTOR

Complete instructions for motor maintenance are included in the motor instruction book.

Gearbox

Periodic oil changes and bearing lubrication are necessary to prolong the life of most gearboxes. Refer to the instructions provided with the unit for recommended maintenance schedule and lubricants.

TROUBLESHOOTING AND REPAIR

WARNING

Line voltage is exposed if the line circuit breaker is on while the cover is removed. Always turn off the circuit breaker before performing any work other than potentiometer adjustments inside the controller.

If a newly installed drive will not function properly, it is most probable that a terminal is loose or a problem exists with a connection, line voltage, or an adjustment. Line voltage must be between 253 volts AC and 207 volts AC, and the adjustments must be set as described in the "Prepower Checks and Adjustments" section this book.

If the drive operates normally for a while and then malfunctions, the problem may be line voltage, motor overload, motor failure, a loose terminal, an open fuse, or a component failure. In the following discussions, each step of troubleshooting is based on the assumption that all preceding steps have been completed and nothing abnormal has been found.

SYMPTOMS AND THEIR PROBABLE CAUSES

Motor Will Not Run

First check the branch circuit breaker and the controller circuit breaker to be certain they are closed. Then turn off the line circuit breaker and check fuses FU5 and FU6 in the controller.

WARNING

Always turn the circuit breaker off before replacing fuses.

Replace any open fuse with one of the same type and amperage rating as the original fuse. Next, connect an AC voltmeter across the controller circuit breaker terminals and verify that the line voltage is between 207V and 253V AC. Next connect a DC voltmeter between field terminals F1 and F2 on the two point terminal strip on the component board and verify that the voltage is between 180 volts DC and 220volts DC. If the field voltage is less than 150 volts DC, one of the diodes in the field power supply may have failed.

These diodes are 16D, 17D, 18D, and 19D and are located on the main component board just above the field connection terminals. If the voltage is zero, two or more diodes may have failed, or a fuse may be open. If the field voltage is correct, press the start button, verify that the control relay on the component board picks up, turn the speed control knob to full speed, and read the DC voltage across terminals A1 and A2. If this voltage is 10 to 20 volts or more, the motor is stalled due to an overload, or there is an open in the motor leads, windings, or brushes. If the voltage from A1 to A2 is zero, turn the minimum speed adjustment (3P) clockwise. If the motor now starts, the problem is in the control station and its leads and connections should be checked. If the motor does not start, locate the two small connectors which are used to plug the SCR gate leads onto the main component board. Partially extract and then reseat each connector to restore electrical contact which may have been lost due to corrosion. If the motor still will not start, the main component board should be replaced.

Motor Runs At High Speed and Cannot Be Controlled

The most probable cause for this symptom is a short in the reference circuit. Turn off the line circuit breaker and inspect the wires to the speed control potentiometer. If no problem is seen, turn on the AC power and turn the minimum speed and maximum speed potentiometers full counterclockwise. If the motor comes down to a very low speed, the speed control potentiometer may be shorted. If the motor still runs at a very high speed, the main component board should be replaced.

Motor Runs Very Fast for Speed Setting, but Very Little Torque is Produced:

Check the AC line voltage at the controller circuit breaker terminals. Verify that this voltage is within ±10% of the nominal 230V AC. Check the DC voltage from F1 to F2 on 1TB. If this voltage is less than 150V DC, one or more of the field power supply diodes has probably failed. These diodes are labeled 16D, 17D, 18D, and 19D and are located on the main component board just above the field connection terminals.

Motor Operates Normally at No Load, but Will Not Deliver Adequate Torque to Drive Load

If the drive has operated properly in the past and suddenly develops this symptom, locate the two small connectors which are used to plug the SCR gate leads onto the main component board. Partially extract and then reseat each connector to restore electrical contact which may have been lost due to corrosion. Then, if an oscilloscope is available, connect it across terminals A1 and A2, and if full wave rectifier power (a voltage pulse every 8 1/3 milliseconds) is being applied to the armature, measure armature current as explained in the next paragraph. If no oscilloscope is available, or if the oscilloscope shows that half wave rectified power (a voltage pulse every 16 2/3 milliseconds) is being applied to the armature, replace the main component board, and if the problem still persists, replace the SCR's.

If a newly installed drive will not deliver adequate torque to drive the load, first verify that the motor is not running faster than its rated speed. Then turn off the line circuit breaker and connect ammeters in series with the motor armature and run the motor under load. If the DC armature current exceeds the motor nameplate rating or if the AC armature current is more than 1.5 times the nameplate rating, the motor is overloaded. If the measured DC current is less than the motor nameplate rating, and if the AC current is less than 1.5 times nameplate rating, turn off the line circuit breaker and reset the current limit adjustment to the setting appropriate to the next high impedance group of motors in Table 2 and retest.

Circuit Breaker Trips

If the circuit breaker trips within a few seconds after power is applied, there is probably a short circuit or a wiring problem. Refer to the "Prepower Checks and Adjustments" section of this book for the appropriate wiring and impedance checks. If the input impedance is low, set the ohmmeter to the X1000 scale and measure the resistance between the cathode and annode (i.e., power terminal and heatsink) of each SCR. The meter should show open circuit for either polarity of the probes. If the reading on any SCR is not open circuit, the SCR should be replaced.

If the circuit breaker trips when the motor starts, turn off the line circuit breaker, refer to Table 2 and Figure 6, and reset the current limit adjustment to the setting appropriate to the next lower impedance group of motors. (If the control is being used with 50 Hz power, verify that resistor 140R has been cut out of the circuit as shown on Figure 6 before resetting the current limit.)

If the circuit breaker trips after a few minutes or a few hours of steady running, the motor is probably overloaded. Measure the DC armature current in the motor, and if it exceeds the motor nameplate rating, the motor is overloaded.

Fuse Blows

The instrument fuses 5FU and 6FU provide overcurrent protection for the component board, including the motor field DC power supply. If a fuse blows, it

should be replaced with a new fuse of the same type and rating. If the fuse blows again, turn off the line circuit breaker and measure the line to line resistance on the load side of the fuse block. This resistance should be 500 to 1000 ohms. A short circuit here indicates a failure of filter capacitor 13C, power supply transformer 1T, transient suppressor 1BD, or one or more of the field power supply diodes 15D, 16D, and 17D, or 18D. (Failure of a field diode indicates a short in the motor field circuit.) Next inspect the wiring for bare wires, loose terminals, and stray wire strands at wire terminations, and verify that the field circuit and regulating circuit are isolated from building ground (refer to the wiring checks in the "Prepower Checks and Adjustments" section for grounding exceptions.) Finally, disconnect one motor field lead and measure the motor field resistance while very slowly rotating the motor shaft through a full 360°. The field resistance should be between 200 and 500 ohms and should be the same regardless of the shaft position.

Motor Hunts

Verify that the motor is not running faster than rated speed, and if the control is being used on 50 Hz line voltage, verify that resistor 140R has been cut out of the circuit as shown in Figure 6. Then refer to the section of this book entitled "Prepower Checks and Adjustments" and check the current limit setting. If it was not set per Table 2, turn off the line circuit breaker and correct the setting. If it was set per Table 2, turn off the power circuit breaker and change the current limit adjustment to the setting appropriate to the next lower impedance group of motors in Table 2.

REPAIR

Motor Repair

WARNING

The controller stop switch does not remove voltage from the motor field. Always turn off the line circuit breaker before attempting to service motor.

The motor can be repaired just as a standard DC motor by any competent motor repairman. For replacement parts or motor service, take the motor model number from the motor nameplate and contact the nearest service shop authorized by the motor manufacturer.

Controller Repairs

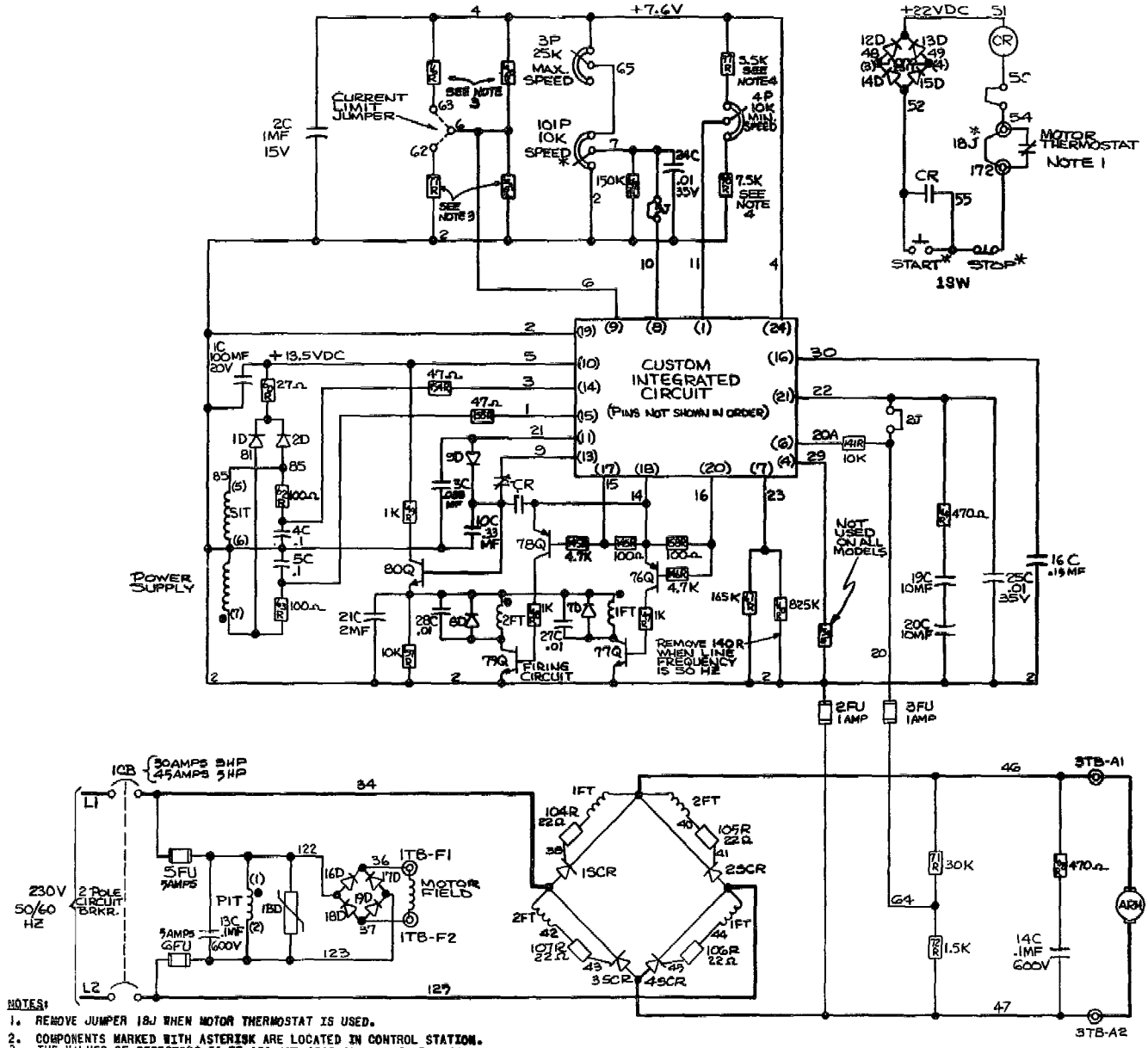
Normal field repair should be limited to replacing component boards. The complexity of the test sequence required to verify proper operation of a component board after repair makes it highly advisable to return failed component boards to General Electric Co. for repair and retest by the trained personnel and automatic test equipment at the factory.

When emergency repairs are required in the field, the following cautions should be observed. Always turn off the line circuit breaker before performing any work on any part of the circuit. The controller stop switch does not remove voltage from the circuitry. When soldering components to a printed circuit board, always use the smallest possible amount of solder. Do not overheat the leads of semiconductor components such as SCR's, diodes, transistors, and integrated circuits. After soldering, inspect carefully to be certain that solder has not bridged between foil paths or reduced the electrical clearance between foil paths. Solder flux is conductive so flux accumulations must be cleaned from the component board when soldering is complete. Solder icicles and component leads must be trimmed from the bottom of the board to prevent short circuits to the heat sink. Many components on the board are very fragile and must be protected from damage while the component board is being handled.

When returning component boards for repair, pack them carefully to prevent additional damage from occurring in transit.

RENEWAL AND SPARE PARTS

Replacement parts can be ordered from the nearest sales office of General Electric Company. Motor parts can be obtained from the nearest service shop authorized by the motor manufacturer.



NOTES:
1. REMOVE JUMPER 18J WHEN MOTOR THERMOSTAT IS USED.
2. COMPONENTS MARKED WITH ASTERISK ARE LOCATED IN CONTROL STATION.
3. THE VALUES OF RESISTORS 76,77,150 AND 151R ARE SELECTED DURING THE INITIAL TEST OF THE COMPONENT BOARD AND THE VALUES WILL VARY FROM BOARD TO BOARD.
4. RESISTORS 97 AND 98R ARE LOCATED ON THE MIN.-MAX. SPEED POT ASSEMBLY.

Figure 7. Elementary Diagram

RENEWAL PARTS LIST
FOR 3SJRB AND 3SJRC SERIES
3 HP AND 5 HP STATOTROL JR CONTROLLERS

DESCRIPTION OF PART OR ASSEMBLY	CATALOG NUMBER	MODEL NUMBER AND HORSEPOWER	
		3SJR2300 3 HP	3SJR2500 5 HP
		QTY. PER UNIT	QTY. PER UNIT
Main Component Board	44B337317-G01	1	1
SCR's	44B212741-109	4	
SCR's	44B310090-206		4
Fuse 5FU and 6FU Amps	K9774717-7	2	2
Circuit Breaker 1CB	TQC213OWL	1	
Circuit Breaker 1CB	TQC2145WL		1
Start-Stop Switch 1SW	44A315572-001	1	1
Speed Adjust Pot 101P	44A335893-G10	1	1

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GENERAL ELECTRIC COMPANY • DRIVE SYSTEMS PRODUCT DEPARTMENT
CONTROL DEVICES OPERATION • WAYNESBORO, VIRGINIA 22980

PRINTED IN U.S.A.

GENERAL ELECTRIC