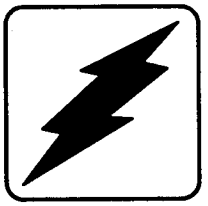
Service Manual

R-Series™
Industrial Generator Sets



Models:
10/15RMOY
15RMY
15/17.5ROY
22.5-47.5ROZ
22.5/32.5RZ

KOHLER®
POWER SYSTEMS

TP-5074 12/88a

Safety Precautions

Read these instructions carefully. Failure to follow instructions and safety rules could result in serious bodily injury and/or damage to the generator or test equipment.

⚠ WARNING

LETHAL EXHAUST GAS! The engine powering your generator discharges deadly carbon monoxide as part of the exhaust gas when operating. Carbon monoxide is particularly dangerous in that it is odorless and colorless. Keep in mind that it can cause death if inhaled for even a short period of time. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside an occupied building. Avoid breathing exhaust fumes when working on or near the generator set.

⚠ WARNING

DANGEROUS FUELS! Use extreme caution when handling, storing, and using fuels—all fuels are highly explosive in a vapor state. Store fuel in a well ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running to prevent spilled fuel from igniting on contact with hot parts or from ignition spark. Keep fuel lines and connections tight and in good condition—don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Additional precautions should be taken when using the following fuels:

Gasoline - Store gasoline only in approved red containers clearly marked GASOLINE. Don't store gasoline in any occupied building.

Propane (LP) - Adequate ventilation is mandatory. Propane is heavier than air; install gas detectors low in room. Inspect detectors often.

Natural Gas - Adequate ventilation is mandatory. Natural gas rises; install gas detectors high in room. Inspect detectors often.

⚠ WARNING

FLASH FIRE! To avoid the possibility of a flash fire, do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump or other potential sources of spilled fuel or fuel vapors.

⚠ WARNING

BACKFIRE! A sudden backfire can cause serious burns. Keep hands and face away from the carburetor when the air cleaner is removed.

⚠ WARNING

HIGH VOLTAGE! Remember that the function of a generator set is to produce electricity and wherever electrical energy is present, there is the potential danger of electrocution. Keep everyone, especially children, away from the set while it is running and take precautions to prevent unqualified personnel from tampering with or attempting to operate your generator set. Have the set and electrical circuits serviced only by qualified technicians. Wiring should be inspected frequently—replace leads that are frayed or in poor condition. Do not operate electrical equipment when standing in water, on wet ground, or when your hands are wet.

⚠ WARNING

UNIT STARTS WITHOUT NOTICE! Units with Automatic Transfer Switches start automatically. Turn Generator Main Switch on controller to OFF position, and remove battery cables (remove ground lead first and reconnect it last) to disable generator set before working on any equipment connected to generator. See Warning - EXPLOSIVE GASES following.

⚠ WARNING

EXCESSIVE NOISE! Never operate without adequate muffler or with faulty exhaust system — exposure to excessive noise is not only tiring but can lead to impairment of hearing.

⚠ WARNING

EXPLOSIVE GASES! The gases generated by a battery being charged are highly explosive. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Any room containing charging batteries should be well ventilated to prevent accumulation of explosive gases. To avoid sparks do not disturb battery charger connections while battery is charging, and always turn charger off before connecting or disconnecting. When operating any test equipment from an auxiliary battery in an enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting fuel vapors.

⚠ WARNING

DANGEROUS ACID! Avoid contact with battery electrolyte. It contains acid which can eat holes in clothing, burn skin, and cause permanent damage to eyes. Always wear splash-proof safety goggles when working around the battery. If battery electrolyte is splashed in the eyes or on skin, immediately flush the affected area for 15 minutes with large quantities of clean water. In the case of eye contact, seek immediate medical aid. Never add acid to a battery once the battery has been placed in service. Doing so may result in dangerous spattering of electrolyte.

⚠ WARNING

MOVING PARTS! Keep hands, hair, necktie, loose clothing and test leads well away from moving parts, as serious injury could result from entanglement. Never run generator set with guards, covers, or screens removed.

⚠ WARNING

ELECTRICAL SHOCK! Battery can cause electrical burns and shocks. Exercise reasonable care when working near the battery to avoid electrical connections through tools. Remove wristwatch, rings and any other jewelry.

⚠ WARNING

DANGER OF ELECTROCUTION! When the generator is used for standby power, use of an automatic transfer switch is required to prevent inadvertent interconnection of standby and other sources of power. In some states and/or localities it is illegal to operate a standby generator without an automatic transfer switch. Failure to install an automatic transfer switch will cause "backfeed" into utility transmission lines and can cause serious injury or death.

Table of Contents

Introduction

This manual covers operation, troubleshooting and repair of Kohler R-Series generators and controls. Differences between models are noted throughout the manual. Engine service, and parts information are available separately for particular models and specs.

Service Assistance

Contact your Kohler Generator Distributor to obtain additional service information for particular models. See your local listing or contact Kohler Company. Give Model, Spec, and Serial Numbers from generator nameplate for complete engine service manual and generator set parts list.

Section 1
OPERATION

Prestart Checklist

The following items should be checked before each start-up of manually controlled generator sets and at regular intervals on sets equipped with automatic transfer switches.

⚠ WARNING

UNIT STARTS WITHOUT NOTICE! Units with Automatic Transfer Switches start automatically. Turn Generator Main Switch on controller to OFF position and remove battery cables (ground lead first) to disable the generator set before working on generator set or any connected equipment. See "Safety Precautions" pages i and ii.

OIL LEVEL: Should be at or near **full** mark, not over.

FUEL LEVEL: Make sure there is an adequate supply; keep tanks full to allow operation for extended periods.

BATTERY: Check connections and level of battery electrolyte.

COOLANT LEVEL: Maintain coolant level at one-half to one inch below top of filler neck. A coolant solution of 50% ethylene glycol and 50% clean, soft water is recommended to inhibit corrosion and prevent freezing to -34°F (-37°C).

AIR CLEANER: Must be clean and properly installed to prevent unfiltered air from entering engine.

DRIVE BELTS: Make visual check of radiator fan, water pump, and battery charging alternator belt to make sure it is tight and in good condition.

OPERATING AREA: Make sure there are no obstructions that could block the flow of cooling air. Make sure area is clean. Rags, tools, or debris must not be left on or near the generator set.

EXHAUST SYSTEM: Exhaust outlet must be clear; silencer and piping must be tight and in good condition.

LAMP TEST: (If Equipped) Press the lamp test button and check to make sure all lamps provided on your panel are operational.

Preheat Feature

15kW and 22.5kW Diesel Models are equipped with a preheat feature. The exact temperature where use of the preheater is necessary varies from engine to engine and according to many other variables. Generally, if the temperature is below 40°F (3° - 4°C) and upon attempting to start the engine it turns over rapidly, exhausts white smoke but does not start, the use of a preheater is necessary. Depress preheat switch for 15-20 seconds, release and initiate starting procedure.

CAUTION

Do not operate preheater on an unprimed engine. If no fuel is present at the preheat inlet and as a result no vaporization occurs, the excessive heat will permanently distort the bimetallic element, and destroy the preheater.

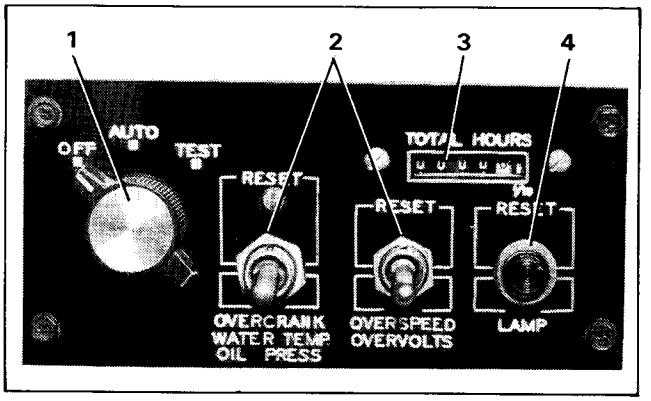


Figure 1-1. Basic Controller

Basic and Meter Box Models

For identification of components on each of these controllers see Figures 1-1 and 1-2; for an explanation of their function refer to the following paragraphs.

1. **Generator Main Switch** — refer to "Testing, Starting and Stopping" following.
2. **Reset Switches** — refer to "Resetting" following.
3. **Hourmeter** — records total generator set operating hours for reference in maintenance scheduling.
4. **Reset Lamp** — lights to indicate a fault condition.

1. **Frequency Meter** — measures frequency (Hz) of generator output voltage.
2. **AC Voltmeter** — measures voltage across output leads indicated by selector switch.
3. **AC Ammeter** - measures amperage from output leads indicated by selector switch.
4. **Selector Switch (Voltmeter-Ammeter)** - selects generator output circuits to be measured. If switched to a point with three circuit lead labels, voltage is measured between the upper two leads and amperage on the lower lead. If switched to a point with two circuit

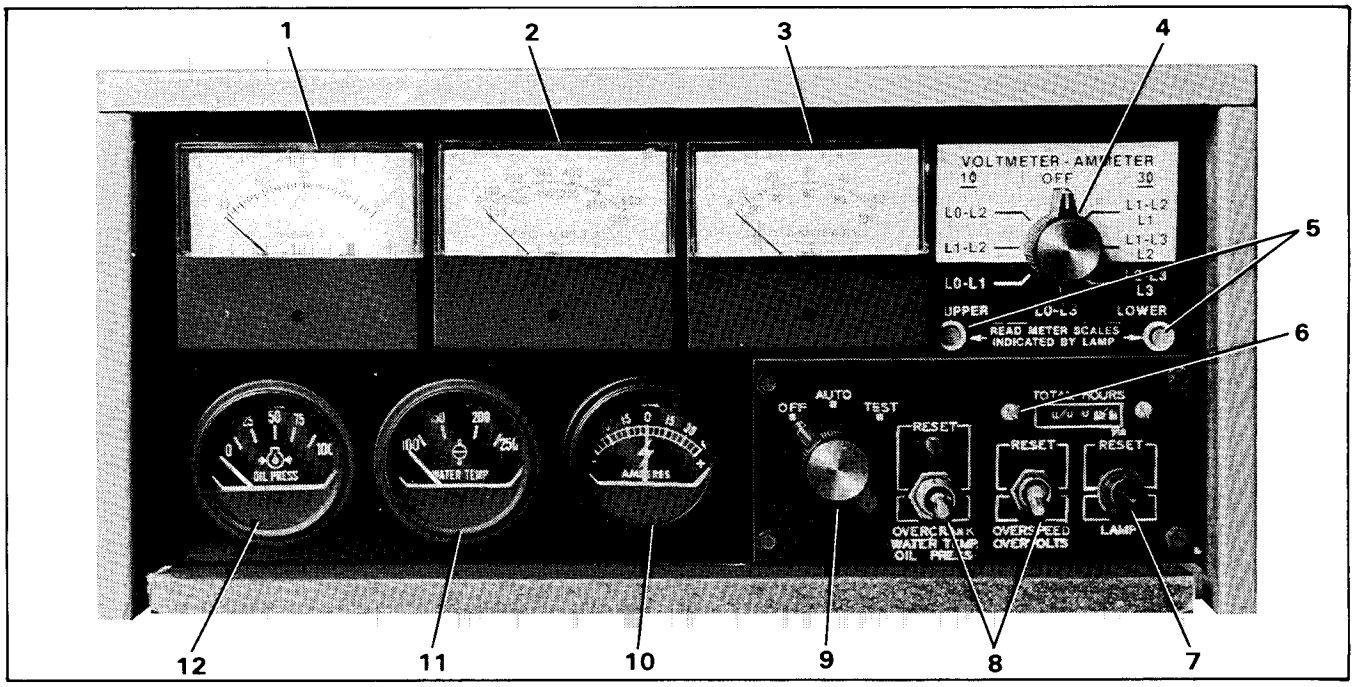


Figure 1-2. Meter Box Controller

Basic and Meter Box Models (Continued)

labels, voltage only is measured. With switch in OFF position, AC voltmeter and ammeter will not register.

CAUTION

To avoid meter damage do not turn switch for 3 phase reading on single phase units; do not turn switch for single phase reading on 3 phase units.

5. **Scale Lamps (upper, lower)** — indicate voltmeter and/or ammeter scales to be read.
6. **Hourmeter** — records total generator set operating hours for reference in maintenance scheduling.
7. **Reset Lamp** — lights to indicate a fault condition.
8. **Reset Switches** — refer to "Resetting" following.
9. **Generator Main Switch** — refer to "Testing, Starting and Stopping" following.
10. **DC Ammeter** — measures charge/discharge rates of engine alternator and starting battery.
11. **Water Temperature** — measures engine coolant temperature.
12. **Oil Pressure** — measures engine oil pressure.

TESTING

To test run the generator set at the controller move the Generator Main Switch to the TEST Position.

STARTING

Move Generator Main Switch to AUTO position to allow start-up by automatic transfer switch or remote start-stop switch. If set is not connected to an automatic transfer or remote start-stop switch move the Generator Main Switch to the TEST position for normal start-up.

STOPPING

1. Run generator set at no load for 5 minutes to allow engine cool-down.
2. Move Generator Main Switch or remote start-stop switch to OFF position.

RESETTING

The generator set will shut down automatically, and RESET lamp will light under the following fault conditions:

OVERCRANK:	Shut-down occurs if engine does not start after 40-60 seconds of cranking.
HIGH TEMPERATURE:	Shut-down occurs 10-20 seconds after fault.
LOW OIL PRESSURE:	Shut-down occurs 10-20 seconds after fault.
OVERSPEED:	Unit shuts down immediately.

OVERVOLTAGE: Unit will begin to shut down after approximately one second of 15% or more over nominal voltage.

CAUTION

Sensitive equipment may suffer damage in less than one second of an overvoltage condition. On line equipment requiring faster shutdowns should have its own overvoltage protection.

The left switch resets controller after Overcrank, High Temperature or Low Oil Pressure shut-down; right switch resets controller after Overspeed or Overvoltage shut-down. To restart the generator set after a fault shut-down, refer to the following procedure:

1. Move Generator Main Switch to OFF position.
2. Actuate reset switches one at a time until reset lamp goes out. Note which switch caused reset lamp to go out to aid in determining possible fault.
3. Disconnect generator set from load with line circuit breaker or automatic transfer switch.
4. Move Generator Main Switch to TEST Position to restart generator set. Refer to "Troubleshooting" following; determine cause of fault shut-down.
5. Return Generator Main Switch to OFF position and actuate appropriate RESET switch.
6. Correct cause of fault shut-down. See "Safety Precautions".
7. Move Generator Main Switch to necessary position (AUTO or TEST) for start-up.
8. Reconnect line circuit breaker.

NFPA (Hospital Code) Model

For identification of components see Figure 1-3; for an explanation of their function refer to the following paragraphs.

1. **Switch Off** — lamp flashes when Generator Main Switch is in CENTER OFF position. Lamp will not light when LAMP TEST button is pushed and Generator Main Switch is in AUTO or TEST Position.
2. **Overcrank** — lamp lights if engine fails to start within preset cranking period.
3. **Emerg. Stop** — lamp lights if EMERG. STOP button has been pushed.
4. **High Water Temp.** — lamp lights if set has shut down due to high engine coolant temperature.
5. **Overspeed** — lamp lights if set shuts down due to overspeed.
6. **Low Oil Press.** — lamp lights if set shuts down due to loss of engine oil pressure.

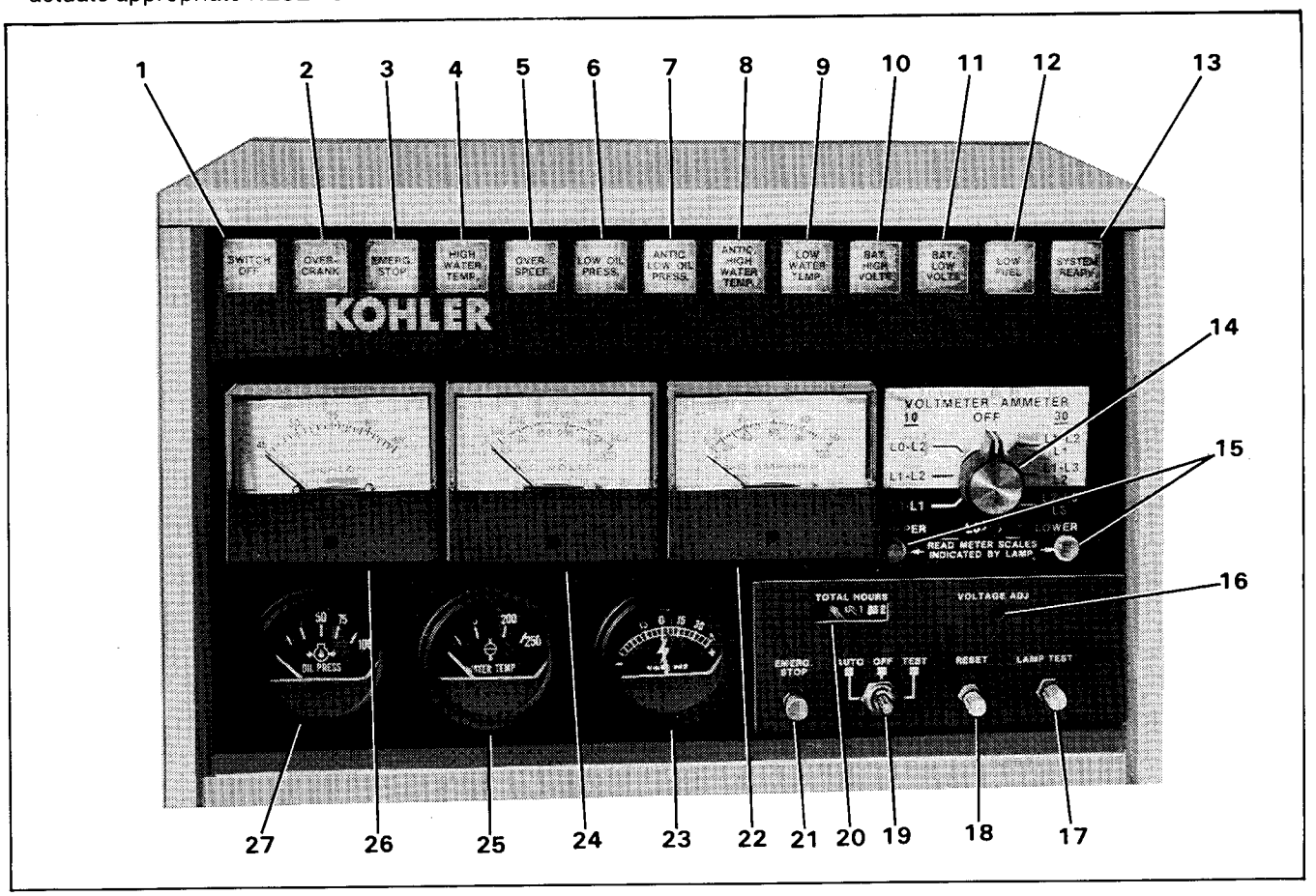


Figure 1-3. NFPA (Hospital Code) Controller

NFPA (Hospital Code) Model (Continued)

7. **Antic. Low Oil Press.** — lamp lights if engine oil pressure approaches shut-down level.
8. **Antic. High Water Temp.** — lamp lights if engine coolant temperature approaches shut-down level.
9. **Low Water Temp.** — lamp lights if optional engine block heater is not working and/or temperature may be too low (below 60°F, 16°C) for 10-second startup.
10. **Bat. High Volts** — lamp lights if battery or charging voltage exceeds normal (will also light if over voltage occurs due to battery charger malfunction while set is not operating).
11. **Bat. Low Volts** — lamp lights if battery or charging voltage drops below normal (will also light if under voltage occurs due to battery or charger malfunction while set is not operating).
12. **Low Fuel** — lamp lights if fuel tank level approaches empty.
13. **System Ready** — lamp lights when Generator Main Switch is in AUTO or TEST position and system senses NO faults.
14. **Selector Switch (Voltmeter-Ammeter)** — selects generator output circuits to be measured. If switched to a point with three circuit lead labels, voltage is measured between the upper two leads and amperage on the lower lead. If switched to a point with two circuit labels, voltage only is measured. With switch in OFF position, AC voltmeter and ammeter will not register.

CAUTION

Do not turn switch for 3 phase reading on single phase units; do not turn switch for single phase reading on 3 phase units.

15. **Scale Lamps (upper, lower)** — indicate voltmeter and/or ammeter scales to be read.
16. **Voltage Adj.** — used to fine-adjust generator output voltage.
17. **Lamp Test** — used to test indicator lamps.
18. **Reset** — refer to "Resetting" following.
19. **Generator Main Switch** — refer to "Testing, Starting and Stopping" following.
20. **Hourmeter** — records total generator set operating hours for reference in maintenance scheduling.
21. **Emergency Stop** — will shut down generator set immediately.
22. **AC Ammeter** — measures amperage from output leads indicated by selector switch.
23. **DC Ammeter** — measures charge/discharge rates of engine alternator and starting battery.
24. **AC Voltmeter** — measures voltage across output leads indicated by selector switch.
25. **Water Temperature** — measures engine coolant temperature.
26. **Frequency Meter** — measures frequency (Hz) of generator output voltage.
27. **Oil Pressure** — measures engine oil pressure.

TESTING

To test run the generator set at the controller move the Generator Main Switch to the TEST position.

STARTING

Move Generator Main Switch to AUTO position to allow start-up by automatic transfer switch or remote start-stop switch. If set is not connected to an automatic transfer or remote start-stop switch move the Generator Main Switch to the TEST position for normal start-up.

STOPPING

Move Generator Main Switch to CENTER OFF position to make non-emergency manual stops.

1. Disconnect load from generator set.
2. Move Generator Main Switch to CENTER OFF position. Set will stop after 5-minute (approx.) cool-down period.

EMERGENCY STOPPING

Press EMERG. STOP switch for immediate shut-down.

RESETTING

The generator set will shut down automatically under the following fault conditions:

OVERCRANK:	Shut-down occurs if engine does not start after 45-70 seconds of cyclic cranking.
HIGH TEMPERATURE:	Shut-down occurs 3-5 seconds after fault.
LOW OIL PRESSURE:	Shut-down occurs 20-30 seconds after fault.
OVERSPEED:	Unit shuts down immediately.
OVERVOLTAGE:	Unit will shut down after approximately one second of 15% or more over nominal voltage.

CAUTION

Sensitive equipment may suffer damage in less than one second of an overvoltage condition. On line equipment requiring faster shut-downs should have its own over-voltage protection.

To restart set after a fault shut-down refer to the following procedure.

1. Move Generator Main Switch to CENTER OFF position.
2. Disconnect generator set from load with line circuit breaker or automatic transfer switch.
3. Correct cause of fault shut-down. See "Safety Precautions" pages i and ii.
4. Press RESET switch (fault indicator light will go off).
5. Move Generator Main Switch to TEST position for start-up.
6. Verify that cause of shut-down has been corrected.
7. Reconnect to load.
8. Move Generator Main Switch to necessary position (AUTO or TEST) for start-up.

Section 2
CONTROLLER TROUBLESHOOTING

Basic and Meter Box

The controller is the controlling point for generator set operation. The following is the sequence of operation it goes through (Figures 2-1a, 2-1b, 2-2). This section should serve as a good starting point in fault detection.

SEQUENCE OF OPERATION

Cranking

- Close Generator Main Switch between 44 and 4; CR relay will energize.
- CR contacts in series with C relay close to energize C relay.
- CR contacts in series with C relay close to energize ignition circuit (Brushless - RZ models only).
- C contacts close to energize S relay.
- S contacts close to energize starter motor.
- S contacts close to energize start-stop solenoid (Static - RY models only).

Field Flashing

- RY models — CR contacts in series with the 1TS heater element closes to energize 1TS timing circuit, alternator and regulator board.
- RZ models — CR contacts in series with the 1TS heater element closes to energize 1TS timing circuit, alternator, choke, water and anti-diesel.
- RY models — B+ on voltage regulator is energized to provide field flashing.
- RZ models — CR contacts will apply battery voltage to F3-F4 to provide field flashing.

Running

- Once unit comes up to speed CC relay energizes to disconnect cranking.
- Upon reaching 100-Volts AC 1CR relay across generator output leads V8 and V0 will energize to disconnect cranking (double protection). 1CR contacts in series with 1TS open to disable overcrank timing.
- Once cranking has disconnected current will flow through RE2 and R1 to keep start-stop solenoid energized at 5-Volts DC (Static - RY models only).

Stopping

- Open Generator Main Switch between 44 and 4; CR relay will de-energize.
- CR contacts in series with fuel solenoid (diesel) or ignition coil (gas/gasoline) will open to stop unit.

Automatic Shut-Down Features

Overspeed

- If engine overspeeds - OS contacts on regulator board will close sending battery voltage to energize SDR (shut-down relay).

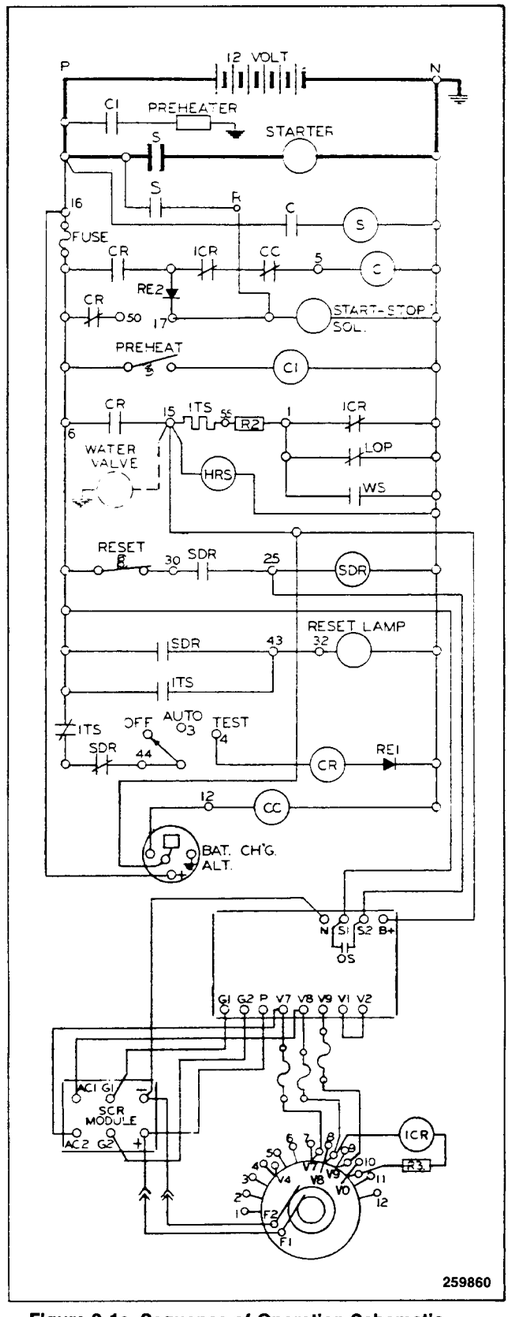


Figure 2-1a. Sequence of Operation Schematic (Early Static Models — RY)

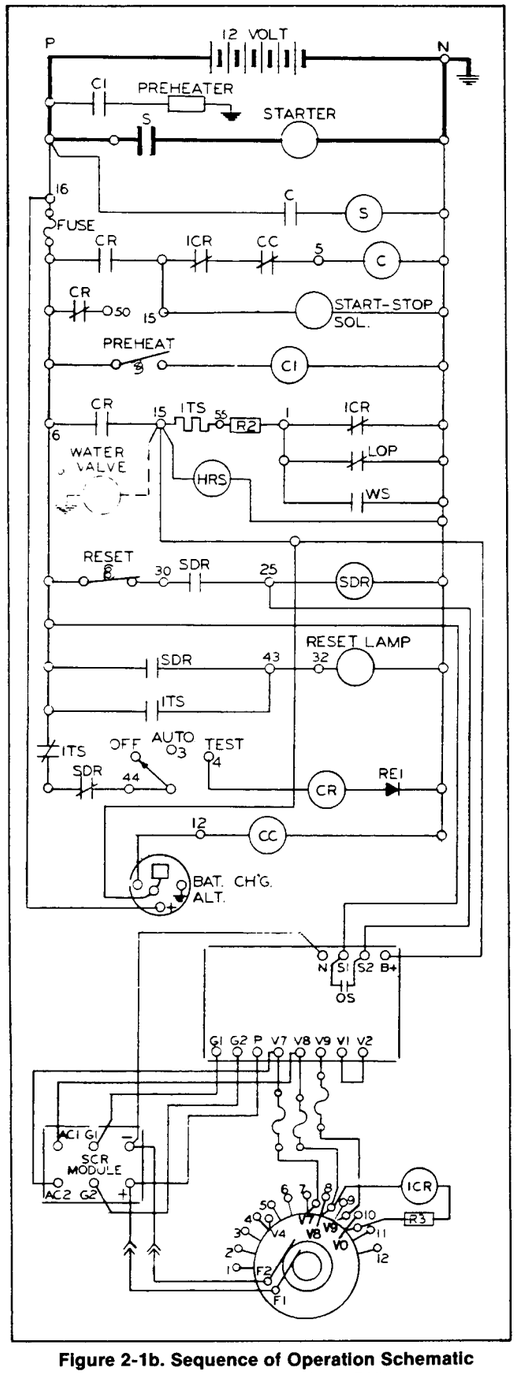


Figure 2-1b. Sequence of Operation Schematic (Later Static Models — RY)

- SDR contacts in series with reset switch close to lock in SDR relay.
- SDR contacts in series with reset lamp close to light lamp.
- SDR contacts in series with CR relay open to stop unit.

NOTE

In order to restart the unit, the overspeed reset switch must be activated to deenergize SDR relay.

Overvoltage

- If voltage rises in excess of 280-Volts measured across V7 and V8 OS contacts on regulator board will close sending battery voltage to energize SDR (shut-down relay).
- SDR contacts in series with reset switch close to lock in SDR relay.
- SDR contacts in series with reset lamp close to light lamp.
- SDR contacts in series with CR relay open to stop unit.

NOTE

In order to restart the unit, the overvoltage reset switch must be activated to deenergize SDR relay.

Low Oil Pressure (LOP)

- Low oil pressure causes LOP contacts in series with 1TS to close.
- 1TS thermal switch times out (30-60 seconds).
- 1TS contacts in series with reset lamp close to light lamp.
- 1TS contacts in series with CR relay open to stop unit.

NOTE

In order to restart the unit, the Oil Press. reset switch must be activated to rest 1TS contacts.

High Water Temperature (WS)

- High water temperature causes WS contacts in series with 1TS to close.
- 1TS thermal switch times out (30 - 60 seconds).
- 1TS contacts in series with reset lamp close to light lamp.
- 1TS contacts in series with CR relay open to stop unit.

NOTE

In order to restart the unit, the water temp. reset switch must be activated to reset 1TS contacts.

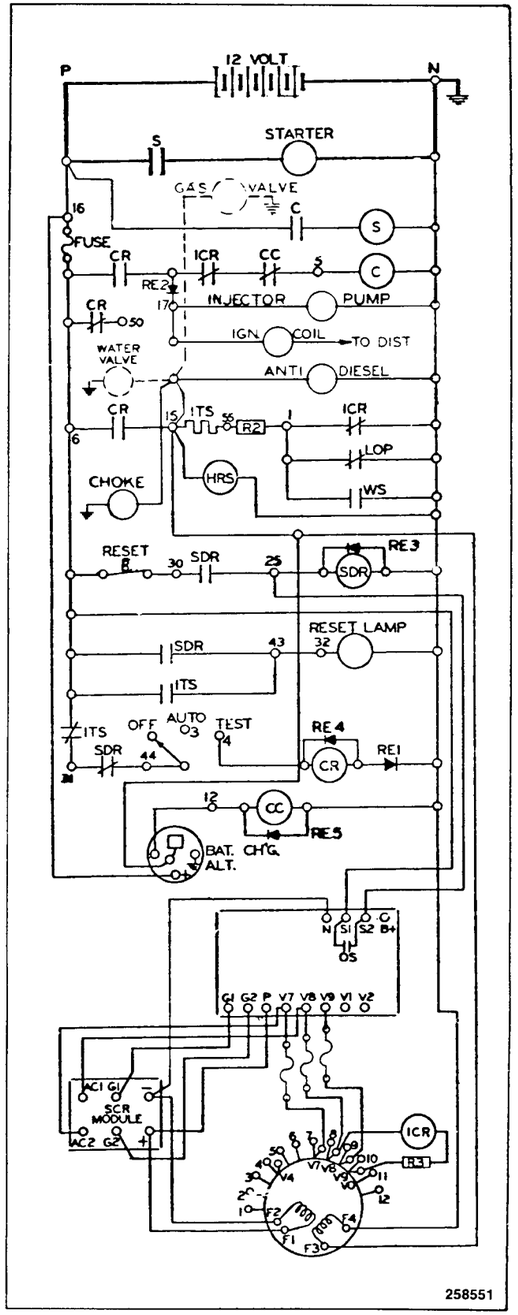


Figure 2-2. Sequence of Operation Schematic (Brushless Models — RZ)

Sequence of Operation (Continued)

Overcrank

- While unit is cranking current will flow through normally closed 1CR contacts allow 1TS to time for overcrank.
- If unit fails to start, 1CR contacts will remain closed and 1TS thermal switch will time out (30 - 60 seconds).
- If unit starts and no AC output is present, 1CR contacts will remain closed and 1TS thermal switch will time out (30 - 60 seconds).
- 1TS contacts in series with reset lamp will close to light lamp.
- 1TS contacts in series with CR relay open to stop cranking (or stop unit if started and producing no AC output).

NOTE

In order to recrank the unit, the overcrank reset switch must be activated to reset 1TS contacts.

Load Shedding Feature

- When a large load is applied generator frequency drops.
- Output voltage drops 1.5-Volts for each Hz below 57Hz (47Hz - 50 Hz Models) to allow the load to get on-line.
- As frequency builds back up, voltage will follow.

RELAYS

Each relay and the functions it controls is listed below.

1. CR (Control Relay)
   - Initiates cranking
   - Energizes ignition circuit
   - Energizes 1TS circuit
   - Energizes primary field
   - Energizes hourmeter
   - Energizes anti-diesel solenoid (Gasoline only)
   - Energizes water valve (city-water cooled only)
   - Energizes choke (Gasoline only)
   - Energizes gas valve (Gasoline only)
2. C (Cranking Relay)
   - Energizes starter solenoid
3. S (Starter Solenoid)
   - Energizes starter motor
   - Energizes fuel solenoid (15RY only)
4. CC (Cranking Cutout)
   - Deenergizes C relay
5. 1CR (Control Relay 1)
   - Deenergizes C relay
   - Deenergizes overcrank
6. SDR (Shut-Down Relay)
   - Locks in SDR relay
   - Energizes reset lamp
   - Deenergizes CR coil

The following chart identifies which relays are energized in each operating condition:

Starting	Running	Stopping
CR	CR	SDR
C	CC	(emergency stops only)
S	1CR	

Fuse

One 10 amp fuse located inside the controller protects against damage in the event a short develops in the wiring. If fuse "blows" generator set will stop. Unit will not crank with a blown fuse. If set has stopped due to causes other than lack of fuel, or fault shut-down — check fuse. If blown, replace the fuse and attempt to restart generator set. If the set will not start, or if the fuse blows again, locate and correct the cause.

NFPA (Hospital Code)

FAST CHECK FEATURES

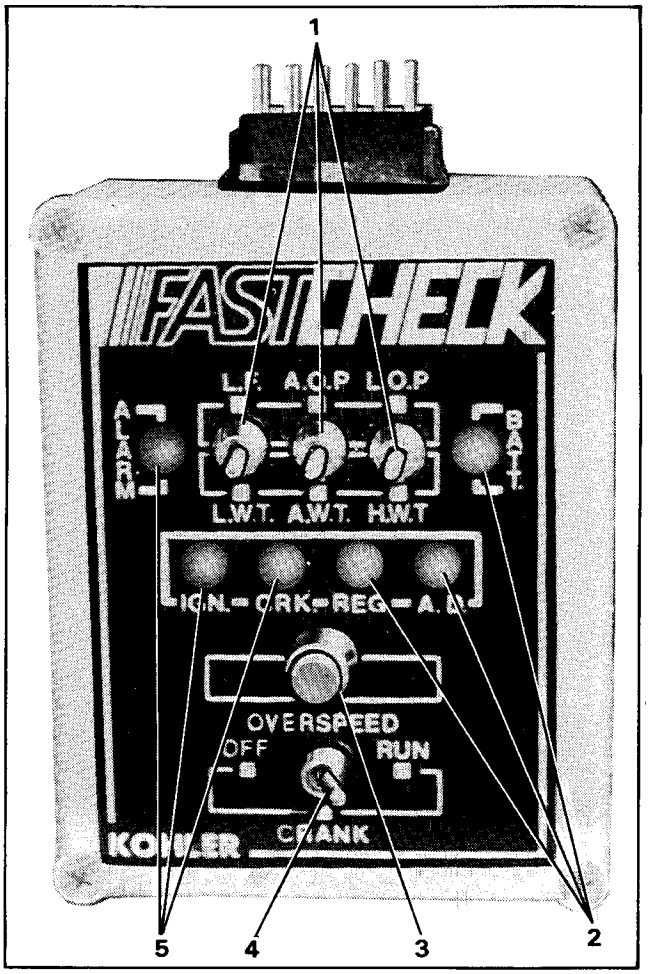
The Fast Check is an engine simulator for testing and troubleshooting R-Series NFPA controller trays (Figure 2-3).

Engine conditions are simulated by the following engine switch positions:

- **OFF** — engine not running
- **CRANK** — battery voltage switched to starter
- **RUN**— engine running
- **OVERSPEED BUTTON** — engine overspeed

Lamps

- **IGN.** — (ignition) lamp shows
  1. Battery voltage supplied to ignition, fuel valves, water valve (city-water cooled only).
  2. Lights during cranking and running.
- **CRK.** — (crank) lamp shows
  1. Battery voltage switched to starter (engine not necessarily turning).
  2. Lights only during "on-crank" cycles.



1. **Toggle Switches**
2. **Indicator Lamps**
3. **Overspeed Button**
4. **Engine Switch**
5. **Indicator Lamps**

Figure 2-3. Fast Check

- **REG.** — (regulator) lamp shows
  1. Battery voltage supplied to generator's AC voltage regulator.
  2. Light during cranking and running.
- **A.D.** — (anti-diesel, fuel shut-off solenoid)

  Lamp lights during normal or fault shut-down or any non-run condition.
- **ALARM** — Lamp lights when engine fault is simulated by one of three upper toggle switches or OVERSPEED button.
- **BATT.** — (Battery) lamp lights when test battery or DC power supply is live and properly connected.

Upper Toggle Switch Positions

- **L.F.** — low fuel
- **L.W.T.** — low engine water temperature
- **A.O.P.** — anticipatory (low) oil pressure
- **A.W.T.** — anticipatory (high) water temperature
- **L.O.P.** — low oil pressure
- **H.W.T.** — high water temperature

FAST CHECK OPERATION

The Fast Check May Be Used To:

- Test NFPA controller's tray when troubleshooting start-up problems.
- Test, troubleshoot, and adjust NFPA tray when removed from controller.

Equipment Required:

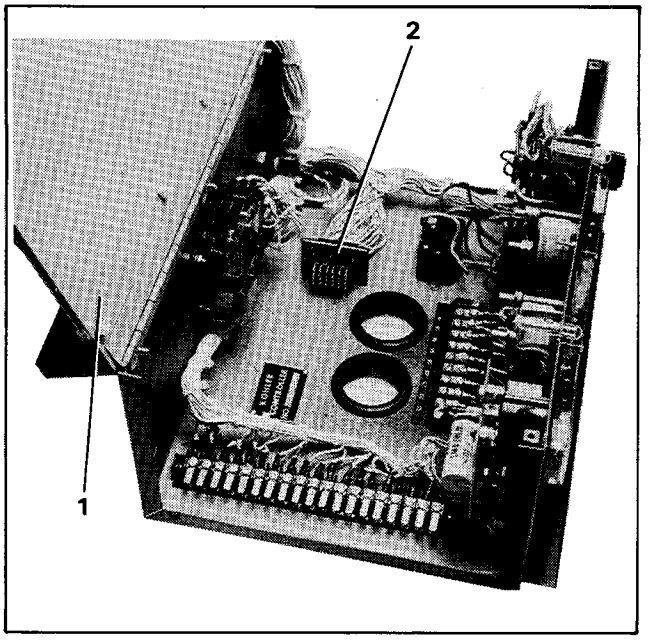
- Fast check and harness (A-291930 and 269955)
- Variable low voltage DC power supply. 0-50 Volt, 3 amp minimum current; 0.5% maximum output voltage ripple at 30-Volts DC.
- Stopwatch

NOTE

When troubleshooting, inspect parts and wiring for damage, corrosion, and moisture. Make any needed repairs before testing.

Fast Check Connection

1. Unplug harness connector inside meter box (Figure 2-4).



1. **NFPA Controller Tray**
2. **Harness Connector**

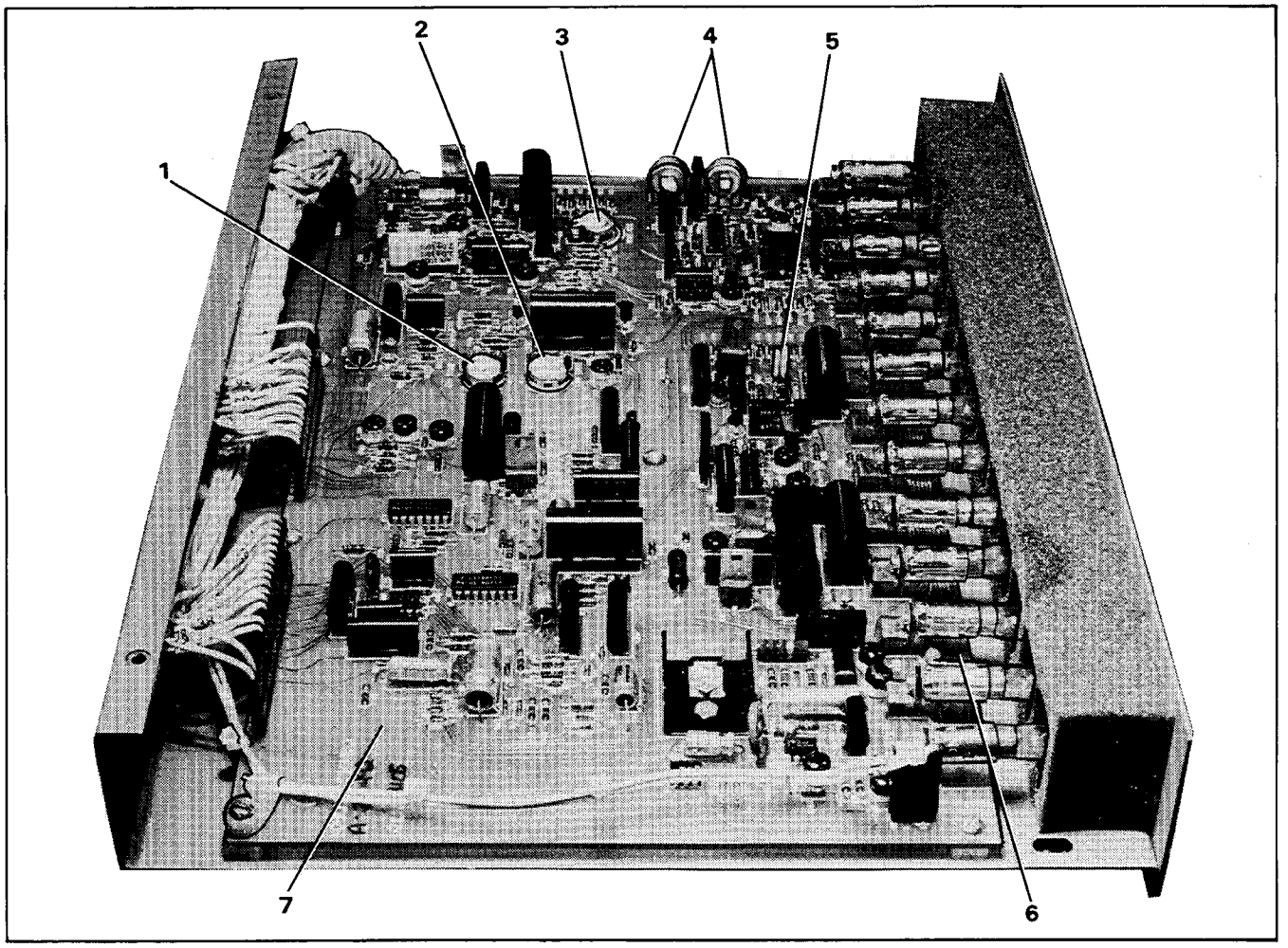
Figure 2-4. Harness Connector

NFPA (Hospital Code) (Continued)

2. Connect Fast Check Harness to harness connector inside meter box. Connectors are keyed to prevent misconnection.
3. Push wiring harness connector onto plug at top of Fast Check.
4. Move Generator Main Switch on controller to OFF.
5. Move Fast Check engine switch to OFF.
6. Clip red (+) and black(-) harness leads to 12-Volt battery or DC power supply. Generator set battery may be used if accessible and fully charged. See "Safety Precautions" before making any battery connections.

FAST CHECK FUNCTION

1. Battery and A.D. lamps of Fast Check should light if red (+) and black (-) harness leads are properly connected; SWITCH OFF lamp on controller should flash.
   a) If not, push LAMP TEST button on controller.
   b) If other lamps do not light, check/replace 3 amp fuse at rear of controller, and/or replace bulbs as needed (Figure 2-5).
   c) If fuse is good and other lamps light when LAMP TEST button is pushed, but SWITCH OFF lamp does not flash,
      - check switch and harness connections
      - replace uni-board
      - repeat test
2. To check controller's ability to detect a locked rotor, stop a start-up attempt if starter locks or does not engage.
   a) Be sure Fast Check engine switch is OFF



1. "On" Pot.
2. "Off" Pot.
3. Time Adj. Pot.
4. Battery Voltage Pots.
5. Overspeed Pot.
6. Indicator Bulbs
7. Uni-board

Figure 2-5. NFPA Controller Tray

b) Move Generator Main Switch on controller to TEST

c) IGN., CRK., and REG. lamps of Fast Check should light (CRK. should light for around 10 seconds). If not,
- check wiring to 1CR
- replace uni-board
- repeat test

d) If CRK. lamp alone does not light (voltage not conducted to starter circuit),
- replace uni-board
- fix 1CR relay wiring or replace relay
- repeat test

e) If IGN. or REG. lamps do not light,
- replace uni-board
- fix CR relay wiring or replace relay
- repeat test

f) CRK. lamp should go out (for around 10 seconds), then light again for a second cranking cycle. After second cranking cycle, IGN., CRK. and REG. lamps should go out (after around 35 seconds of "cyclic cranking"). OVERCRANK lamp on controller plus A.D. and ALARM lamps on Fast Check should light. If not,
- replace uni-board
- repeat test

g) Reset system; move Generator Main Switch to OFF. Press reset button.

3. To test uni-board's ability to stop a start-up attempt if starter works but engine will not run.

a) Be sure Fast Check's engine switch is OFF.

b) Move Generator Main Switch on controller to TEST.

c) Move Fast Check's engine switch to CRANK and start stopwatch.

NOTE

The uni-board gives a restart cranking delay of about 1-2 seconds. CRK. lamp on Fast Check may not light immediately when engine switch is moved to CRANK from OFF.

NOTE

The cranking cycle may be readjusted to other than the standard 10 second on, 10 second off. Readjust R53 for on time and R52 for off time.

d) IGN., CRK. and REG. lamps on Fast Check should light to show "on-crank" cycle. CRK. lamp will go out during "off-crank" cycles.

e) After 45-75 seconds of cyclic cranking, IGN., CRK. and REG. lamps on Fast Check should go out; ALARM and A.D. lamps on Fast Check plus OVERCRANK lamp on controller should light, stop stopwatch. If cyclic cranking does not stop after 45-75 seconds.
- try adjustment
- repeat test
- replace uni-board

f) Reset system; move Fast Check engine switch and Generator Main Switch to OFF. Press reset button on controller.

4. To test normal start-up ability:

a) Move Generator Main Switch on controller to TEST.

b) Move Fast Check engine switch to CRANK. IGN., CRK. and REG. lamps should light after restart time delay.

c) Move Fast Check engine switch to RUN; CRK. lamp should go out. If CRK. lamp does not go out,
- check ICR Relay and wiring
- replace uni-board
- repeat test

5. To test low fuel safety feature:

a) Hold first toggle switch up to L.F.

b) LOW FUEL lamp on controller and ALARM lamp on Fast Check should light as long as switch is held. If LOW FUEL lamp does not light, check bulb with LAMP TEST or replace bulb.
- replace uni-board
- repeat test

6. To test low water temperature safety feature:

a) Hold first toggle switch down to L.W.T.

b) LOW WATER TEMP. lamp on controller and ALARM lamp on Fast Check should light as long as switch is held. If LOW WATER TEMP lamp does not light,
- check bulb with LAMP TEST or replace bulb
- replace uni-board
- repeat test

7. To test anticipatory low oil pressure safety feature:

a) Hold second toggle switch up to A.O.P.

b) ANTIC. LOW OIL PRESS. lamp on controller and ALARM lamp on Fast Check should light as long as switch is held; if ANTIC. LOW OIL PRESS. LAMP does not light,
- check bulb with LAMP TEST or replace
- replace uni-board
- repeat test

8. To test anticipatory high water temperature safety feature:

a) Hold second toggle switch down to A.W.T.

b) ANTIC. HIGH WATER TEMP. lamp on controller and ALARM on Fast Check should light as long as

NFPA (Hospital Code) (Continued)

switch is held; if ANTIC. HIGH WATER TEMP. lamp does not light,

- check bulb with LAMP TEST or replace bulb
- replace uni-board
- repeat test

9. To test low oil pressure safety feature:
   a) Hold third toggle switch up to L.O.P. and start stopwatch
   b) In 20 - 60 seconds, LOW OIL PRESS. lamp on controller should light. Stop stopwatch.
   c) ALARM and A.D. lamps on Fast Check should light to show engine shut-down (IGN. and REG. lamps should be out).
   d) If LOW OIL PRESS. lamp does not light,
      - check bulb with LAMP TEST or replace bulb
      - replace uni-board
      - repeat test
   e) Reset system; move Fast Check engine switch and Generator Main Switch to OFF. Press reset button on controller. Move Fast Check engine switch to RUN.

10. To test high water temperature safety feature:
    a) Hold third toggle switch down to H.W.T. and start stopwatch.
    b) In 3 - 6 seconds High Water Temp. lamp on controller should light. Stop stopwatch.
    c) ALARM and A.D. lamps on Fast Check should light to show engine shut-down (IGN. and REG. lamps should be out).
    d) If HIGH WATER TEMP. lamp does not light within 6 seconds,
       - check bulb with LAMP TEST or replace bulb
       - replace uni-board
       - reset system and repeat test
    e) Reset system; move Fast Check engine switch and Generator Main Switch to OFF. Press reset button on controller. Move Generator Main Switch to TEST and Fast Check engine switch to RUN.

11. To test overspeed safety feature:
    a) Push and hold OVERSPEED button on Fast Check
    b) OVERSPEED lamp on controller should light; ALARM and A.D. lamps on Fast Check should light (IGN. and REG. should be out)
    c) If not, turn OVERSPEED pot on uni-board clockwise until OVERSPEED lamp on controller lights along with ALARM and A.D. lamps on Fast Check (showing shut-down) (Figure 2-5).
    d) If lamps do not show shut-down after adjusting pot,
       - check OVERSPEED lamp with LAMP TEST or replace bulb
       - replace uni-board
       - reset system and repeat test

NOTE

Make final adjustment to OVERSPEED Pot by manually overspeeding engine to 70 Hz for 60 Hz sets, and 60 Hz for 50 Hz sets. Adjust pot to cause shut-down at proper frequency.

    e) Reset system; move Fast Check engine switch and Generator Main Switch to OFF. Press reset button on controller.

12. To test shut-down delay:
    a) Move Generator Main Switch on controller to TEST.
    b) Move Fast Check engine switch to RUN. Wait until IGN. and REG. lamps light.
    c) Move Generator Main Switch to OFF and start stopwatch.
    d) In 4 - 6 minutes IGN. and REG. lamps on Fast Check should go out to show shut-down.
    e) If not, carefully turn TIME ADJ. pot (R85) on uni-board counterclockwise to adjust delay. Retest (Figure 2-5).

Adjustments

1. To adjust "on-crank" time as needed for engine starting under usual conditions (standard setting 10 seconds):
   a) Move Fast Check engine switch to CRANK.
   b) Move Generator Main Switch on controller to TEST and start stopwatch.
   c) Stop stopwatch when CRK. lamp on Fast Check goes out.
   d) Adjust ON TIME pot on uni-board as needed (Figure 2-5).
   e) Move Fast Check engine switch to OFF.
   f) Repeat test to recheck "on-crank" time.

2. To adjust "off-crank" time to allow battery system recovery between "on-crank" cycles (if engine would not start in preceding "on-crank" cycle):
   a) Move Fast Check engine switch to CRANK.

b) Move Generator Main Switch on controller to TEST.

c) Start stopwatch when CRK. lamp on Fast Check goes out.

d) Stop stopwatch when CRK. lamp relights.

e) Adjust OFF time pot on uni-board as needed (Figure 2-5).

f) Repeat test to recheck "off-crank" time.

3. To test and adjust high/low battery voltage and system ready indicators:

   a) Connect red (+) and black (-) Fast Check harness leads to positive (+) and negative (-) terminals of variable-voltage DC power supply. Place Generator Main Switch on controller in AUTO position and Fast Check engine switch in OFF position.

   b) Slowly turn DC supply voltage up until BAT. HIGH VOLTS lamp on controller lights. DC supply voltmeter should read about 15-Volts.

   c) Slowly turn DC supply voltage down until BAT. LOW VOLTS lamp on controller lights. DC supply voltmeter should read about 11-Volts.

If adjustments are needed refer to Figure 2-5 and continue as follows:

   d) Turn HIGH VOLT ADJ. pot on uni-board fully counterclockwise (turn from outside of board).

   e) Set DC power supply to 14-Volts, BAT. HIGH VOLTS on controller should be "on"; SYSTEM READY "off".

   f) Slowly turn HIGH VOLT ADJ. pot clockwise until BAT. HIGH VOLTS goes out, and SYSTEM READY lights (Figure 2-5).

   g) Slowly turn HIGH VOLT ADJ. pot counterclockwise until BAT. HIGH VOLTS lights, and SYSTEM READY goes out.

   h) Turn LOW VOLT ADJ. pot counterclockwise to stop.

   i) Set DC power supply to 10-Volts, BAT. LOW VOLTS should be "out"; SYSTEM READY, "on".

   j) Slowly turn LOW VOLT ADJ. pot clockwise until BAT. LOW VOLTS lights and SYSTEM READY goes out.

   k) If any indicator lamps do not work check with LAMP TEST and replace bulbs as necessary.

   l) If any indicator lamps do not work or adjustments can't be made, replace uni-board.

   m) Vary DC voltage below and above described levels and observe indicators. Repeat tests. Make final adjustments if needed.

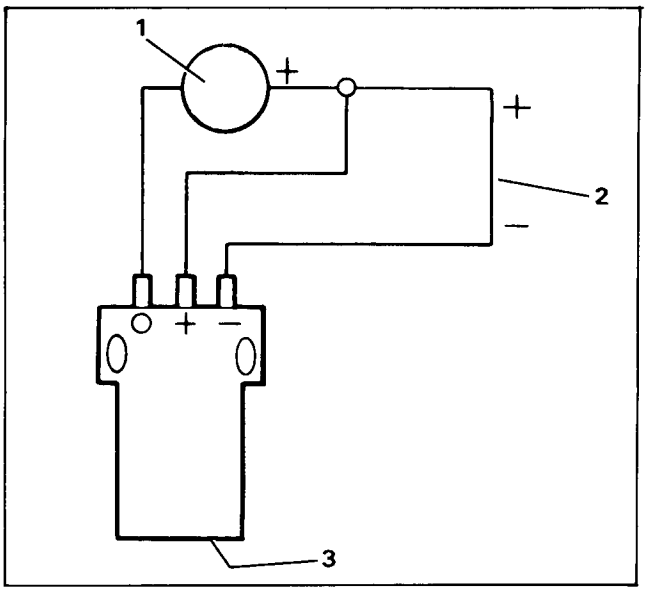
SPEED SENSOR

Speed sensor mounting and gap adjustment details can be found in Section 4, "Generator Disassembly-Reassembly". To determine if the signal from the speed sensor is being received at the controller follow the procedure outlined below:

1. Connect DC voltmeter between pin 24 on uni-board and ground — voltmeter reading should equal approximately 7.5-Volts.
2. With generator set running, connect DC voltmeter between pin 16 on the uni-board and ground — voltmeter reading should equal voltage read in Step 1 minus approximately 1-Volt.

If the speed sensor signal is not being received at the generator set controller, test speed sensor:

1. Connect speed sensor, voltmeter and DC voltage source as shown in Figure 2-6.



1. DC Voltmeter
2. 12-Volt DC Power Supply
3. Sensing Surface

Figure 2-6. Speed Sensor Test

2. Touch sensing surface with a flat piece of iron or steel — at least 1/4 cubic inch (4.1 cm^3).
3. Test voltmeter reading should equal voltage source volts.
4. Remove iron or steel from sensing surface and observe NO test voltmeter reading.

NFPA (Hospital Code) (Continued)

NOTE

If voltage readings coincide with above recommended test results, speed sensor may be used in generator set.

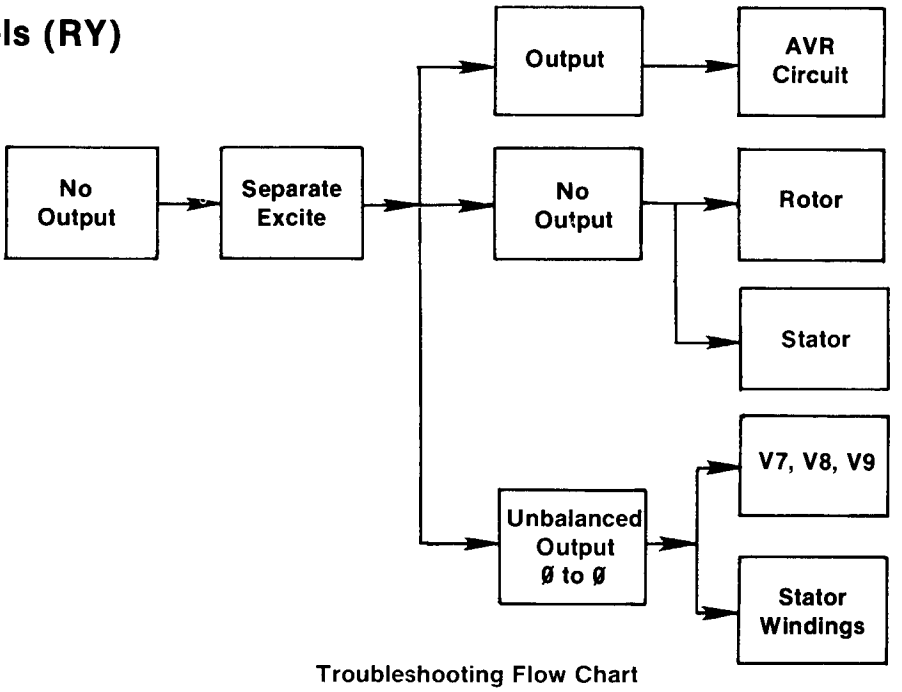
FUSES

3-Amp — protects controller against damage in the event a short develops in the controller wiring. If fuse "blows" generator set will stop. Unit will not crank with a blown fuse. If set has stopped due to causes other than lack of fuel, or fault shut-down — check fuse. If blown, replace the fuse and attempt to restart generator set. If the set wil not start, or if the fuse blows again, locate and correct the cause.

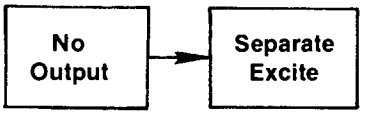
15-Amp — protects the CR and 1CR relay contacts from overcurrent in the event of a short in the wiring or engine accessories. Unit will not crank with blown fuse. If this fuse blows while the generator set is running, the unit will shut down.

Section 3
GENERATOR TROUBLESHOOTING

Static Models (RY)



Troubleshooting Flow Chart



To help determine the cause of no or low AC output separately excite generator. The generator field (rotor) may be excited (magnetized) using an outside power source and the following procedure. Refer to Figures 3-1, 3-2 and the appropriate wiring diagram in Section 5.

NOTE

On CSA Models no-output could be the result of a blown fuse. Fuses on sensing leads V7, V8 and V9 protect regulator board and SCR module against an overcurrent condition.

WARNING

HIGH OUTPUT VOLTAGE DURING TESTS MAY ENDANGER HUMAN LIFE OR DAMAGE EQUIPMENT! See "Safety Precautions". Disconnect generator from load when troubleshooting. Trip all line circuit breakers to "OFF" or remove generator output leads from connections to load circuits and HEAVILY INSULATE ENDS OF LEADS.

Steps 1-6 below are used to check brushes, springs and holder before separately exciting.

1. Disconnect V7, V8 and V9 from terminal strip and insulate.
2. Disconnect load leads and insulate (separately excite under no load).
3. Disconnect brush leads F1 and F2 at quick disconnect.
4. Check for continuity between "quick disconnect" point on each brush lead and its adjacent slip ring. Repair or replace assembly if fault is detected.
5. Check brush assembly for weak springs, loose holder, sticking brushes or improper brush-to-slip ring alignment causing brushes to wear excessively or unevenly.

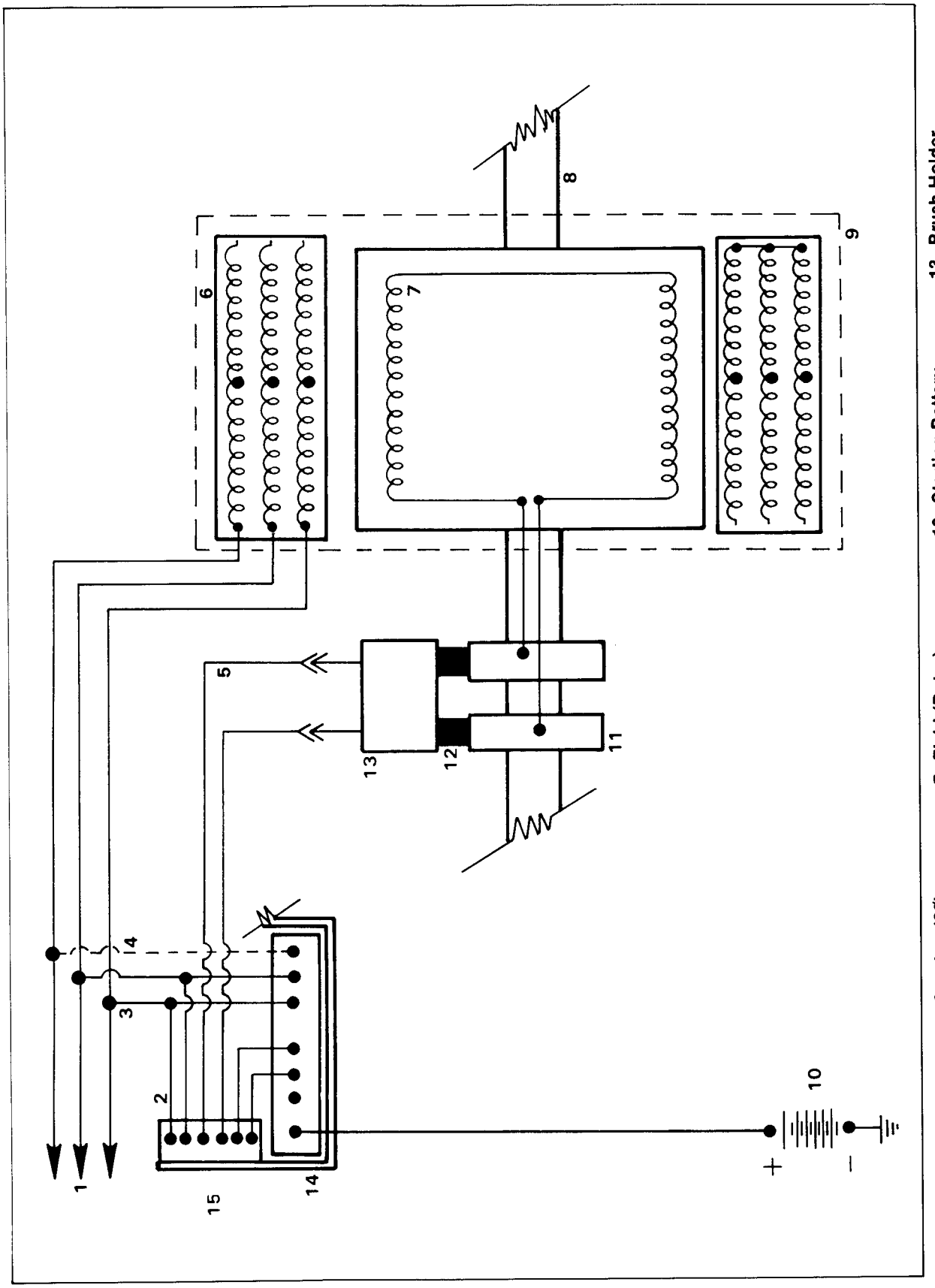
WARNING

EXPLOSIVE GASES! When working in an enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting fuel vapors. See "Safety Precautions".

SEPARATELY EXCITE — RY MODELS

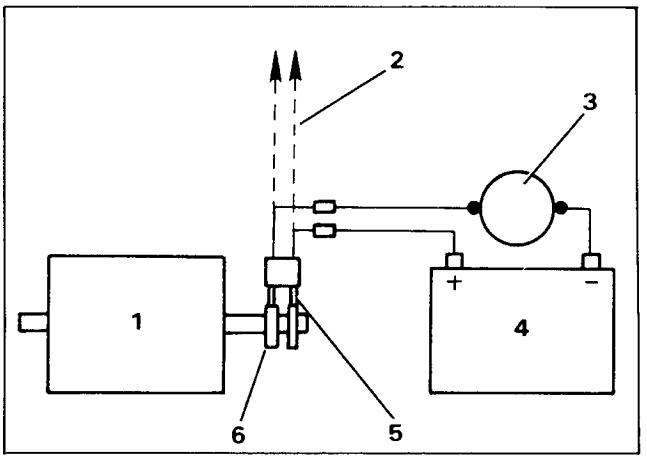
1. Check rotor for running fault. Connect for "Separate Field Excitation" as shown in Figure 3-2.
2. Disconnect and insulate L1, L2, L3, V7, V8, V9, V0 and V4.
3. Connect brush leads in series with a 12-volt battery and DC ammeter as shown in Figure 3-2.
4. Record ammeter reading.
5. Start unit and observe ammeter. Ammeter reading should remain the same. If current increases considerably, a running short in the rotor has been detected. If current drops to zero, an open rotor is indicated.
6. If tests show shorted or open rotor — replace.
7. While unit is running check L1, L2, L3, V7, V8, V9, V0 and V4 for AC output.

Static Models (RY) (Continued)



1. Load
2. Input Supply
3. Sensing (1Ø)
4. Sensing (3Ø)
5. Output Supply
6. Stator
7. Field (Rotor)
8. Rotor Shaft
9. Generator
10. Starting Battery
11. Slip Rings
12. Brushes
13. Brush Holder
14. Voltage Regulator
15. SCR Module

Figure 3-1. RY Schematic



1. Rotor
2. To SCR Module
3. DC Ammeter
4. Battery
5. Brushes
6. Slip Rings

Figure 3-2. Separate Field Excitation

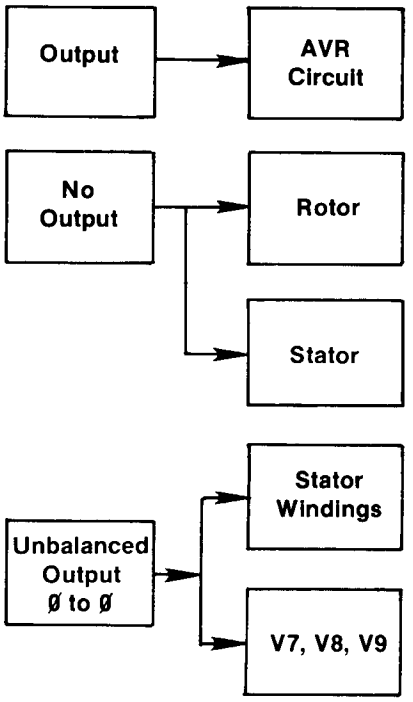
8. If any winding shows no output — repair or replace stator. If output reading is correct, problem is in Automatic Voltage Regulation (AVR) circuit.

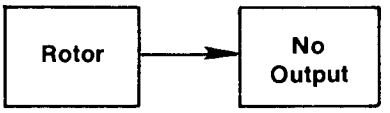
NOTE

The ITS will trip if there is no output. If more than 60 seconds is needed, remove 1CR after starting.

NOTE

On Basic and Meter Box Models overcrank circuit will shut unit down after 60 seconds. If needed to run longer, remove 1CR immediately after unit has started.





If generator output is not available under normal operation but is available when you separately excite unit — the fault is probably in the Automatic Voltage Regulation (AVR) circuit.

SCR Module

1. Check SCR Module with ohmmeter on RX1 Scale (Figure 3-3).

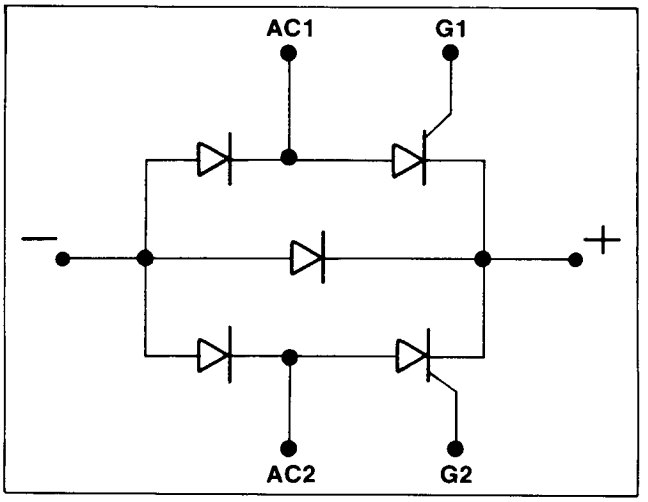


Figure 3-3. SCR Module

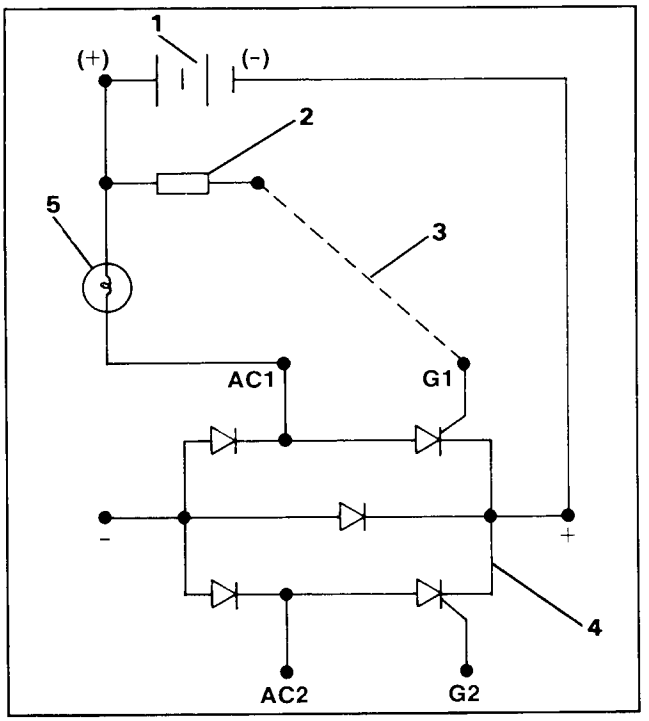
2. Connect ohmmeter from (+) to (-). You should read high resistance in one direction and low resistance in the other.
3. Connect ohmmeter from AC1 to (+). You should read high resistance in both directions. Repeat for AC2.
4. Connect ohmmeter from AC1 to (-). You should read high resistance in one direction and low resistance in the other. Repeat for AC2.
5. G1 to (+) should see low resistance in one direction and higher in the other. Repeat for G2.
6. If any of the above checks (2-5) indicates a faulty SCR module — replace.
7. See Figure 3-4. Connect negative (-) lead from DC source to positive (+) pin on SCR module.

CAUTION

The SCR module may be damaged if this step is performed incorrectly. Be sure to connect the **NEGATIVE** (-) lead of the battery to the **POSITIVE** (+) pin on the SCR module.

8. Connect positive (+) lead from DC source, with lamp in series, to AC1 pin on SCR module. Lamp should not glow.
9. Momentarily connect jumper, with resistor in series, from positive of DC source to G1 pin on SCR module. Lamp should glow, and continue to glow after removing jumper.

Static Models (RY) (Continued)



1. 12-Volt DC Source
2. 100-500-Ohm Resistor
3. Momentary Jumper
4. SCR Module
5. 12-Volt Lamp

Figure 3-4. SCR Test

10. Repeat steps 8 and 9, with positive (+) lead and lamp connected to AC2 pin on SCR module, momentarily connecting jumper to G2 pin.
11. If any of the above checks indicates a faulty SCR module — replace.

Regulator Board — Test

To check regulator board you'll need the following equipment:

- 208-240 Volt AC power source
- On-Off switch
- SCR module (pre-tested)
- 120 or 240 Volt AC light bulb and socket
- Jumper wires

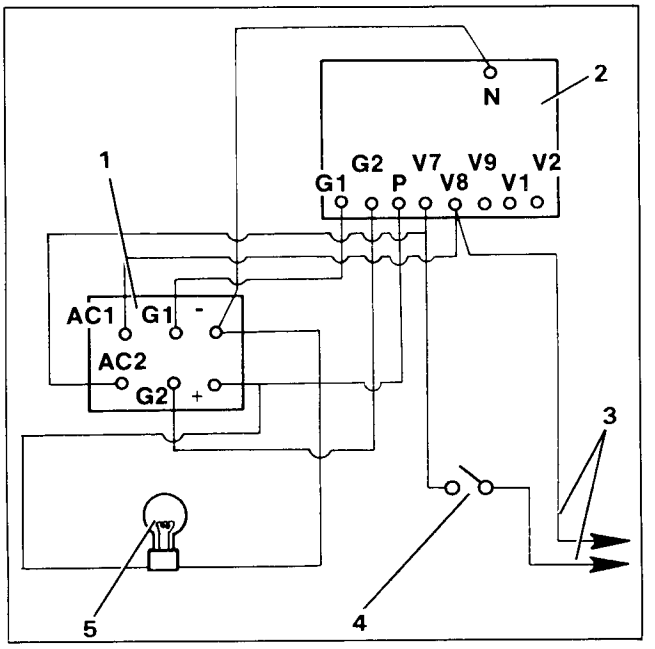
NOTE

240-Volts will shorten life of 120-Volt bulb.

WARNING

HIGH VOLTAGE! Whenever electrical energy is present, there's the potential danger of electrocution. Remove rings, watches and jewelry that can cause short circuits. Do not touch electrical equipment when standing in water, on wet ground, or when your hands are wet. See "Safety Precautions".

1. Refer to Figure 3-5 and the appropriate wiring diagram in Section 5; connect regulator board to good SCR module.
2. Wire a 120 or 240-Volt AC light bulb across (+) and (-) of SCR module.
3. Wire on-off switch (in open position) in series with AC power source.



1. SCR Module
2. Regulator Board
3. To AC Source
4. On-Off Switch
5. Light Bulb and Socket

Figure 3-5. Regulator Board Test — Connections

4. Wire 208-240-Volts to V7 and V8 on terminal strip in regulator/terminal strip tray.
5. Close switch to apply power; lamp should light. Adjust Pot. 2 to clockwise limit and observe maximum intensity of light. Adjusting Pot. 2 to counterclockwise limit will extinguish bulb. See Figures 3-6 and 3-7 for adjustment location.

NOTE

Steps 6, 7 and 8 must be completed within 60 seconds or the 1TS thermal switch will trip, de-energizing the controller. If more time is needed, remove the 1CR relays after starting.

6. Connect battery (+) to the P terminal and connect battery (-) to common wire between hour meter and reset lamp.
7. Turn on AC and DC power and adjust overspeed Pot. 5 counterclockwise until reset lamp turns on. Return Pot. 5-1/8 of a turn clockwise.

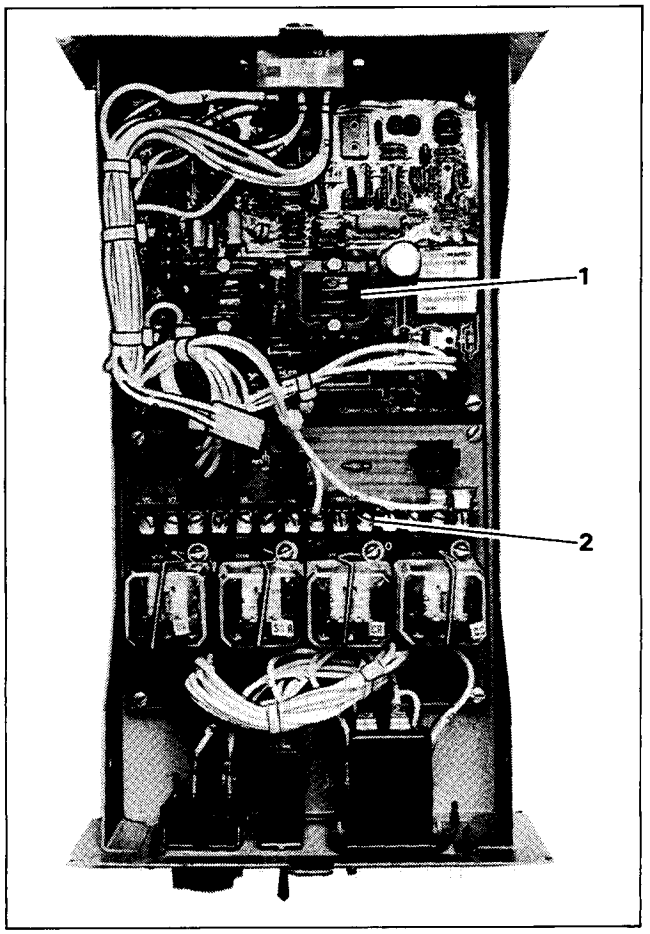


Figure 3-6. Regulator and Terminal Boards

1. **Voltage Regulator Board**
2. **Terminal Strip**

8. Reset fault. Turn overvoltage Pot. 6 counterclockwise until the reset lamp comes on. Return Pot. 6-1/8 of a turn clockwise.
9. If above test indicates a faulty regulator board — replace and refer to new board adjustment procedure following.

Regulator Board — Calibration

Voltage regulator must be recalibrated using the following procedure if output leads are reconnected to voltage other than factory test voltage. Failure to do so may result in equipment damage.

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when set is running.

The following equipment is required to properly adjust regulator board.

1. AC voltmeter, 0-300 V. AC minimum range, ± 0.5% minimum accuracy.
2. Frequency counter, 45 to 75 Hz minimum range, ± 1% minimum accuracy.
3. Potentiometer adjustment tool (or small blade screwdriver).
4. Load bank-capacity must equal output potential of generator set. (Used only on voltage regulator boards with Pot. 4 — Load Shed.)

Before Starting Generator Set:

1. Disconnect generator from load. Place generator main switch in OFF position. Lift enclosure cover to expose voltage regulator board and terminal strip. See Figure 3-6.
2. Check the wire jumpers on the regulator board and arrange as noted in Table 3-1.

Table 3-1. Jumper Condition

Jumper	Models	
	10 kW-17.5 kW	22.5 kW-47.5 kW
J1	Inserted	Removed
J2	Removed	Inserted
J3	Inserted for 60 Hz — Removed for 50 Hz	

3. For generator sets having a single-phase connection, lift lead V9 from the controller circuit board terminal strip and insulate lead end with electrical tape to prevent any electrical connection.
4. Adjust the external voltage adjustment potentiometer located on the controller assembly front panel (if equipped) to the approximate midpoint of its adjustment range.
5. Connect the AC voltmeter and frequency counter between leads V7 and V8 on the generator set.
6. See Figure 3-7 for types of voltage regulator boards, in order to determine which adjustment procedure must be used.

VOLTAGE REGULATOR BOARD ADJUSTMENT (New style boards without Pot. 4 — Load Shed)

1. Break adjustment seals on Pots. 1, 2 and 3.

NOTE

Pot. 5 (Ov. Spd.) and Pot. 6 (Ov. Volt) should be sealed and do not require any adjustment at this time.

2. Turn Pot. 1 to full clockwise (CW) position.
3. Turn Pot. 2 to full counterclockwise (CCW) position.
4. Start the generator set with no load applied.

Static Models (RY) (Continued)

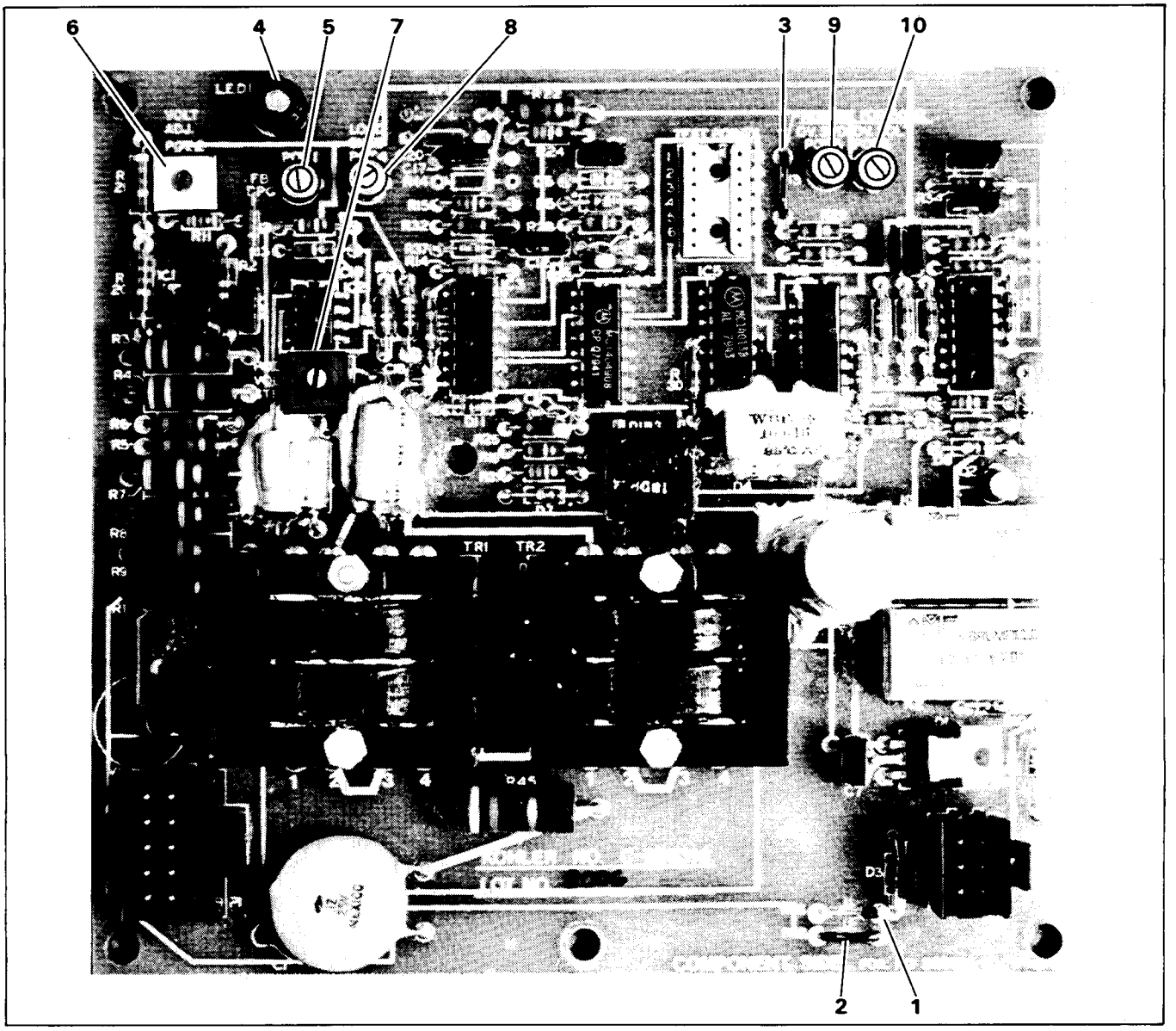


Figure 3-7. Regulator Board

1. **J-1**
2. **J-2**
3. **J-3**
4. **LED**
5. **Pot. 1 — FR Damp**
6. **Pot. 2 — Volt Adj.**
7. **Pot. 3 — Volt Stb.**
8. **Pot. 4 — Load Shed (Found only on old style board)**
9. **Pot. 5 — Ov. Spd.**
10. **Pot. 6 — Ov. Volt**

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when unit is running.

5. Adjust Pot. 2 (Volt Adj.) while observing the AC voltmeter. Adjust for a meter reading as specified for this set.

6. Observe LED on the regulator board. If it is glowing a steady red, proceed to the next step. If it is "flickering" alternately, first adjust Pot. 3 (Volt Stb.) and then Pot. 1 (FR Damp) until a steady glow is attained. It may be necessary to repeat the alternate adjustment several times.

NOTE

For single-phase units do *not* adjust Pot. 1. Leave it in the fully clockwise limit.

7. Overvoltage Shutdown Check (Pot. 6)

   a. While observing the AC voltmeter reading, slowly adjust Pot. 2 just to the point where the generator set shuts down. Note carefully the AC voltmeter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 257 ± 5 Volts AC
      60 Hz Sets: 280 ± 5 Volts AC

CAUTION

Do not exceed 285 Volts when adjusting Pot. 2. Regulator board damage may result.

   b. Readjust Pot. 2 about 1/8 turn in the CCW direction to prevent an immediate shutdown upon restart.

   c. Turn the controller main switch to the OFF position and reset the overvoltage fault.

   d. Restart the generator set.

   e. Adjust Pot. 2 while observing the AC voltmeter. Adjust for a meter reading as specified for this set.

NOTE

If the set fails to pass this test, go to Step 8. Otherwise, omit Step 8 and go to Step 9.

8. Overvoltage Shutdown Adjustment (Pot. 6)

   a. Break adjustment seal and turn Pot. 6 to full CW position.

   b. While observing AC voltmeter reading, adjust Pot. 2 as follows:

      50 Hz Sets: 257 ± 3 Volts AC
      60 Hz Sets: 280 ± 3 Volts AC

   c. Slowly turn Pot. 6 in a CCW direction just to the point where the generator set shuts down. Do *not* turn pot. beyond this point.

   d. Readjust Pot. 2 about 1/8 turn CCW to prevent immediate shutdown upon restart.

   e. Turn the controller's main switch to the OFF position and reset the overvoltage fault.

   f. Restart the generator set and turn Pot. 2 CW until unit shuts down while observing AC voltmeter. Note carefully the AC voltmeter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 257 ± 3 Volts AC
      60 Hz Sets: 280 ± 3 Volts AC

      If voltage is not within specifications, readjust Pot. 6 1° CW and go back to Step d.

   g. Readjust Pot. 2 about 1/8 turn CCW to prevent immediate shutdown upon restart.

   h. Turn the controller's main switch to the OFF position and reset the overvoltage fault.

   i. Restart the generator set and readjust Pot. 2 for the specified output voltage for this set as indicated on the AC voltmeter.

   j. Seal Pot. 6 with insulating varnish or equivalent.

9-1.1. Overspeed Shutdown Check (Pot. 5) — Models Without NFPA Controllers Only

   a. While observing the frequency counter reading, slowly increase the engine speed (by adjusting the engine governor) just to the point where the set shuts down. Note carefully the frequency counter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 60 ± 2 Hz
      60 Hz Sets: 70 ± 2 Hz

   b. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

   c. Turn the controller main switch to the OFF position and reset the overspeed fault.

   d. After restarting the set, readjust the engine speed governor for the set's specified output frequency.

NOTE

If the set fails to pass this test, go to Step 9-1.2. Otherwise, omit Step 9-1.2 and go to Step 10.

9-1.2. Overspeed Shutdown Adjustment (Pot. 5) — Models Without NFPA Controllers Only

   a. Break adjustment seal and turn Pot. 5 to its full CW position.

   b. Adjust the engine speed governor for a frequency counter reading as follows:

      50 Hz Sets: 61 ± 1 Hz
      60 Hz Sets: 71 ± 1 Hz

   c. Slowly turn Pot. 5 in a CCW direction, just to the point where the generator set shuts down. Do *not* turn the pot. beyond this point.

   d. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

   e. Turn the controller's main switch to the OFF position and reset the overspeed fault.

   f. Restart the set and increase engine speed until shutdown while observing frequency meter. Note carefully the frequency reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 61 ± 1 Hz
      60 Hz Sets: 71 ± 1 Hz

Static Models (RY) (Continued)

NOTE

If frequency is not within specifications, readjust Pot. 5 1° CW and go back to Step d.

g. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

h. Turn the controller's main switch to the OFF position and reset the overspeed fault.

i. Restart the set and readjust the engine speed governor for the set's specified output frequency as indicated by the frequency counter.

j. Seal Pot. 5 with insulating varnish or equivalent.

9-2.1. Overspeed Shutdown Adjustment (Pot. 5) — Models with NFPA Controllers Only

a. Break adjustment seal and turn Pot. 5 to its full CW position.

b. Adjust the engine speed governor for:

50 Hz Sets: 61 ± 1 Hz
60 Hz Sets: 71 ± 1 Hz

c. Break adjustment seal and slowly adjust the overspeed pot. on the NFPA controller board just to the point where the generator set shuts down. See Figure 3-8.

d. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

e. Turn the controller's main switch to the OFF position and reset the overspeed fault.

f. Restart the set and increase engine speed until shutdown while observing frequency meter. Note carefully the frequency reading just prior to shutdown. This reading shall be within the following limits:

50 Hz Sets: 61 ± 1 Hz
60 Hz Sets: 71 ± 1 Hz

g. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

h. Turn the controller's main switch to the OFF position and reset the overspeed fault.

i. Restart the set and readjust the engine speed governor for the set's specified output frequency as indicated by the frequency counter.

j. Seal Pot. 5 with insulating varnish or equivalent.

k. Seal the overspeed pot. on the NFPA controller board with insulating varnish or equivalent. Be careful not to move the adjustment wheel.

9-2.2. Voltage Adjustment Range Check — Models with NFPA Controllers Only

a. Turn the external voltage adjustment potentiometer on the controller assembly front panel (if equipped) while observing the AC voltmeter reading. Note the readings when the potentiometer is in the CW and CCW limit positions. These readings should be at least 10 Volts above and below the set's specified output voltage. Adjust to the specified voltage.

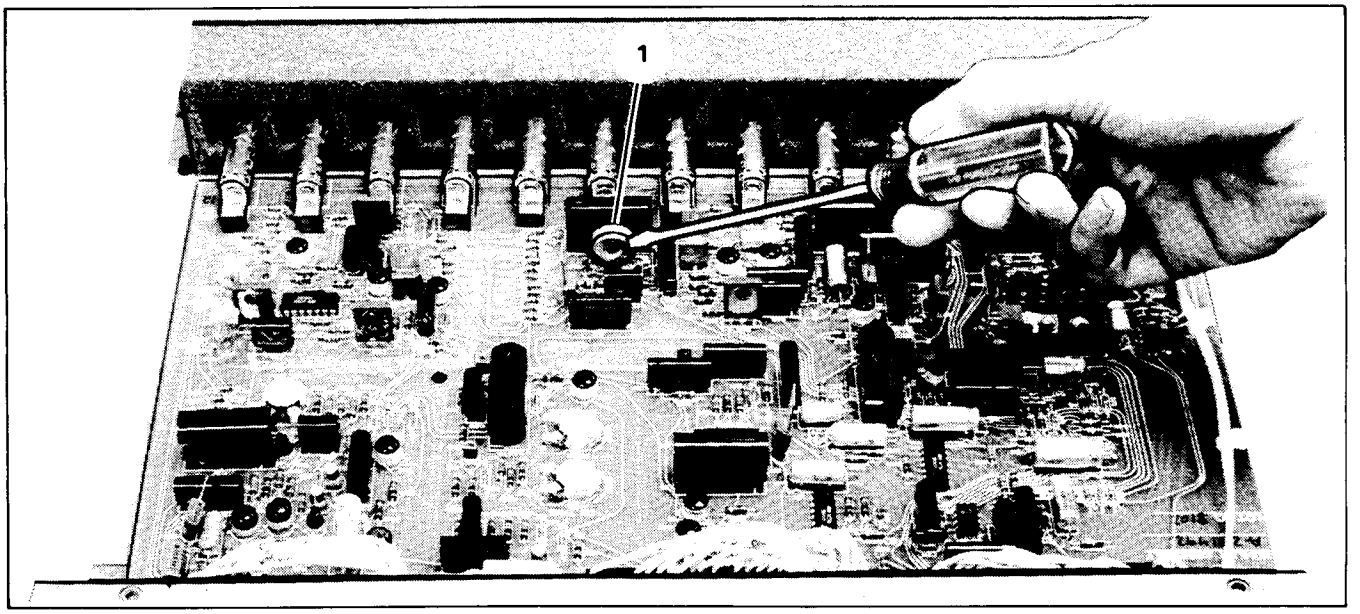


Figure 3-8. NFPA Controller

1. Overspeed Pot.

10. Regulator calibration is now complete. Turn controller main switch to OFF position and wait until set shuts down. Disconnect AC voltmeter and frequency counter. Seal Pot. 1, Pot. 2 and Pot. 3 on the regulator board with insulating varnish or equivalent. Check to make sure all five pots. on the regulator board are sealed. On units with NFPA controllers, check to make sure overspeed adjustment pot. on NFPA controller is sealed.

VOLTAGE REGULATOR BOARD ADJUSTMENT (Old style boards with Pot. 4 — Load Shed)

1. Break adjustment seals on Pots. 1, 2, 3, 4, 5 and 6.
2. Adjust Pot. 2 and Pot. 4 to their fully counterclockwise position.
3. Adjust Pot. 1, Pot 5 and Pot. 6 to their fully clockwise position.
4. Start the generator set with no load applied.

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when unit is running.

5. Adjust Pot. 2 for the specified output voltage as indicated by the AC voltmeter.

CAUTION

Do not exceed 285 volts when adjusting Pot. 2. Regulator board damage may result.

6. Observe LED on the regulator board. If it is glowing a steady red, proceed to the next step. If it is "flickering" alternately adjust Pot. 3 and Pot. 1 until a steady glow is obtained. It may be necessary to repeat the alternate adjustment several times.

NOTE

For Single Phase units do NOT adjust Pot. 1. Leave it in the fully clockwise limit.

7. For 60 Hz Frequency Specifications:

   Readjust Pot. 2 for an output of 280 Volts ± 4 Volts as indicated by the AC voltmeter.

8. Slowly adjust Pot. 6 in the counterclockwise direction to the point where the generator set shuts down. The overvoltage shut-down function is now set.
9. Readjust Pot. 2 approximately 1/8 turn counterclockwise before restarting the generator set.
10. Turn the controller main switch to OFF. Activate the overvoltage reset switch and restart the generator set.
11. Adjust Pot. 2 for the specified output voltage as indicated by the AC voltmeter.
12. For 60 Hz Frequency Specifications:

    Adjust the engine speed governor for an output frequency of 71 Hz (2130 RPM) ± 1 Hz as indicated by the frequency meter.

    For 50 Hz Frequency Specifications:

    Adjust the engine speed governor for an output frequency of 61 Hz (1830 RPM) ± 1 Hz as indicated by the frequency meter.

13. For Basic and Meter Box Models:

    Slowly adjust Pot. 5 in the counterclockwise direction to the point where the generator set shuts down. The overspeed shut-down function is now set.

    For NFPA (Hospital Code) Models:

    Leaving Pot. 5 in its fully clockwise position, slowly adjust the overspeed Pot. on controller board clockwise until set shuts down (Figure 3-8). The overspeed shut-down function is now set.

14. Adjust engine governor as necessary to reduce engine speed before restarting set.
15. Turn main switch to OFF. Activate overspeed reset switch, and turn main switch to test to restart generator set.

Complete the following steps with rated full load applied to the generator set:

16. For 60 Hz Frequency Specifications:

    Adjust the governor for an output frequency of 57 Hz (1710 RPM) ± 1 Hz as indicated by the frequency meter.

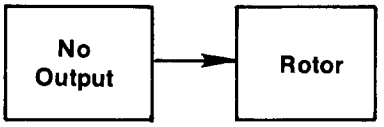
    For 50 Hz Frequency Specifications:

    Adjust the governor for an output frequency of 47 Hz (1410 RPM) ± 1 Hz as indicated by the frequency meter.

17. Observe the AC voltmeter reading and adjust Pot. 4 clockwise to where the output voltage begins to decrease. Slowly readjust counterclockwise to the point where the output voltage stops increasing. The load shedding function is now calibrated to become operational at a frequency slightly below the specified value.
18. Adjust the governor to the specified frequency.
19. Adjust the external voltage adjustment on the controller assembly front plate (if equipped) throughout its range. The output voltage indicated by the AC voltmeter should change ± 10 Volts minimum from the specified value. Adjust to the specified voltage.
20. Regulator calibration is now complete. Turn main switch to OFF and wait until set shuts down. Disconnect meters and reseal pots. with "insulating varnish".

Static Models (RY) (Continued)

Rotor



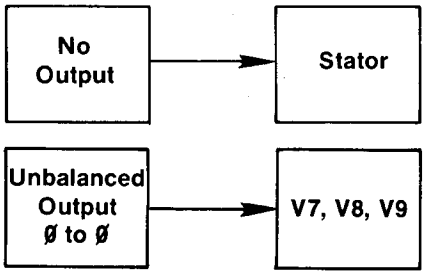
1. Lift brushes by leads F1 and F2 and lock in holder by inserting a length of wire or a paper clip as illustrated in "Generator Disassembly — Static Models (RY)".

CAUTION

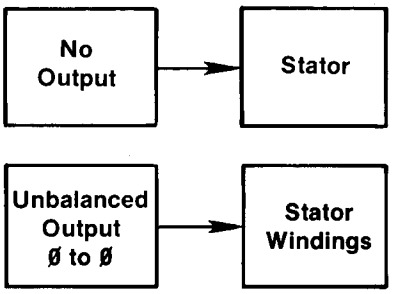
If separate excitation connections are still in place, disconnect auxiliary battery (negative lead first) to avoid equipment damage through short-circuit. See "Safety Precautions" for battery handling warnings.

2. Check rotor resistance. Contact each slip ring with an ohmmeter lead. Resistance readings for cold rotors should be 19.2 ohms ± 10%. A low reading indicates an internal short, and a high reading an open rotor.
3. Check rotor for ground. Touch one ohmmeter lead to either slip ring and other lead to rotor shaft. Meter should register no continuity. Any reading would indicate a short to ground.
4. If there is no reading, check stator.

Stator



1. Refer to appropriate wiring diagram in Section 5 and check V7, V8 and V9 connections at stator and voltage regulator.
2. Use an ohmmeter to check V7, V8 and V9 continuity between stator and voltage regulator. No continuity would indicate an open lead.



1. Unwrap and disconnect stator winding connections as shown in Figure 3-9.

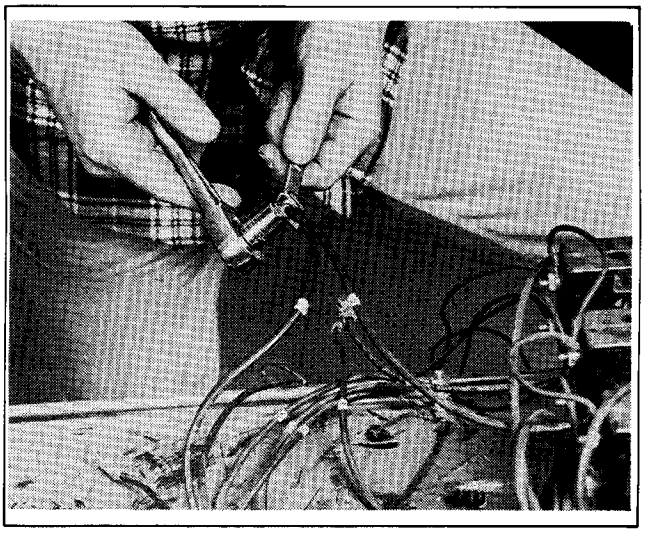
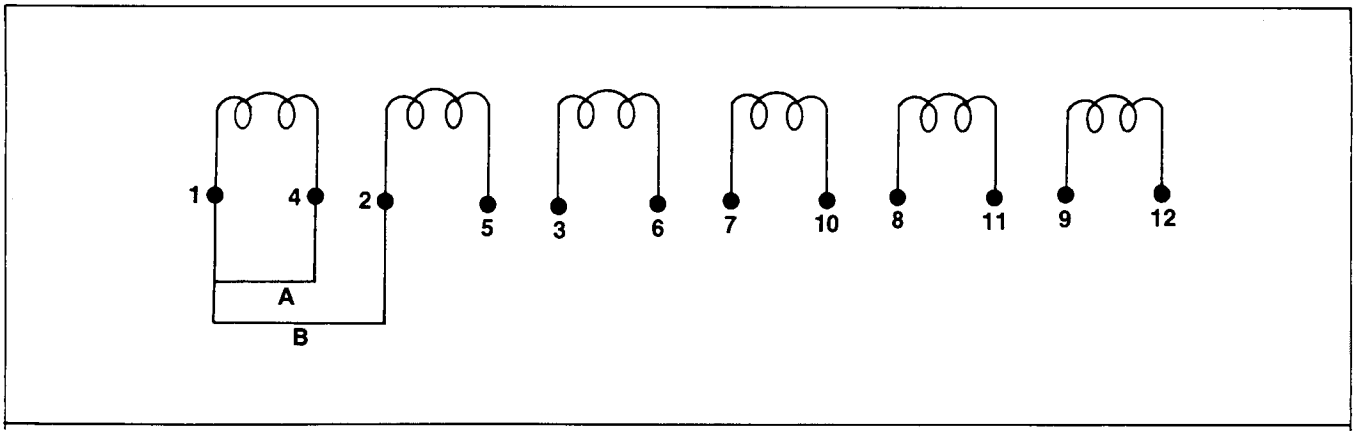


Figure 3-9. Stator Winding Connections



A. Continuity
B. No Continuity

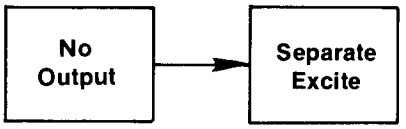
Figure 3-10. Stator Windings

Brushless Models (RZ)

2. Make sure all connections are isolated. Connect an ohmmeter across each winding (Figure 3-10) to check for continuity. No continuity would indicate an open winding and a faulty stator.

3. Connect an ohmmeter from one lead of each winding to one lead of each other winding (Figure 3-10) to check for continuity. Meter should register no continuity. Continuity would indicate a winding to winding short and a faulty stator.

4. Connect an ohmmeter between each winding and ground on the stator frame. Meter should register no continuity. Continuity would indicate a winding short to ground and a faulty stator.



To help determine the cause of no or low AC output separately excite generator. The generator field (rotor) may be excited (magnetized) using an outside power source and the following procedure. Refer to Figures 3-11, 3-12 and the appropriate wiring diagram in Section 5.

NOTE

On CSA Models no-output could be the result of a blown fuse. Fuses on sensing leads V7, V8 and V9 protect regulator board and SCR module against an overcurrent condition.

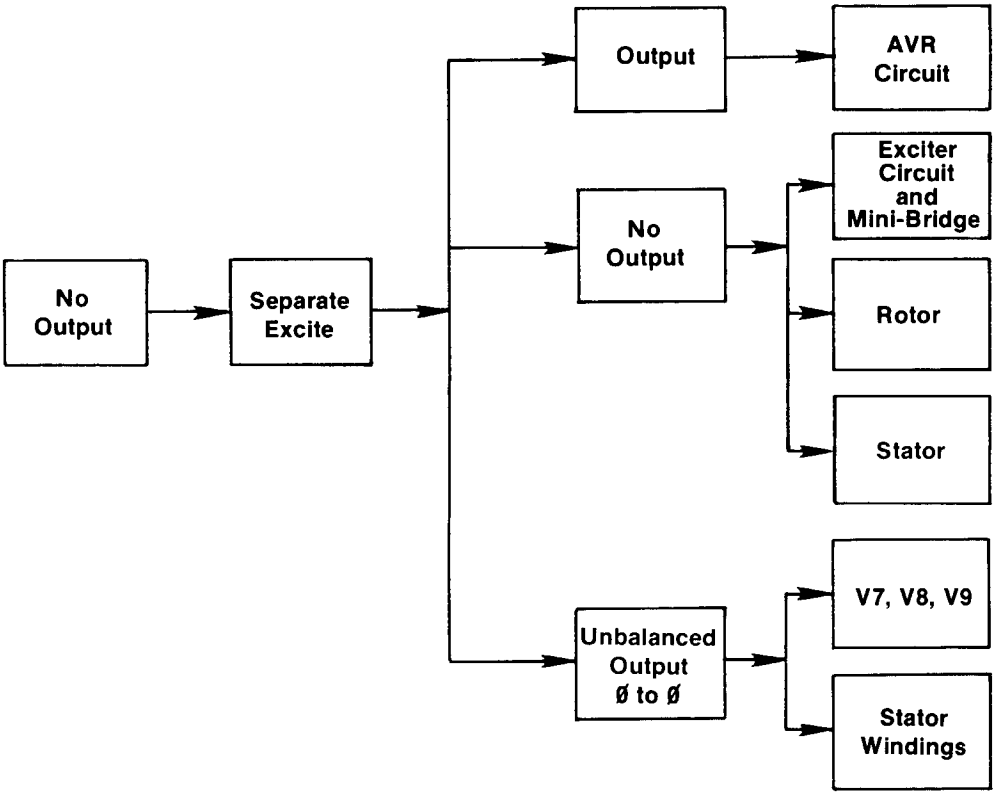
SEPARATELY EXCITE — RZ MODELS

1. Disconnect and insulate V7, V8, V9, V0 and V4 from terminal strip. Disconnect and insulate L1, L2 and L3.
2. Disconnect exciter leads F1 and F2 at quick disconnect.

WARNING

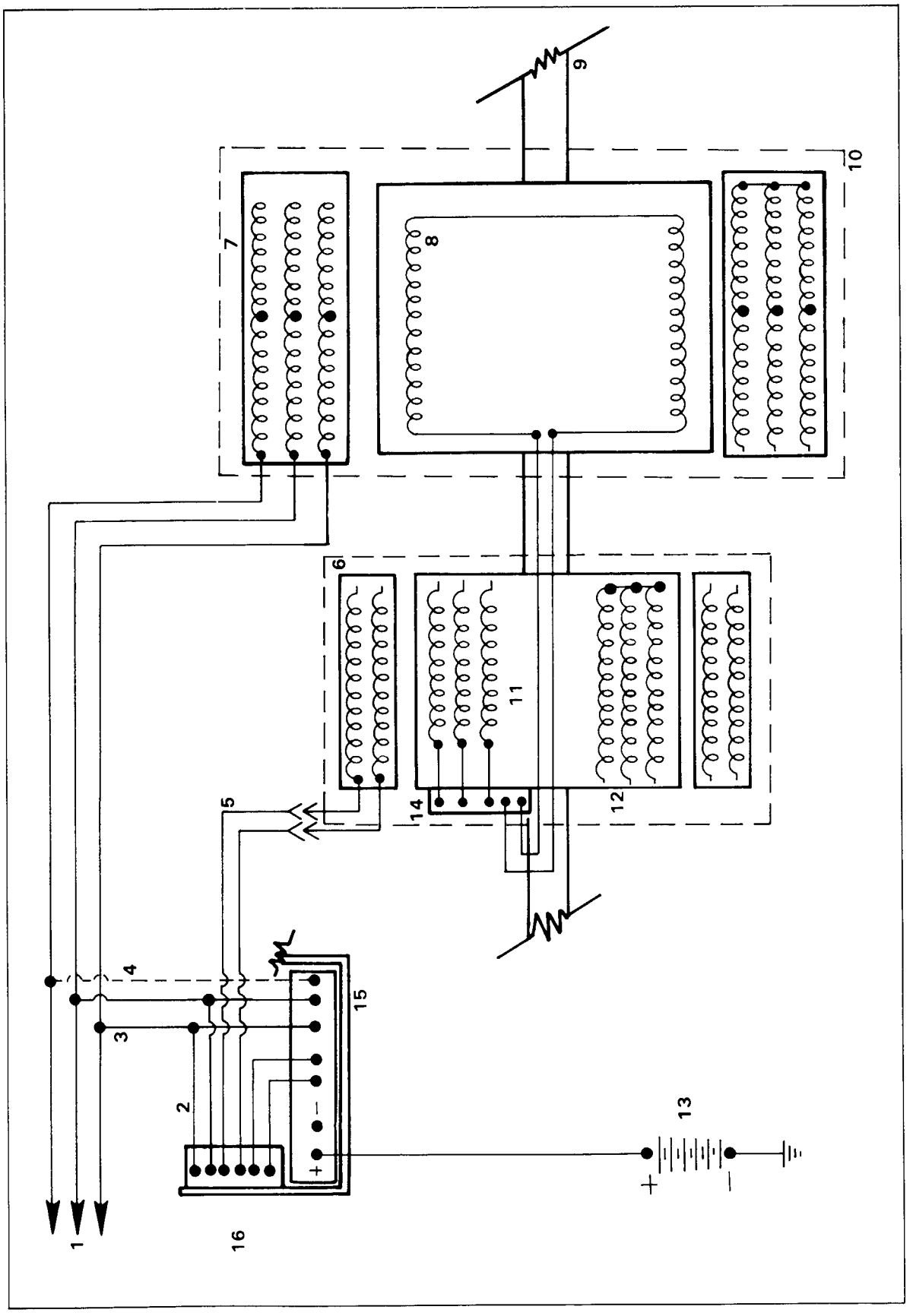
EXPLOSIVE GASES! When working in an enclosed area, auxiliary battery should be located at least 18 inches above the floor to minimize the possibility of igniting fuel vapors. See "Safety Precautions".

3. Place a voltmeter across F3 and F4. Connect an ammeter in series with F3. Start unit and read battery voltage. Ammeter should read 4/10 of 1 amp. If voltage is not present, problem is in controller. If current is high or low, problem is in the exciter field.
4. Check L1, L2, L3, V7, V8, V9, V0 and V4 with a voltmeter for output (25-35 volts). If no voltage, refer to No Output checks.
5. If there is output, check the Automatic Voltage Regulation (AVR) circuit.



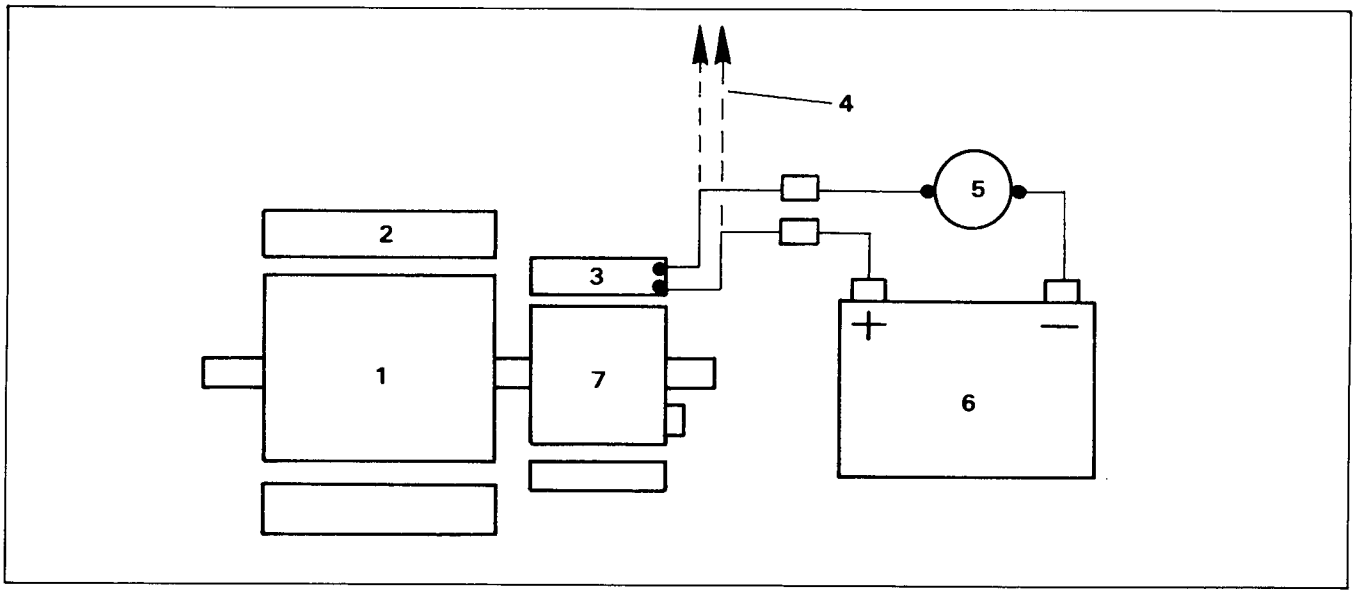
Troubleshooting Flow Chart

Brushless Models (RZ) (Continued)



1. Load
2. Input Supply
3. Sensing (1Ø)
4. Sensing (3Ø)
5. Output Supply
6. Exciter Field
7. Stator
8. Field (Rotor)
9. Rotor Shaft
10. Main Generator
11. Exciter Generator
12. Exciter Armature
13. Starting Battery
14. Mini Bridge Rectifier
15. Voltage Regulator
16. SCR Module

Figure 3-11. RZ Schematic

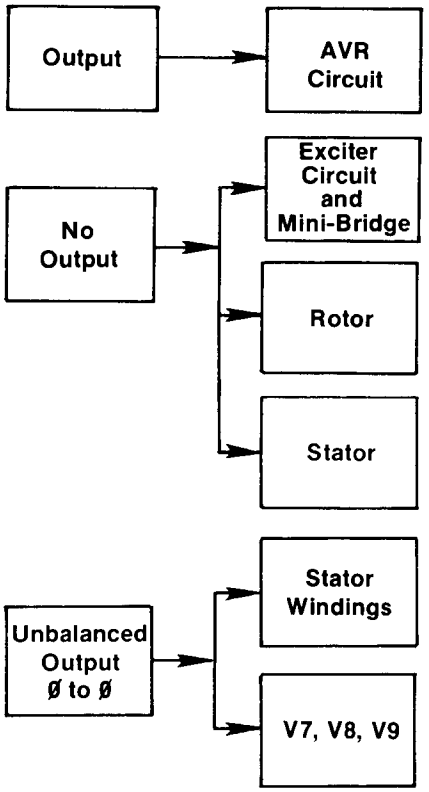


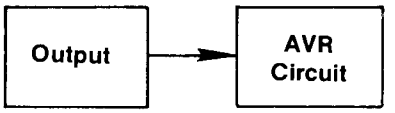
1. Rotor
2. Stator
3. Exciter Field
4. To SCR Module
5. DC Ammeter
6. Battery
7. Exciter Armature

Figure 3-12. Separate Field Excitation

NOTE

On Basic and Meter Box Models overcrank circuit will shut unit down after 60 seconds. If needed to run longer, remove 1CR immediately after unit has started.





If generator output is not available under normal operation but is available when you separately excite unit — the fault is probably in the Automatic Voltage Regulation (AVR) circuit.

SCR Module

1. Check SCR Module on RX1 scale (Figure 3-13).

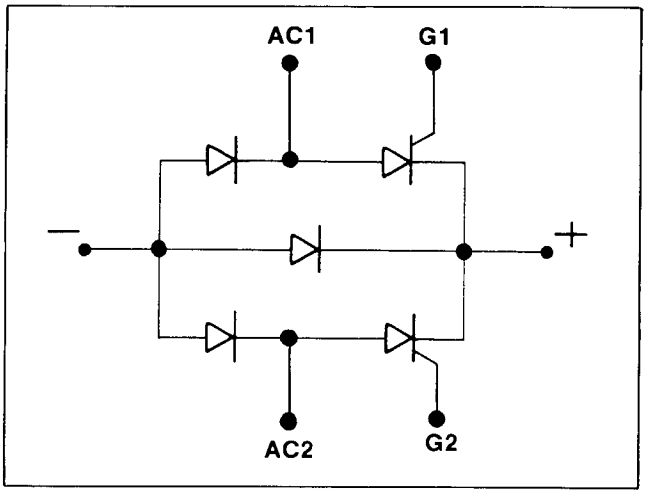


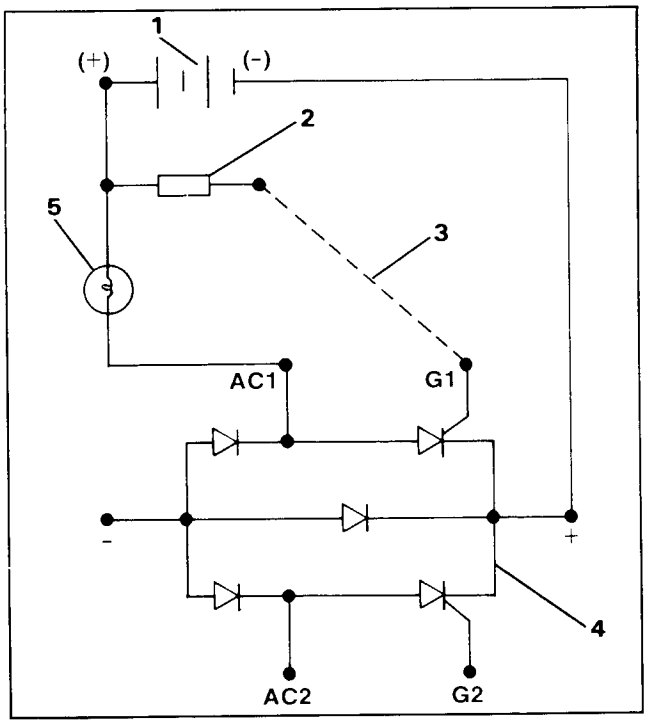
Figure 3-13. SCR Module

Brushless Models (RZ) (Continued)

2. Connect ohmmeter from (+) to (-). You should read high resistance in one direction and low resistance in the other.
3. Connect ohmmeter from AC1 to (+). You should read high resistance in both directions. Repeat for AC2.
4. Connect ohmmeter from AC1 to (-). You should read high resistance in one direction and low resistance in the other. Repeat for AC2.
5. G1 to (+) should see low resistance in one direction and high resistance in the other. Repeat for G2.
6. If any of the above checks indicates a faulty SCR module — replace.
7. See Figure 3-14. Connect negative (-) lead from DC source to positive (+) pin on SCR module.

CAUTION

The SCR module may be damaged if this step is performed incorrectly. Be sure to connect the **NEGATIVE** (-) lead of the battery to the **POSITIVE** (+) pin on the SCR module.



1. **12-Volt DC Source**
2. **100-500-Ohm Resistor**
3. **Momentary Jumper**
4. **SCR Module**
5. **12-Volt Lamp**

Figure 3-14. SCR Test

8. Connect positive (+) lead from DC source, with lamp in series, to AC1 pin on SCR module. Lamp should not glow.
9. Momentarily connect jumper, with resistor in series, from positive of DC source to G1 pin on SCR module. Lamp should glow, and continue to glow after removing jumper.
10. Repeat steps 8 and 9, with positive (+) lead and lamp connected to AC2 pin on SCR module, momentarily connecting jumper to G2 pin.
11. If any of the above checks indicates a faulty SCR module — replace.

Regulator Board — Test

To check regulator board you'll need the following equipment:

- 208-240 Volt AC power source
- On-Off Switch
- SCR module (pre-tested)
- 120 or 240 Volt AC light bulb and socket
- Jumper wires

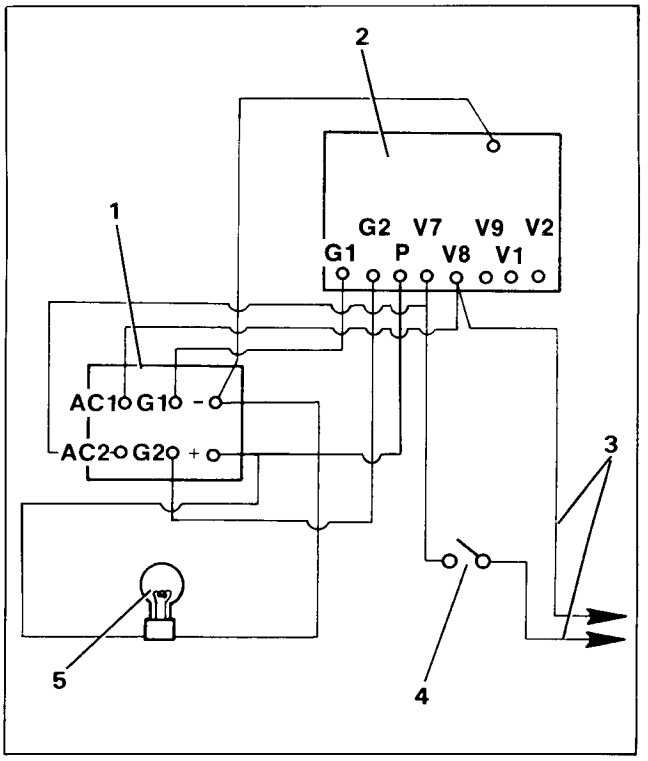
NOTE

240-Volts will shorten life of 120-Volt bulb.

WARNING

HIGH VOLTAGE! Whenever electrical energy is present, there's the potential danger of electrocution. Remove rings, watches and jewelry that can cause short circuits. Do not touch electrical equipment when standing in water, on wet ground, or when your hands are wet. See "Safety Precautions".

1. Refer to Figure 3-15 and the appropriate wiring diagram in Section 5; connect regulator board to good SCR module.
2. Wire a 120 or 240-Volt AC light bulb across (+) and (-) of SCR module.
3. Wire on-off switch (in open position) in series with AC power source.
4. Wire 208-240-Volts to V7 and V8 on terminal strip in regulator/terminal strip tray.
5. Close switch to apply power; lamp should light. Adjust Pot. 2 to clockwise limit and observe maximum intensity of light. Adjusting Pot. 2 to counterclockwise limit will extinguish bulb. See Figures 3-16 and 3-17 for adjustment location.
6. Connect battery (+) to the P terminal and connect battery (-) to common wire between hour meter and reset lamp.
7. Turn on AC and DC power and adjust overspeed Pot. 5 counterclockwise until reset lamp turns on. Return Pot. 5-1/8 of a turn clockwise.
8. Reset fault. Turn overvoltage Pot. 6 counterclockwise until the reset lamp comes on. Return Pot. 6-1/8 of a turn clockwise.
9. If above test indicates a faulty regulator board — replace and refer to new board adjustment procedure following.



1. **SCR Module**
2. **Regulator Board**
3. **To AC Source**
4. **On-Off Switch**
5. **Light Bulb and Socket**

Figure 3-15. Regulator Board Test — Connections

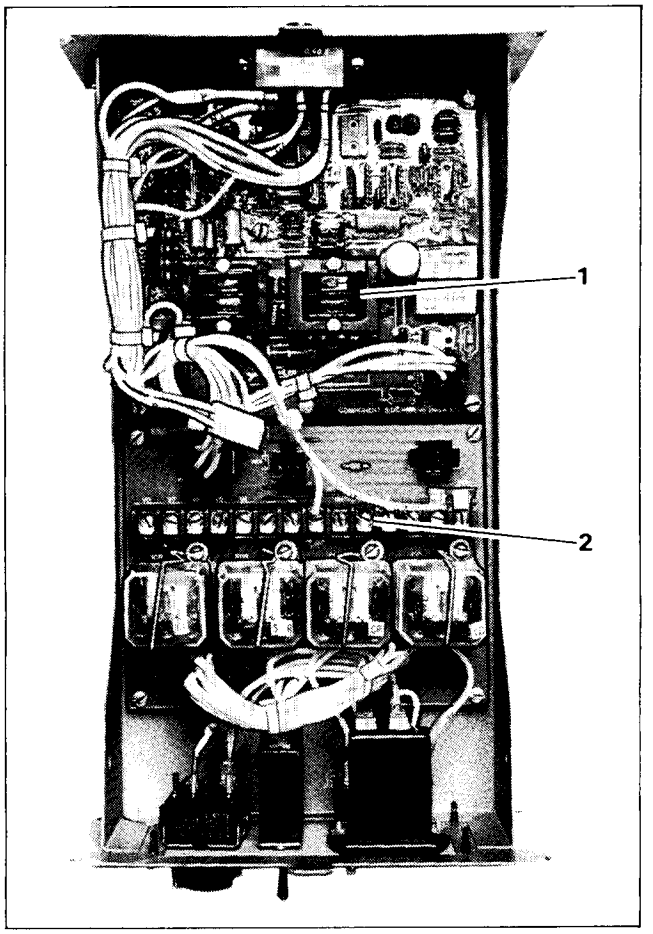


Figure 3-16. Regulator and Terminal Boards

1. **Voltage Regulator Board**
2. **Terminal Strip**

Regulator Board — Calibration

Voltage regulator must be recalibrated using the following procedure if output leads are reconnected to voltage other than factory test voltage. Failure to do so may result in equipment damage.

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when set is running.

The following equipment is required to properly adjust regulator board.

1. AC voltmeter, 0-300 V. AC minimum range, ± 0.5% minimum accuracy.
2. Frequency counter, 45 to 75 Hz minimum range, ± 1% minimum accuracy.
3. Potentiometer adjustment tool (or small blade screwdriver).
4. Load bank-capacity must equal output potential of generator set. (Used only on voltage regulator boards with Pot. 4 — Load Shed.)

Before Starting Generator Set:

1. Disconnect generator from load. Place generator main switch in OFF position. Lift enclosure cover to expose voltage regulator board and terminal strip. See Figure 3-16.
2. Check the wire jumpers on the regulator board and arrange as noted in Table 3-2.
3. For generator sets having a single-phase connection, lift lead V9 from the controller circuit board terminal strip and insulate lead end with electrical tape to prevent any electrical connection.

Table 3-2. Jumper Condition

Jumper	Models	
	10 kW-17.5 kW	22.5 kW-47.5 kW
J1	Inserted	Removed
J2	Removed	Inserted
J3	Inserted for 60 Hz — Removed for 50 Hz	

Brushless Models (RZ) (Continued)

4. Adjust the external voltage adjustment potentiometer located on the controller assembly front panel (if equipped) to the approximate midpoint of its adjustment range.
5. Connect the AC voltmeter and frequency counter between leads V7 and V8 on the generator set.
6. See Figure 3-17 for types of voltage regulator boards, in order to determine which adjustment procedure must be used.

VOLTAGE REGULATOR BOARD ADJUSTMENT (New style boards without Pot. 4 — Load Shed)

1. Break adjustment seals on Pots. 1, 2 and 3.

NOTE

Pot. 5 (Ov. Spd.) and Pot. 6 (Ov. Volt) should be sealed and do not require any adjustment at this time.

2. Turn Pot. 1 to full clockwise (CW) position.
3. Turn Pot. 2 to full counterclockwise (CCW) position.

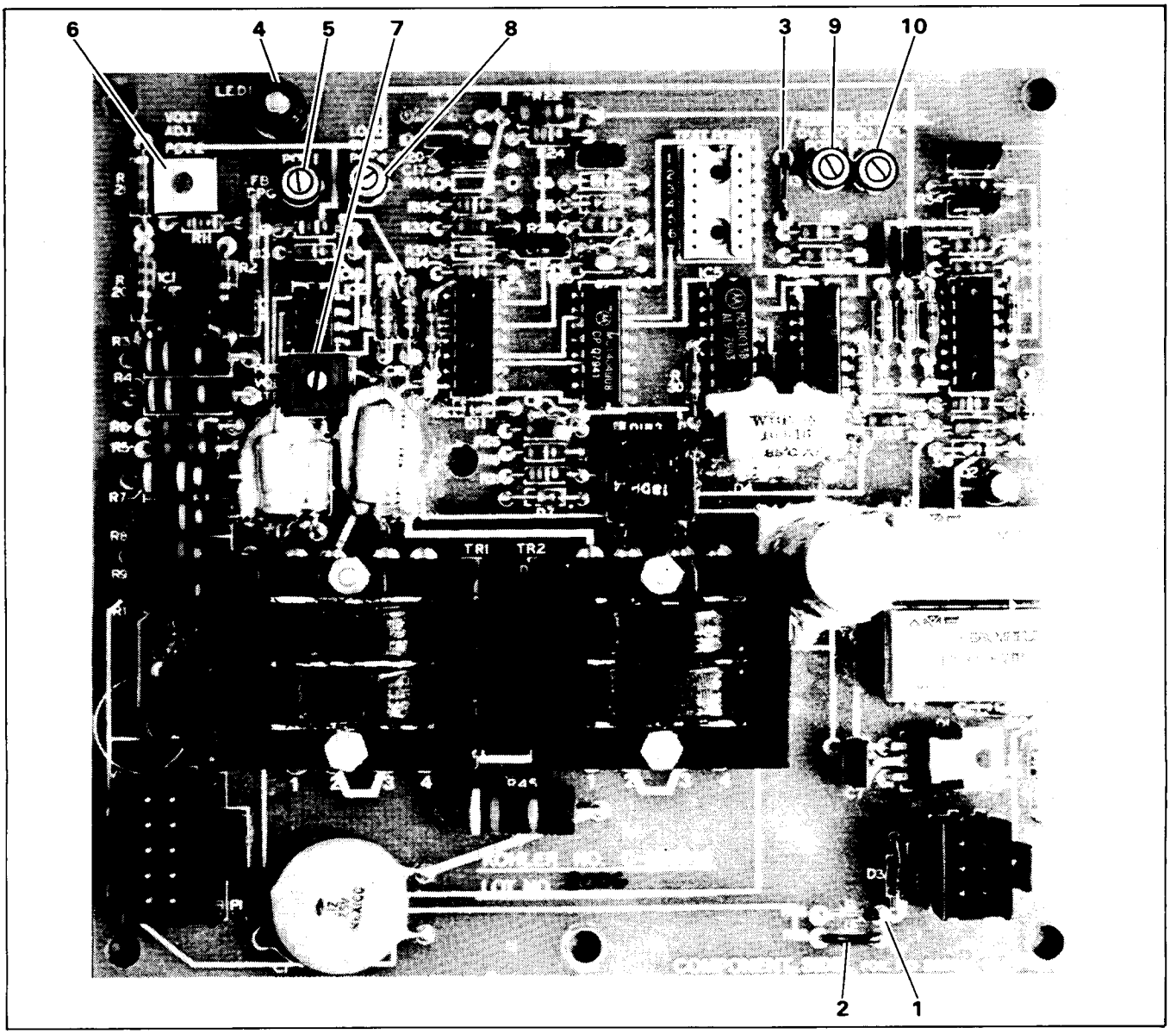


Figure 3-17. Regulator Board

1. J-1
2. J-2
3. J-3
4. LED
5. Pot. 1 — FR Damp
6. Pot. 2 — Volt Adj.
7. Pot. 3 — Volt Stb.
8. Pot. 4 — Load Shed (Found only on old style board)
9. Pot. 5 — Ov. Spd.
10. Pot. 6 — Ov. Volt

4. Start the generator set with no load applied.

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when unit is running.

5. Adjust Pot. 2 (Volt Adj.) while observing the AC voltmeter. Adjust for a meter reading as specified for this set.
6. Observe LED on the regulator board. If it is glowing a steady red, proceed to the next step. If it is "flickering" alternately, first adjust Pot. 3 (Volt Stb.) and then Pot. 1 (FR Damp) until a steady glow is attained. It may be necessary to repeat the alternate adjustment several times.

NOTE

For single-phase units do *not* adjust Pot. 1. Leave it in the fully clockwise limit.

7. Overvoltage Shutdown Check (Pot. 6)
   a. While observing the AC voltmeter reading, slowly adjust Pot. 2 just to the point where the generator set shuts down. Note carefully the AC voltmeter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 257 ± 5 Volts AC
      60 Hz Sets: 280 ± 5 Volts AC

CAUTION

Do not exceed 285 Volts when adjusting Pot. 2. Regulator board damage may result.

   b. Readjust Pot. 2 about 1/8 turn in the CCW direction to prevent an immediate shutdown upon restart.
   c. Turn the controller main switch to the OFF position and reset the overvoltage fault.
   d. Restart the generator set.
   e. Adjust Pot. 2 while observing the AC voltmeter. Adjust for a meter reading as specified for this set.

NOTE

If the set fails to pass this test, go to Step 8. Otherwise, omit Step 8 and go to Step 9.

8. Overvoltage Shutdown Adjustment (Pot. 6)
   a. Break adjustment seal and turn Pot. 6 to full CW position.
   b. While observing AC voltmeter reading, adjust Pot. 2 as follows:

      50 Hz Sets: 257 ± 3 Volts AC
      60 Hz Sets: 280 ± 3 Volts AC

   c. Slowly turn Pot. 6 in a CCW direction just to the point where the generator set shuts down. Do *not* turn pot. beyond this point.
   d. Readjust Pot. 2 about 1/8 turn CCW to prevent immediate shutdown upon restart.
   e. Turn the controller's main switch to the OFF position and reset the overvoltage fault.
   f. Restart the generator set and turn Pot. 2 CW until unit shuts down while observing AC voltmeter. Note carefully the AC voltmeter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 257 ± 3 Volts AC
      60 Hz Sets: 280 ± 3 Volts AC

      If voltage is not within specifications, readjust Pot. 6 1° CW and go back to Step d.

   g. Readjust Pot. 2 about 1/8 turn CCW to prevent immediate shutdown upon restart.
   h. Turn the controller's main switch to the OFF position and reset the overvoltage fault.
   i. Restart the generator set and readjust Pot. 2 for the specified output voltage for this set as indicated on the AC voltmeter.
   j. Seal Pot. 6 with insulating varnish or equivalent.

9-1.1. Overspeed Shutdown Check (Pot. 5) — Models Without NFPA Controllers Only
   a. While observing the frequency counter reading, slowly increase the engine speed (by adjusting the engine governor) just to the point where the set shuts down. Note carefully the frequency counter reading just prior to shutdown. This reading shall be within the following limits:

      50 Hz Sets: 60 ± 2 Hz
      60 Hz Sets: 70 ± 2 Hz

   b. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.
   c. Turn the controller main switch to the OFF position and reset the overspeed fault.
   d. After restarting the set, readjust the engine speed governor for the set's specified output frequency.

NOTE

If the set fails to pass this test, go to Step 9-1.2. Otherwise, omit Step 9-1.2 and go to Step 10.

9-1.2. Overspeed Shutdown Adjustment (Pot. 5) — Models Without NFPA Controllers Only
   a. Break adjustment seal and turn Pot. 5 to its full CW position.
   b. Adjust the engine speed governor for a frequency counter reading as follows:

      50 Hz Sets: 61 ± 1 Hz
      60 Hz Sets: 71 ± 1 Hz

Brushless Models (RZ) (Continued)

c. Slowly turn Pot. 5 in a CCW direction, just to the point where the generator set shuts down. Do *not* turn the pot. beyond this point.

d. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

e. Turn the controller's main switch to the OFF position and reset the overspeed fault.

f. Restart the set and increase engine speed until shutdown while observing frequency meter. Note carefully the frequency reading just prior to shutdown. This reading shall be within the following limits:

50 Hz Sets: 61 ± 1 Hz
60 Hz Sets: 71 ± 1 Hz

NOTE

If frequency is not within specifications, readjust Pot. 5 1° CW and go back to Step d.

g. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

h. Turn the controller's main switch to the OFF position and reset the overspeed fault.

i. Restart the set and readjust the engine speed governor for the set's specified output frequency as indicated by the frequency counter.

j. Seal Pot. 5 with insulating varnish or equivalent.

9-2.1. Overspeed Shutdown Adjustment (Pot. 5) — Models with NFPA Controllers Only

a. Break adjustment seal and turn Pot. 5 to its full CW position.

b. Adjust the engine speed governor for:

50 Hz Sets: 61 ± 1 Hz
60 Hz Sets: 71 ± 1 Hz

c. Break adjustment seal and slowly adjust the overspeed pot. on the NFPA controller board just to the point where the generator set shuts down. See Figure 3-18.

d. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

e. Turn the controller's main switch to the OFF position and reset the overspeed fault.

f. Restart the set and increase engine speed until shutdown while observing frequency meter. Note carefully the frequency reading just prior to shutdown. This reading shall be within the following limits:

50 Hz Sets: 61 ± 1 Hz
60 Hz Sets: 71 ± 1 Hz

g. Readjust the governor slightly to reduce engine speed, thereby preventing an immediate shutdown upon restart.

h. Turn the controller's main switch to the OFF position and reset the overspeed fault.

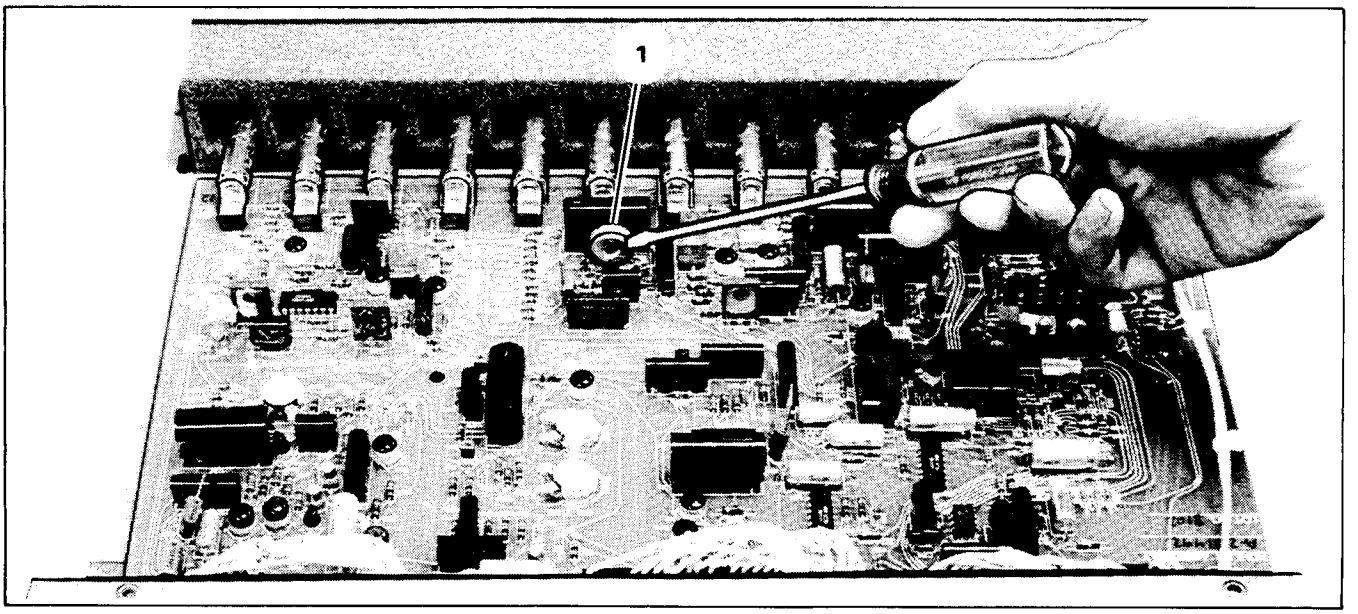


Figure 3-18. NFPA Controller

1. Overspeed Pot.

i. Restart the set and readjust the engine speed governor for the set's specified output frequency as indicated by the frequency counter.

j. Seal Pot. 5 with insulating varnish or equivalent.

k. Seal the overspeed pot. on the NFPA controller board with insulating varnish or equivalent. Be careful not to move the adjustment wheel.

9-2.2. Voltage Adjustment Range Check — Models with NFPA Controllers Only

a. Turn the external voltage adjustment potentiometer on the controller assembly front panel (if equipped) while observing the AC voltmeter reading. Note the readings when the potentiometer is in the CW and CCW limit positions. These readings should be at least 10 Volts above and below the set's specified output voltage. Adjust to the specified voltage.

10. Regulator calibration is now complete. Turn controller main switch to OFF position and wait until set shuts down. Disconnect AC voltmeter and frequency counter. Seal Pot. 1, Pot. 2 and Pot. 3 on the regulator board with insulating varnish or equivalent. Check to make sure all five pots. on the regulator board are sealed. On units with NFPA controllers, check to make sure overspeed adjustment pot. on NFPA controller is sealed.

VOLTAGE REGULATOR BOARD ADJUSTMENT (Old style boards with Pot. 4 — Load Shed)

1. Break adjustment seals on Pots. 1, 2, 3, 4, 5 and 6.
2. Adjust Pot. 2 and Pot. 4 to their fully counterclockwise position.
3. Adjust Pot. 1, Pot 5 and Pot. 6 to their fully clockwise position.
4. Start the generator set with no load applied.

WARNING

DANGER OF ELECTROCUTION! High voltage is present at regulator board P1 connector and terminal strip when unit is running.

5. Adjust Pot. 2 for the specified output voltage as indicated by the AC voltmeter.

CAUTION

Do not exceed 285 volts when adjusting Pot. 2. Regulator board damage may result.

6. Observe LED on the regulator board. If it is glowing a steady red, proceed to the next step. If it is "flickering" alternately adjust Pot. 3 and Pot. 1 until a steady glow is obtained. It may be necessary to repeat the alternate adjustment several times.

NOTE

For Single Phase units do NOT adjust Pot. 1. Leave it in the fully clockwise limit.

7. For 60 Hz Frequency Specifications:

   Readjust Pot. 2 for an output of 280 Volts ± 4 Volts as indicated by the AC voltmeter.

8. Slowly adjust Pot. 6 in the counterclockwise direction to the point where the generator set shuts down. The overvoltage shutdown function is now set.

9. Readjust Pot. 2 approximately 1/8 turn counterclockwise before restarting the generator set.

10. Turn the controller main switch to OFF. Activate the overvoltage reset switch and restart the generator set.

11. Adjust Pot. 2 for the specified output voltage as indicated by the AC voltmeter.

12. For 60 Hz Frequency Specifications:

    Adjust the engine speed governor for an output frequency of 71 Hz (2130 RPM) ± 1 Hz as indicated by the frequency meter.

    For 50 Hz Frequency Specifications:

    Adjust the engine speed governor for an output frequency of 61 Hz (1830 RPM) ± 1 Hz as indicated by the frequency meter.

13. For Basic and Meter Box Models:

    Slowly adjust Pot. 5 in the counterclockwise direction to the point where the generator set shuts down. The overspeed shutdown function is now set.

    For NFPA (Hospital Code) Models:

    Leaving Pot. 5 in its fully clockwise position, slowly adjust the overspeed Pot. on controller board clockwise until set shuts down (Figure 3-18). The overspeed shutdown function is now set.

14. Adjust engine governor as necessary to reduce engine speed before restarting set.

15. Turn main switch to OFF. Activate overspeed reset switch, and turn main switch to test to restart generator set.

Complete the following steps with rated full load applied to the generator set:

16. For 60 Hz Frequency Specifications:

    Adjust the governor for an output frequency of 57 Hz (1710 RPM) ± 1 Hz as indicated by the frequency meter.

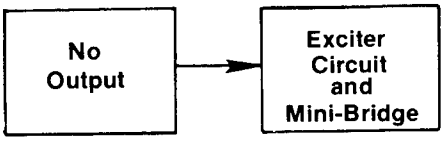
    For 50 Hz Frequency Specifications:

    Adjust the governor for an output frequency of 47 Hz (1410 RPM) ± 1 Hz as indicated by the frequency meter.

Brushless Models (RZ) (Continued)

17. Observe the AC voltmeter reading and adjust Pot. 4 clockwise to where the output voltage begins to decrease. Slowly readjust counterclockwise to the point where the output voltage stops increasing. The load shedding function is now calibrated to become operational at a frequency slightly below the specified value.
18. Adjust the governor to the specified frequency.
19. Adjust the external voltage adjustment on the controller assembly front plate (if equipped) throughout its range. The output voltage indicated by the AC voltmeter should change ± 10 Volts minimum from the specified value. Adjust to the specified voltage.
20. Regulator calibration is now complete. Turn main switch to OFF and wait until set shuts down. Disconnect meters and reseal pots. with "insulating varnish".

Exciter Field



1. Disconnect exciter leads F1 and F2 at quick disconnect.
2. Check exciter field resistance. Connect an ohmmeter across F1 and F2. Resistance reading for a cold exciter field should be 35 ohms ± 10%. A low reading indicates an internal short and a high reading an open winding. Replace a faulty exciter field.
3. Check exciter field for ground. Touch one ohmmeter lead to F1 or F2 and other lead to the exciter frame. Meter should register no continuity. Any reading would indicate a short to ground and a faulty exciter field.

NOTE

F3 and F4 are auxiliary field winding leads used for voltage build-up. With unit running check for battery voltage at these connections.

4. Repeat Steps 1-3 for exciter leads F3 & F4.

Exciter Armature

1. Disconnect three AC leads from mini-bridge rectifier. See Figure 3-19.

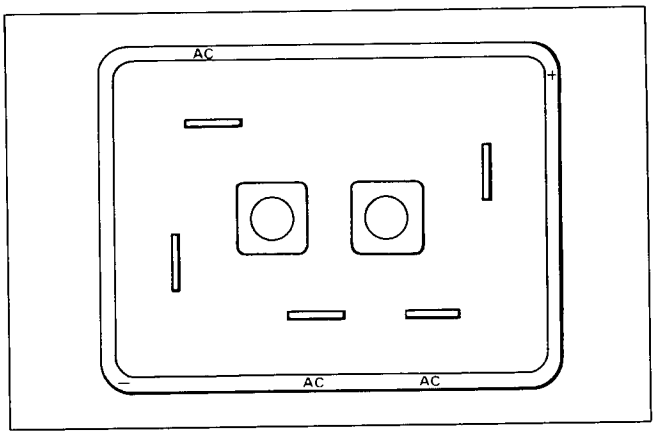


Figure 3-19. Mini-Bridge

2. Connect ohmmeter across each set of leads to check for continuity.

   AC1 to AC2 (.5-.75 ohms)

   AC2 to AC3 (.5-.75 ohms)

   AC1 to AC3 (.5-.75 ohms)

   No continuity would indicate an open winding and a faulty exciter armature.
3. Connect an ohmmeter lead from each AC lead to the rotor shaft. Meter should register no continuity. Continuity would indicate a winding short to ground and a faulty exciter armature.

Mini-Bridge

1. Check mini-bridge (Figure 3-20).

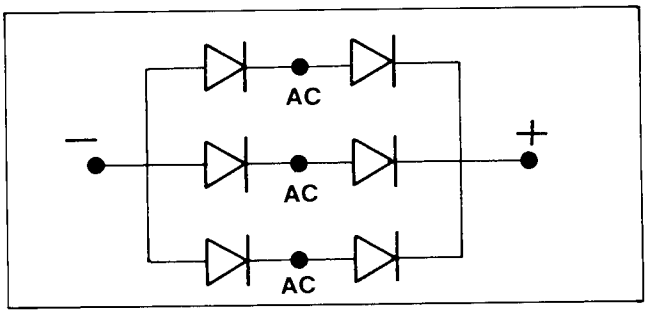
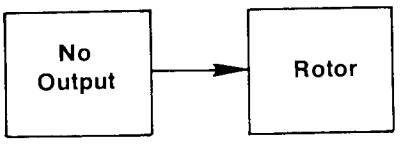


Figure 3-20. Mini-Bridge

2. Connect an ohmmeter from each AC terminal to (+) terminal. You should see low resistance in one direction and high resistance in the other direction.
3. Connect an ohmmeter from each AC terminal to (-) terminal. You should see low resistance in one direction and high resistance in the other direction.

Rotor

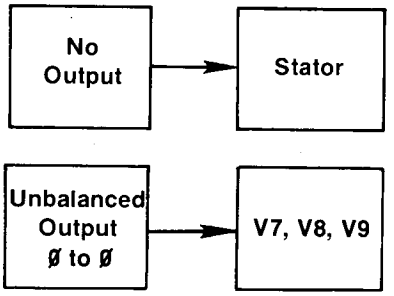


1. Disconnect (+) and (-) rotor leads from mini-bridge.
2. Check rotor resistance. Contact each rotor lead with an ohmmeter lead. Resistance readings for cold rotors are listed in the chart below. A low reading indicates an internal short, and high reading an open rotor.

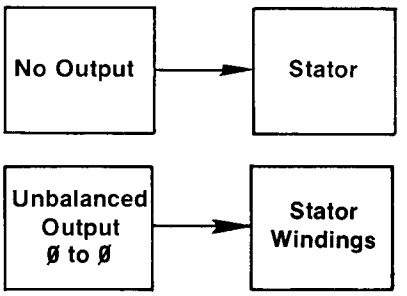
Specified Cold Rotor Resistance ± 10%		
22.5kW	32.5kW	47.5kW
3.3	2.4	2.9

3. Check rotor for ground. Touch one ohmmeter lead to either rotor lead and other meter lead to rotor shaft. Meter should register no continuity. Any reading would indicate a short to ground.
4. If there is no reading, check stator.

Stator



1. Refer to appropriate wiring diagram in Section 5 and check V7, V8 and V9 connections at stator and voltage regulator.
2. Use an ohmmeter to check V7, V8 and V9 continuity between stator and voltage regulator. No continuity would indicate an open lead.



1. Unwrap and disconnect stator winding connections as shown in Figure 3-21.
2. Make sure all connections are isolated. Connect an ohmmeter across each winding (Figure 3-22) to check for continuity. No continuity would indicate an open winding and a faulty stator.
3. Connect an ohmmeter from one lead of each winding to one lead of each other winding (Figure 3-22) to check for continuity. Meter should register no continuity. Continuity would indicate a winding short and a faulty stator.

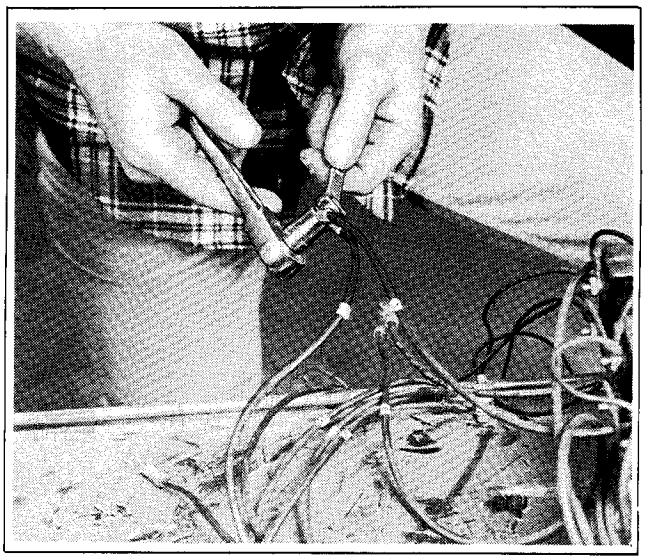
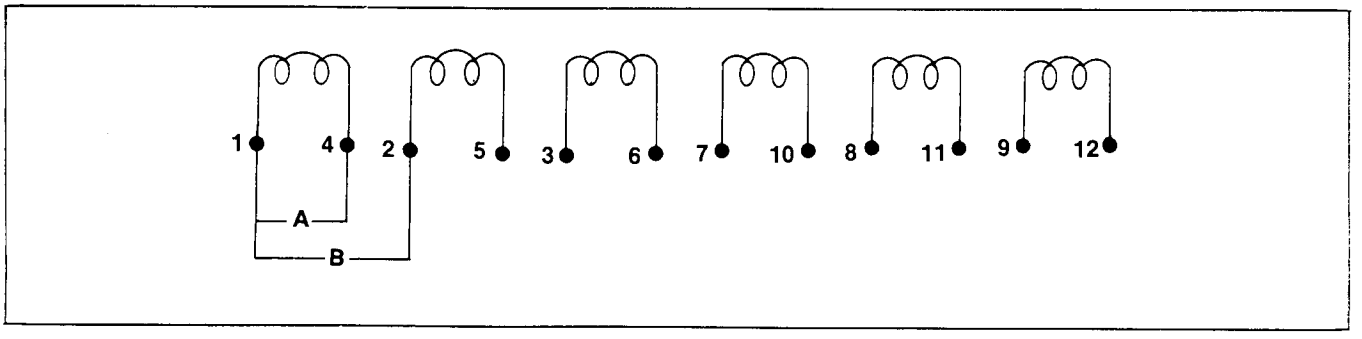


Figure 3-21. Stator Winding Connections



A. Continuity
B. No Continuity

Figure 3-22. Stator Windings

Section 4
GENERATOR DISASSEMBLY — REASSEMBLY

WARNING

Before beginning to disassemble generator set carefully read all Safety Precautions at the beginning of this manual. Please do not neglect the importance of these precautions. Some additional safety procedures are listed below.

1. Disconnect and remove starting batteries from work area to prevent fire hazard. Disconnect any AC accessories such as battery charger, block heater and fuel transfer pump.
2. Shut off fuel supply. Drain fuel system as necessary, emptying fuel into proper containers. Remove any fuel containers from work area to prevent fire hazard. Ventilate work area to clear fumes.
3. Disconnect fuel, cooling, and exhaust systems as necessary to tilt generator set. Disconnect output leads or load circuit cables at generator.
4. Any cranes, hoists, or other devices used in disassembly or reassembly must be rated for weight of generator set. Check generator set nameplate for weight.

Controls

METER BOX AND NFPA CONTROLLER REMOVAL

1. Remove controller cover screws and lift away cover (Figure 4-1).

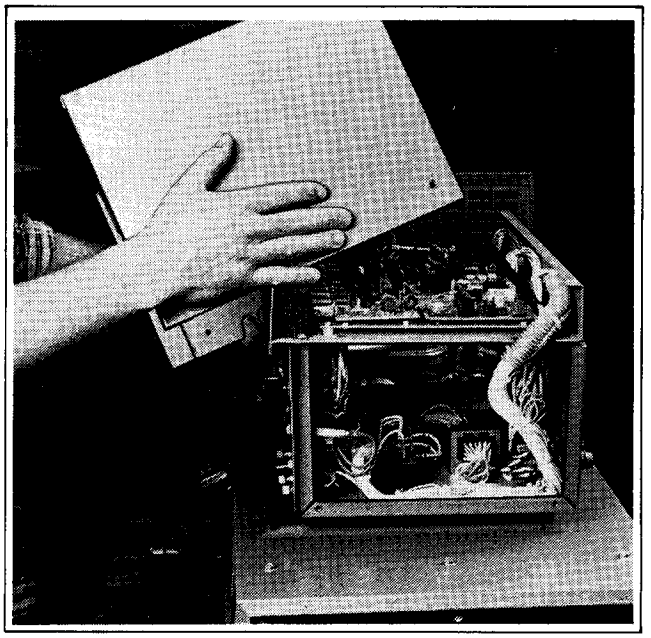


Figure 4-1. Controller Cover

2. Remove capscrews and tilt back enclosure access cover/controller (Figure 4-2).

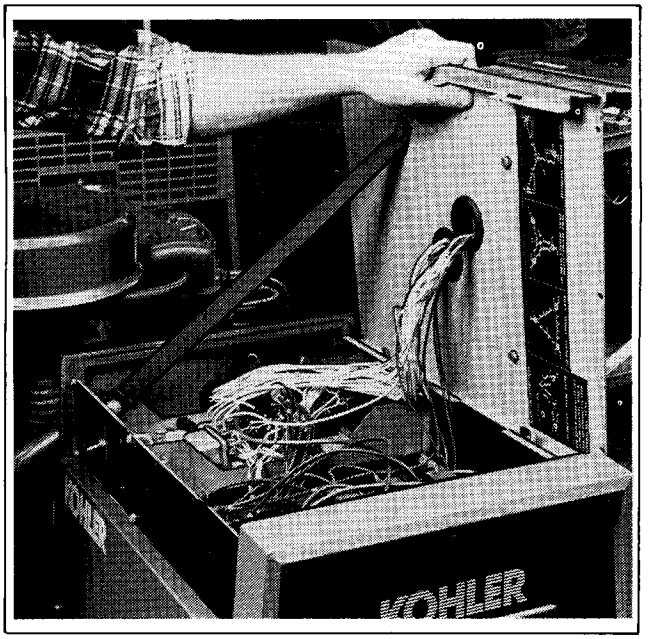


Figure 4-2. Access Cover/Controller

3. Disconnect all wiring between controller and generator enclosure.
4. Disconnect canvas support strap in generator enclosure. Lift controller/access cover away from generator enclosure (Figure 4-3).

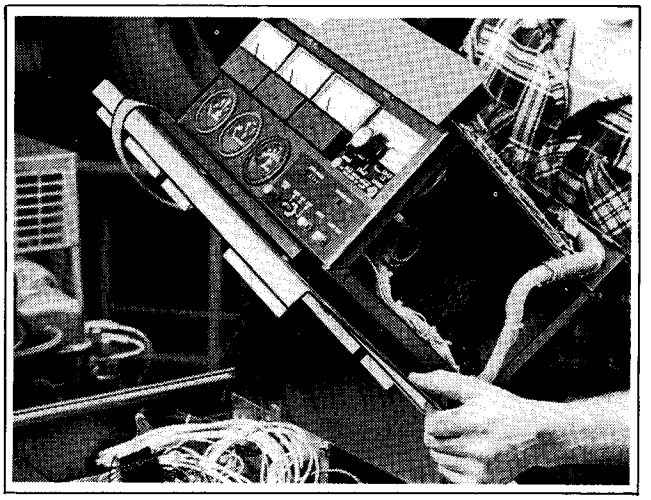


Figure 4-3. Lifting Away Controller/Access Cover

REGULATOR/TERMINAL STRIP TRAY, AND BASIC CONTROLLER REMOVAL

1. Remove generator enclosure access cover (Basic models only, if unit is equipped with Meter Box or

Controls (Continued)

NFPA option cover was removed in previous steps) (Figure 4-4).

2. Disconnect wiring from regulator board and terminal strip on all models, and controller board on Basic and Meter Box models.

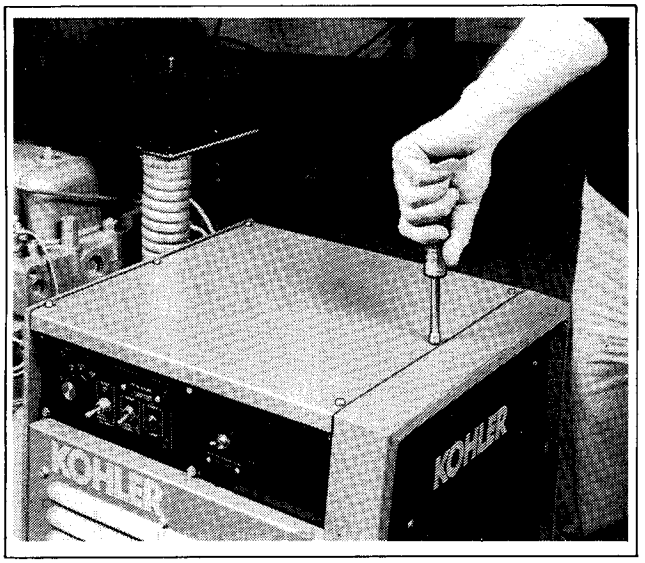


Figure 4-4. Access Cover Removal

3. Remove capscrews and lift regulator/terminal strip tray (including controller board on basic models) away from generator enclosure (Figure 4-5).

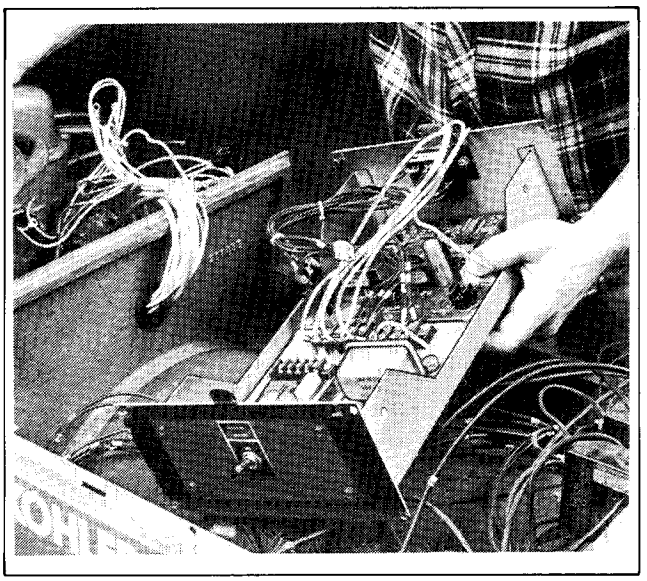
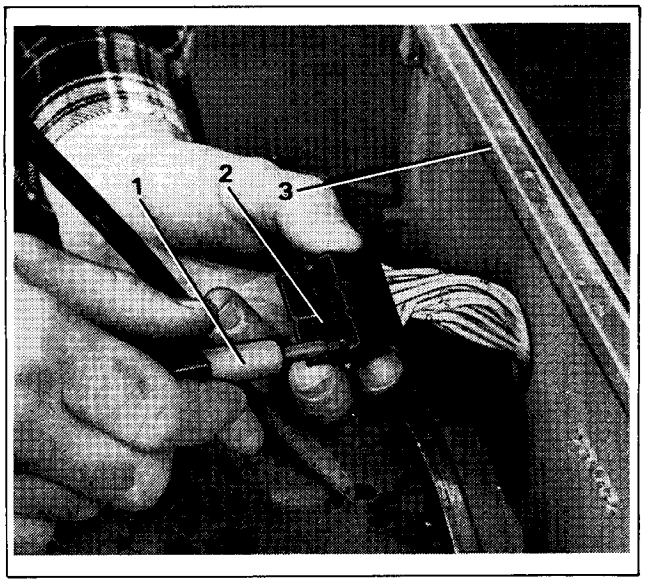


Figure 4-5. Regulator/Terminal Strip Tray

4. On NFPA models feed engine sensor wiring back through opening in generator adaptor (it may be necessary to remove pins from connector with a pin extractor (Kohler Part No. 241918) or disconnect wiring at engine to fit through opening on some models) (Figure 4-6).



1. **Pin Extractor**
2. **Connector**
3. **Generator Adapter**

Figure 4-6. Engine Wiring

Static Models (RY) — Disassembly

1. Remove end panel and enclosure side panels (Figure 4-7).

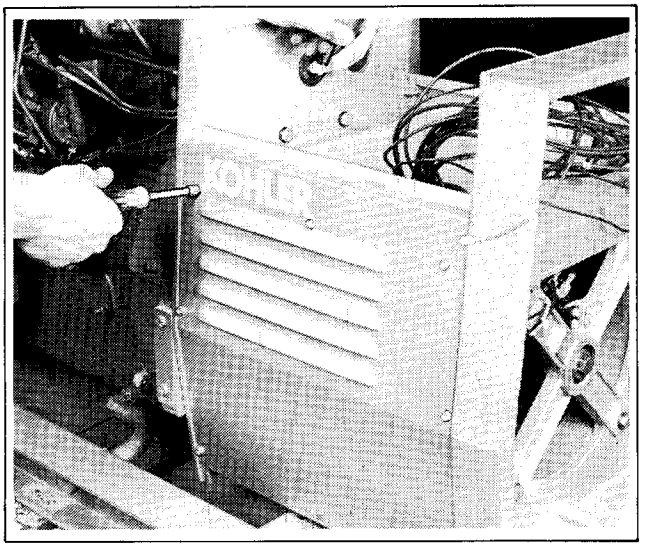
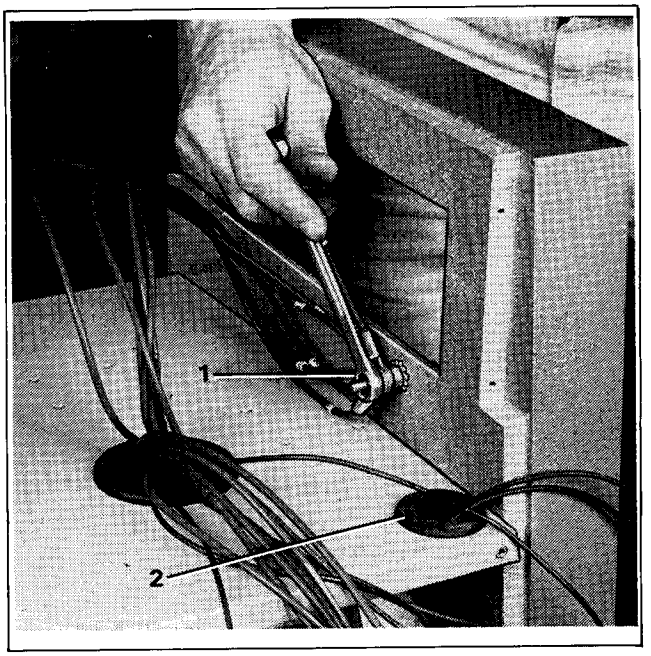


Figure 4-7. Panel Removal

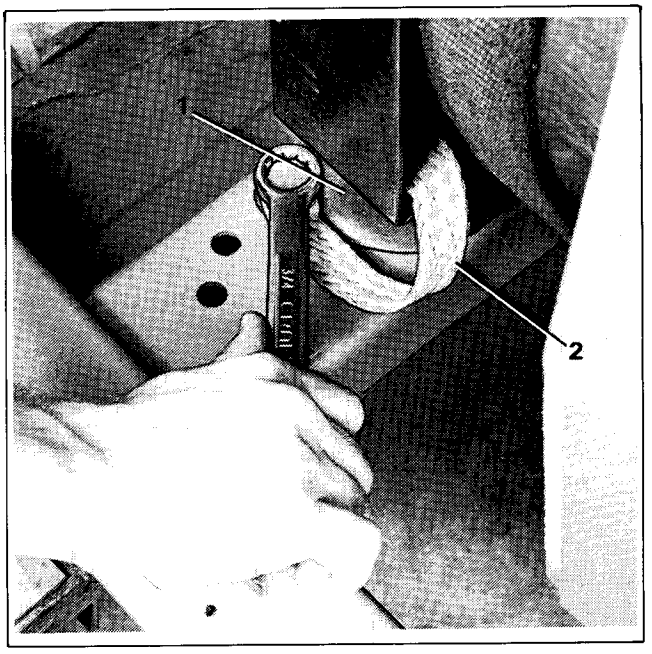
2. Disconnect stator lead connections and remove base tray (Figure 4-8).



1. Stator Lead Connections
2. Base Tray

Figure 4-8. Connections and Base Tray

3. Disconnect stator from steel mounting frame by removing bolts from vibro-mounts (Figure 4-9).



1. Vibro-Mount
2. Ground Strap

Figure 4-9. Stator Mounting

4. Cradle stator with lifting straps and raise with a hoist to lift generator off of vibro-mounts (Figure 4-10).

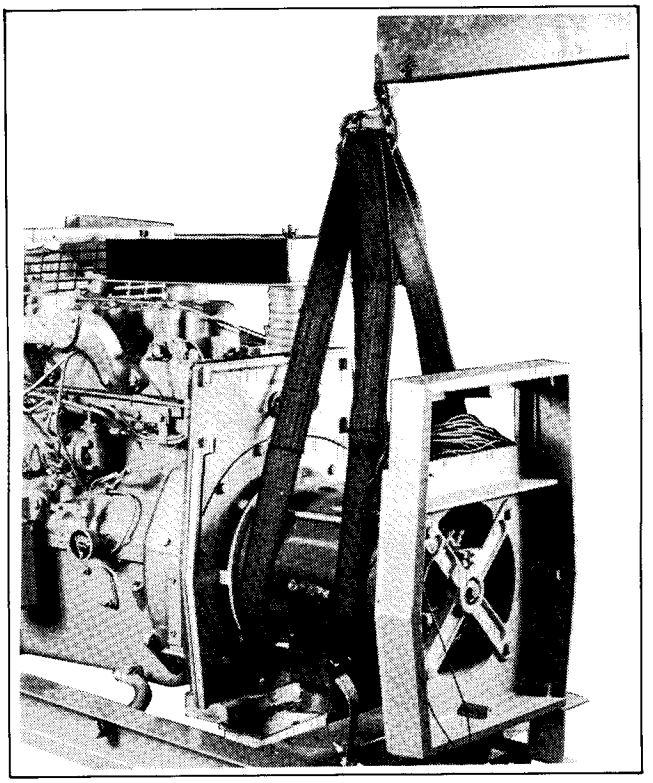


Figure 4-10. Hoisting Generator

5. Place wood blocks under flywheel housing to support engine; lower, allowing flywheel housing to rest on blocks.

6. Remove black plastic speed sensor from end bracket (NFPA models only) to minimize the possibility of damage during generator disassembly.

7. Lift the brushes by the leads and lock in holder by inserting a length of wire or a paper clip (Figure 4-11).

8. Remove four overbolts and bump end bracket with a rubber mallet to remove (Figure 4-12).

9. Remove the stator by guiding it to the rear (Figure 4-13).

10. To remove the rotor loosen the thru bolt 2-3 turns and break the rotor loose from taper by striking the bolt head with a heavy lead mallet. If after striking bolt head the rotor can be rocked slightly back and forth in place, remove thru bolt and pull rotor away from engine. If rotor is not loose, repeat procedure. The generator fan will be removed with rotor (Figure 4-14).

Static Models (RY) — Disassembly (Continued)

1. Brush Leads
2. Brush Holder
3. Retainer Wire

Figure 4-11. Lifting Brushes

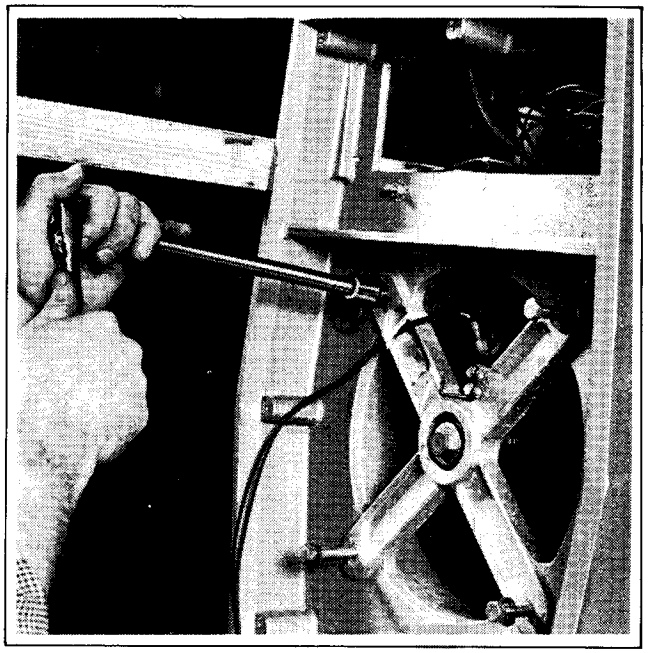


Figure 4-12. End Bracket Removal

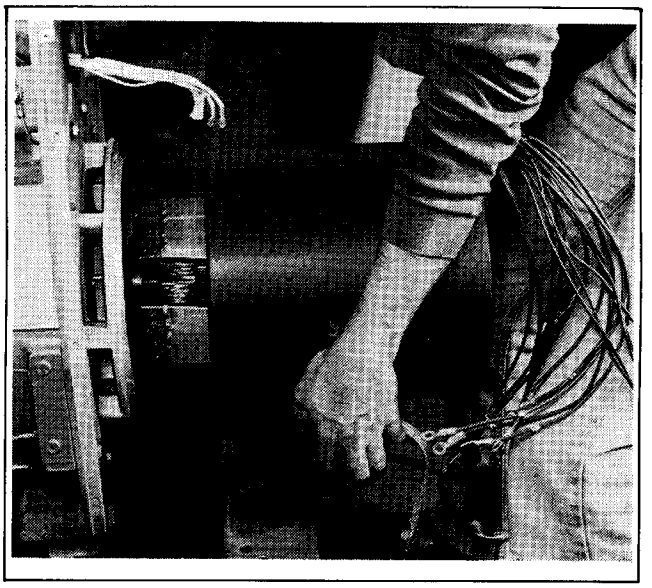


Figure 4-13. Stator Removal

Static Models (RY) — Reassembly

1. Clean stub shaft taper and paint with copper-graphite or some other type of anti-sieze compound.

2. Lift rotor assembly onto taper and replace thru bolt. Torque thru bolt to 50 ft. lbs. (6.92 Kgm).

3. Slide stator into position making sure stator mounting lines up with holes in frame (Figure 4-15).

4. Replace tolerance ring in end bracket with a new one. Tolerance ring should be replaced every time end bracket is removed (Figure 4-16).

5. Taking caution not to pinch any wires, position end bracket on stator. Bump snugly into place using a rubber mallet. Replace hardened washers and four long overbolts. Torque overbolts to 260 in. lbs. (2.99 Kgm).

6. Cradle stator with lifting straps and raise with a hoist. Remove wood block(s) and return generator to normal position. Replace vibro-mount bolts and equipment ground strap (if removed).

7. Replace base tray. Feed stator leads up through large grommet, and brush and speed sensor (if equipped) leads through small grommet.

8. Remount speed sensor (if equipped). Turn rotor to position sensing lobe directly below speed sensor.

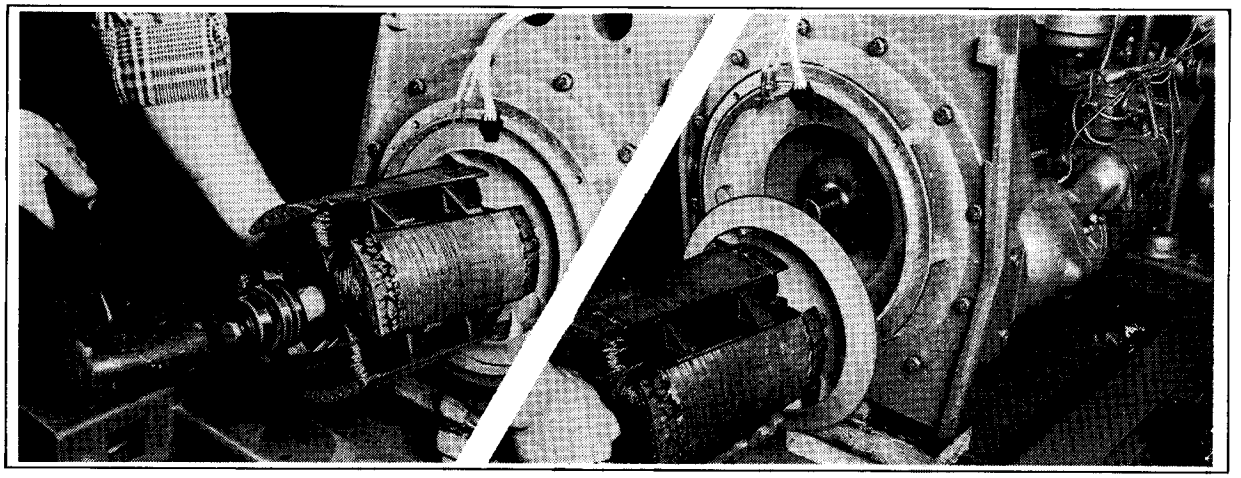


Figure 4-14. Rotor Removal

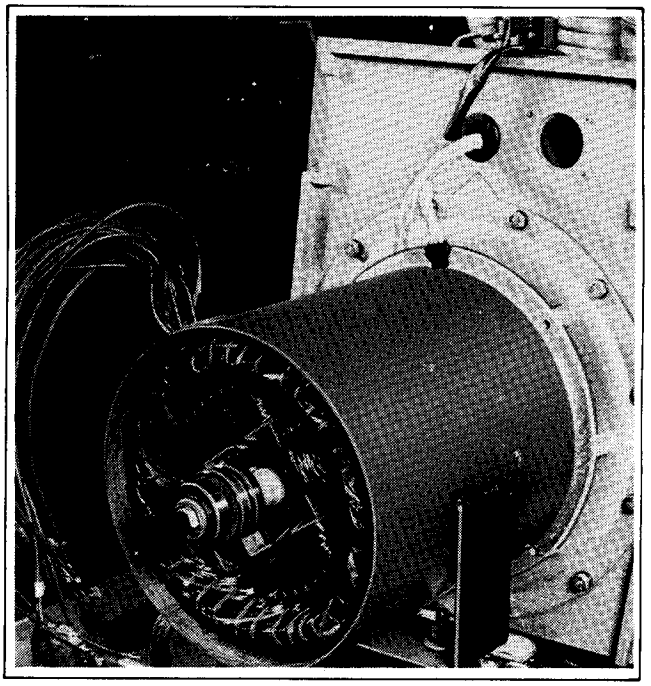
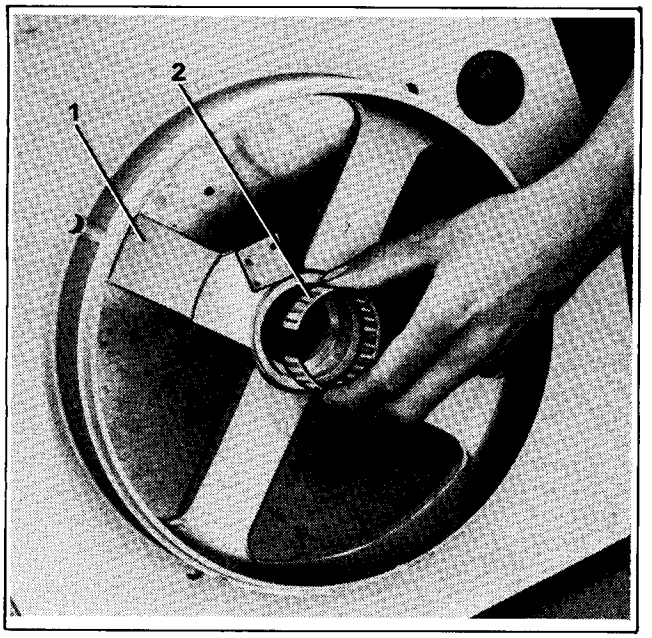


Figure 4-15. Stator Position



1. **End Bracket**
2. **Tolerance Ring**

Figure 4-16. Tolerance Ring

Use a feeler gauge to set air gap between sensor and lobe at 0.020" (0.508 mm) (Figure 4-17).

9. Remove retainer wire from brush holder allowing brushes to contact slip rings.

CAUTION

Improper brush-to-slip ring alignment may contribute to exciter voltage regulator failure and excessive ring wear.

CAUTION

If brush retainer wire is not removed, voltage regulator will be damaged when generator is started.

10. Replace end panel and enclosure side panels.

11. To complete reassembly reverse procedure outlined in "Controller Removal" and refer to appropriate wiring diagram in Section 5.

Static Models (RY) — Reassembly (Continued)

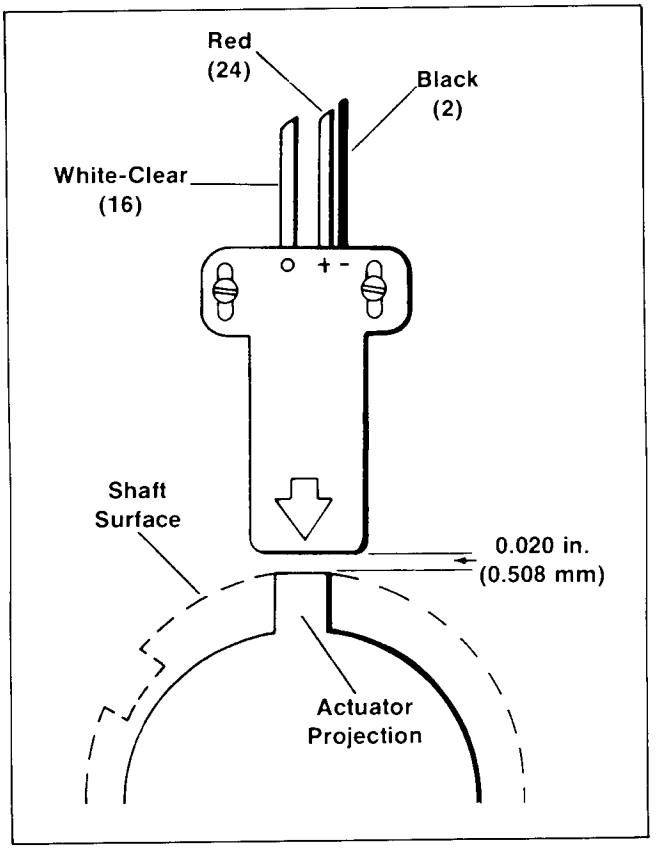


Figure 4-17. Speed Sensor Air Gap

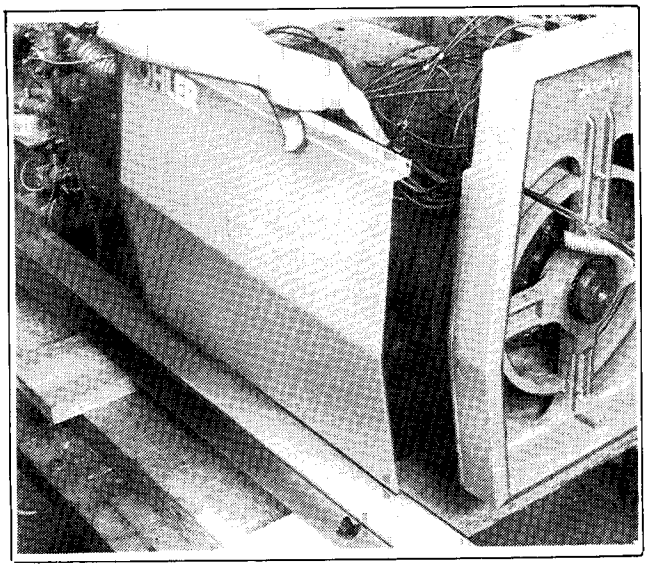
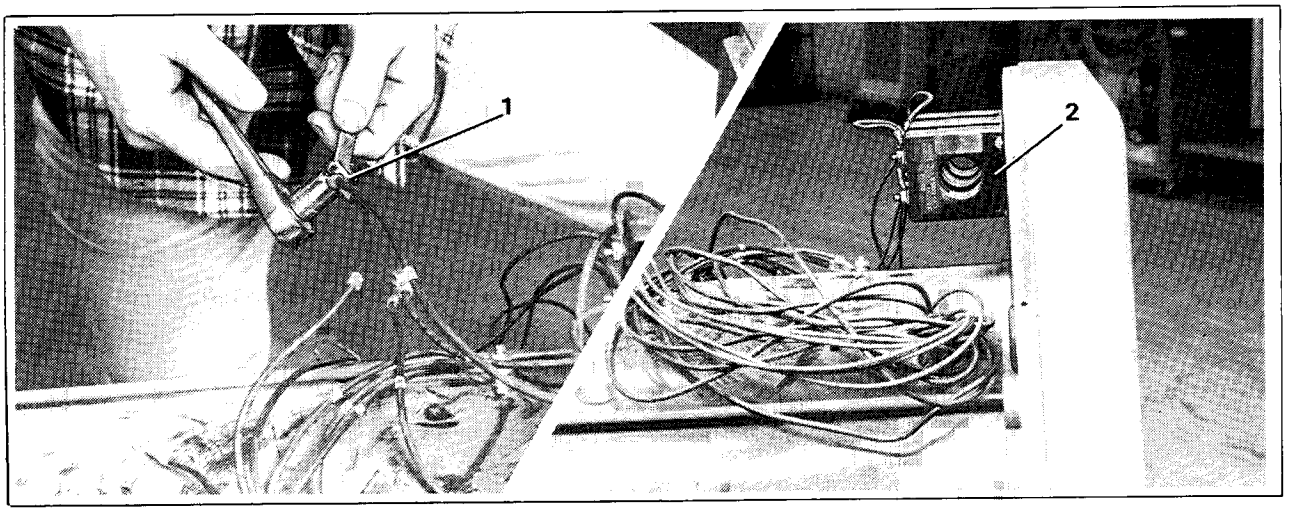


Figure 4-18. Panel Removal

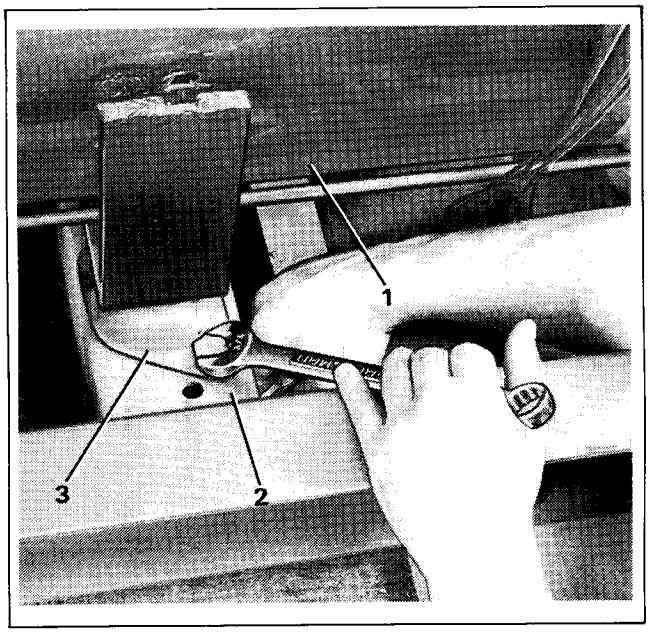
Brushless Models (RZ) Disassembly

1. Remove end panel and enclosure side panels (Figure 4-18).
2. Wrap and disconnect stator lead connections; pull back through current transformers (if equipped) (Figure 4-19).
3. Remove black plastic speed sensor from end bracket (NFPA models only) to minimize the possibility of damage during generator disassembly.
4. Disconnect stator from steel mounting frame by removing bolts from vibro-mounts (Figure 4-20).
5. Cradle stator with lifting straps or attach lifting hooks to holes in stator frame. Hoist generator off of vibro-mounts.



1. Stator Lead Connections 2. Current Transformers

Figure 4-19. Current Transformers



1. **Stator**
2. **Steel Mounting Frame**
3. **Vibro-Mount**

Figure 4-20. Vibro-Mounts

6. Place wood block(s) under flywheel housing to support engine; lower, allowing flywheel housing to lightly rest on wood blocks (Figure 4-21).

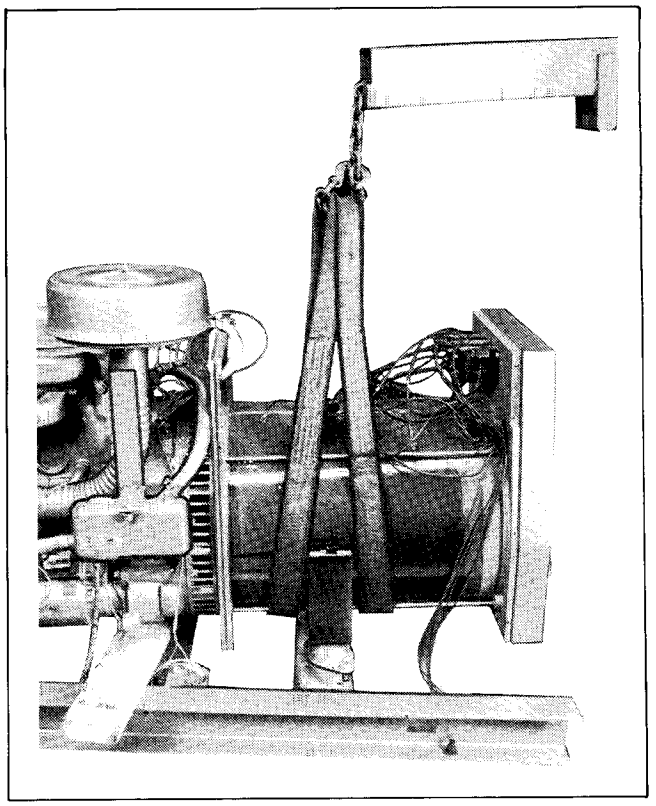
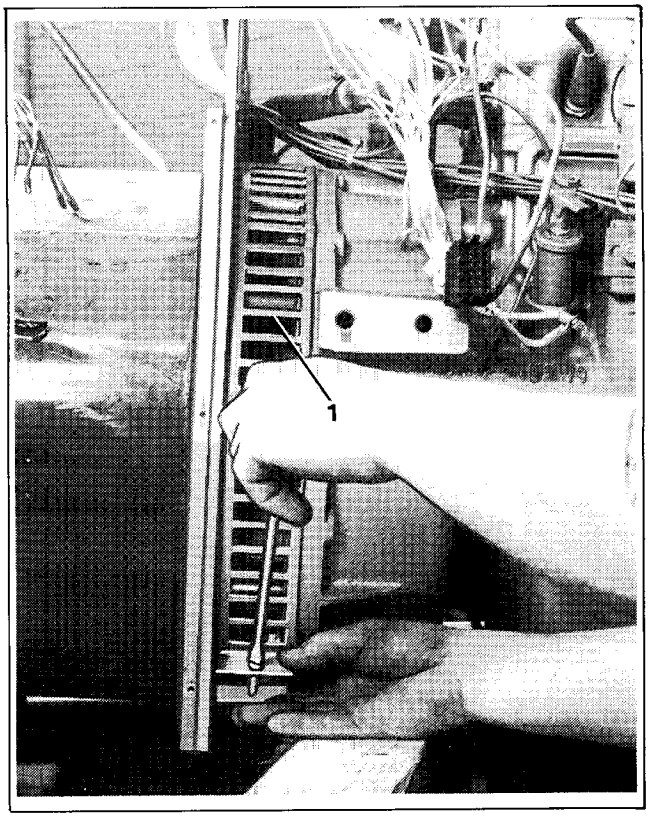


Figure 4-21. Hoisting Generator

7. Remove generator fan guard (Figure 4-22).



1. Fan Guard

Figure 4-22. Fan Guard

8. Remove bolts mounting generator adapter to flywheel housing (Figure 4-23).

9. Remove nuts holding fan and drive discs to flywheel (Figure 4-24).

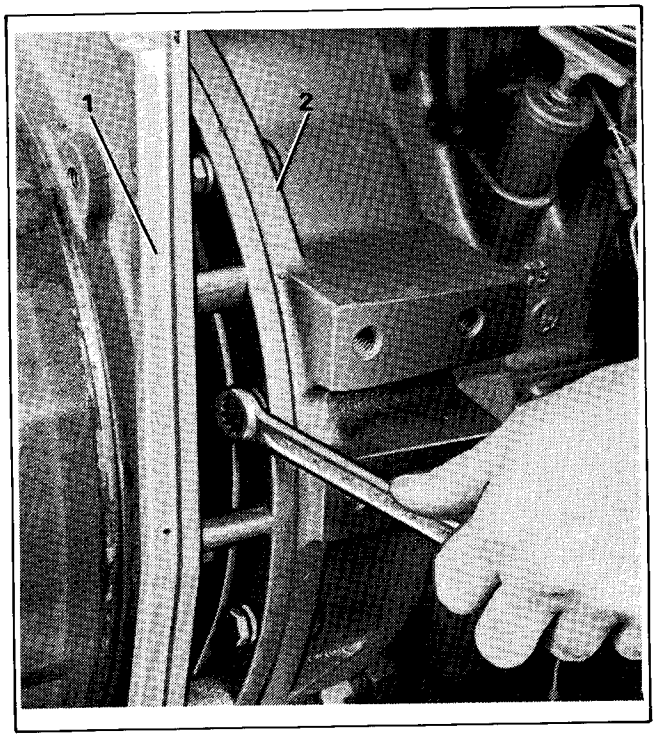
10. Guide generator fan off of studs and remove spacers. If studs hold drive discs to flywheel, work drive discs over studs to separate generator from engine (Figure 4-25).

11. Loosen four stator-to-end bracket and four stator-to-adapter attachment bolts to where they can be turned by hand (47.5kW). Loosen four overbolts to where they can be turned by hand (all other models) (Figures 4-26 and 4-27).

12. Carefully hoist generator assembly (end bracket down) into a vertical position. Assembly should rest on wood blocks (Figure 4-28).

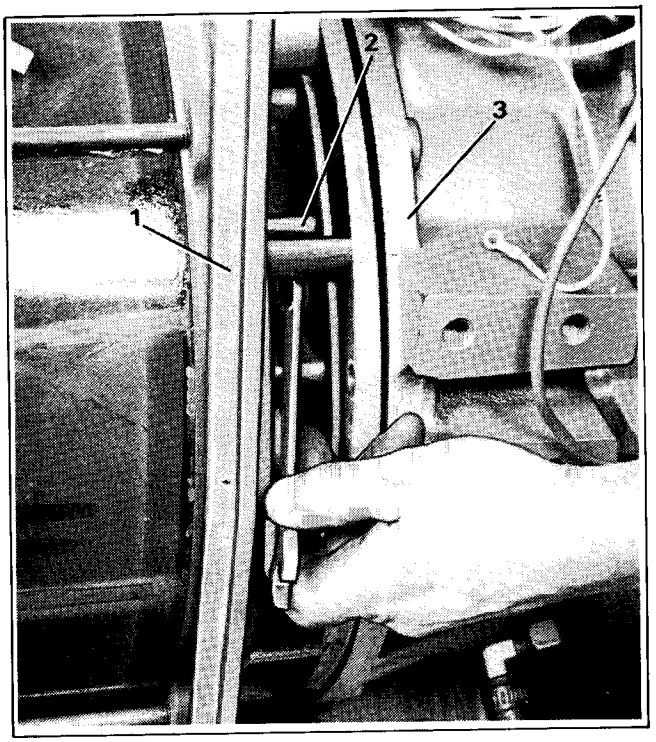
13. Remove eight drive disc bolts; lift away drive discs and generator fan (Figure 4-29).

Brushless Models (RZ)
Disassembly (Continued)



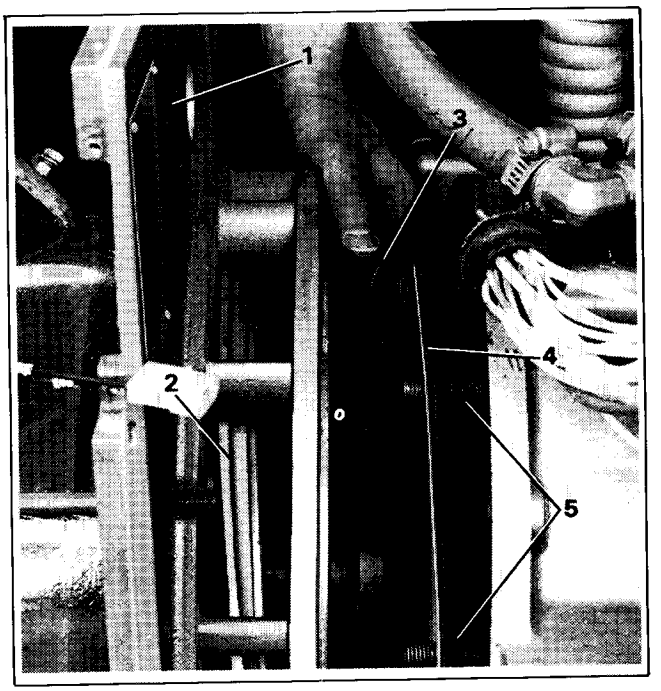
1. Generator Adapter 2. Flywheel Housing

Figure 4-23. Adapter Mounting Bolts



1. Generator Adapter 2. Generator Fan
3. Flywheel Housing

Figure 4-24. Fan/Drive Disc Mounting Bolts



1. Generator Adapter
2. Generator Fan
3. Spacer
4. Drive Discs
5. Flywheel Studs

Figure 4-25. Generator/Engine Separation

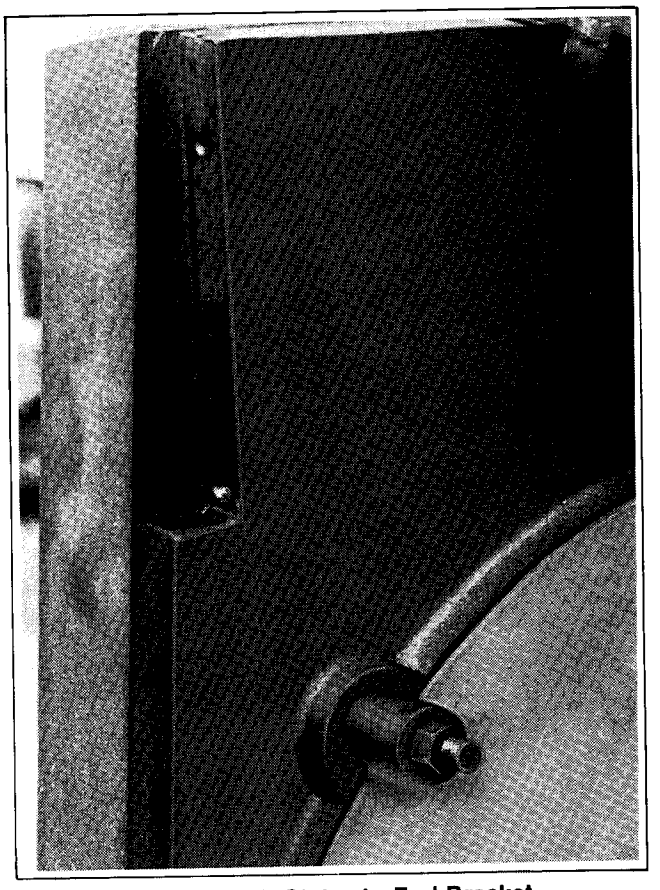


Figure 4-26. Stator-to-End Bracket Attachment Bolt (47.5kW)

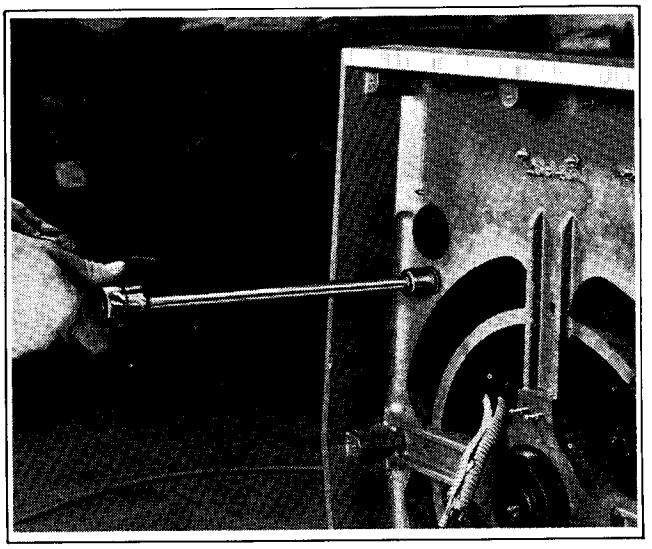


Figure 4-27. Over-Bolt

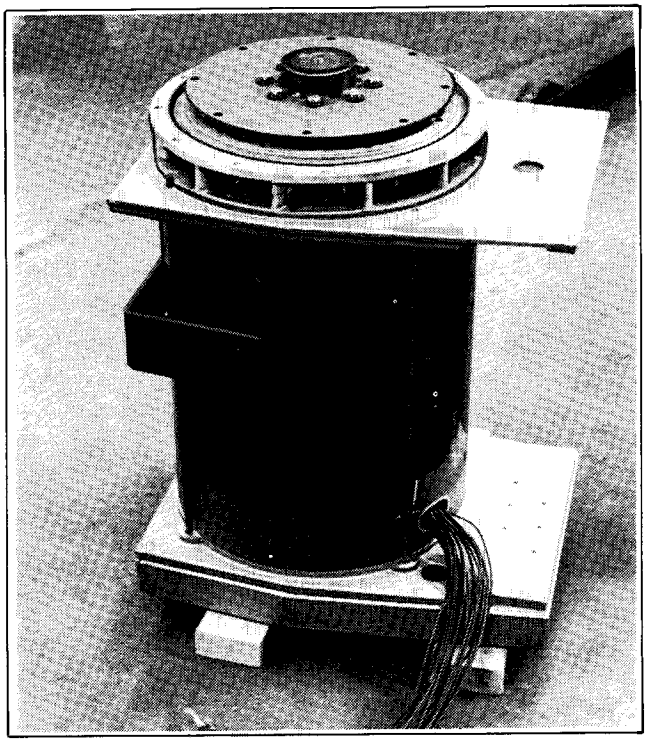
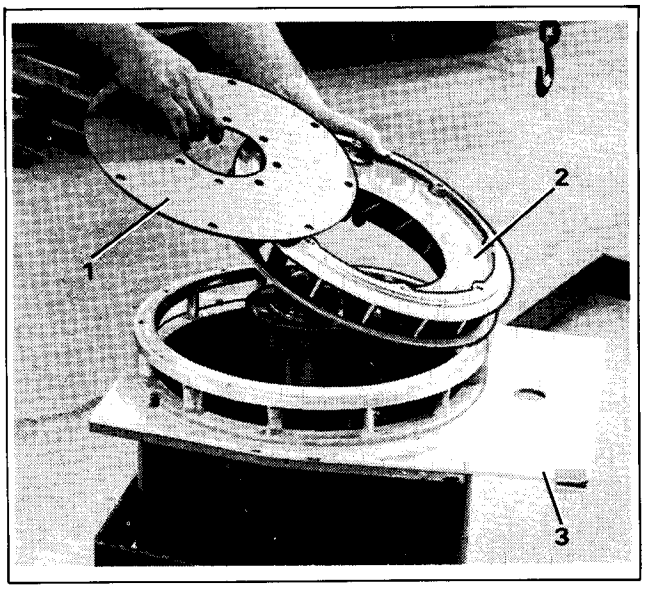
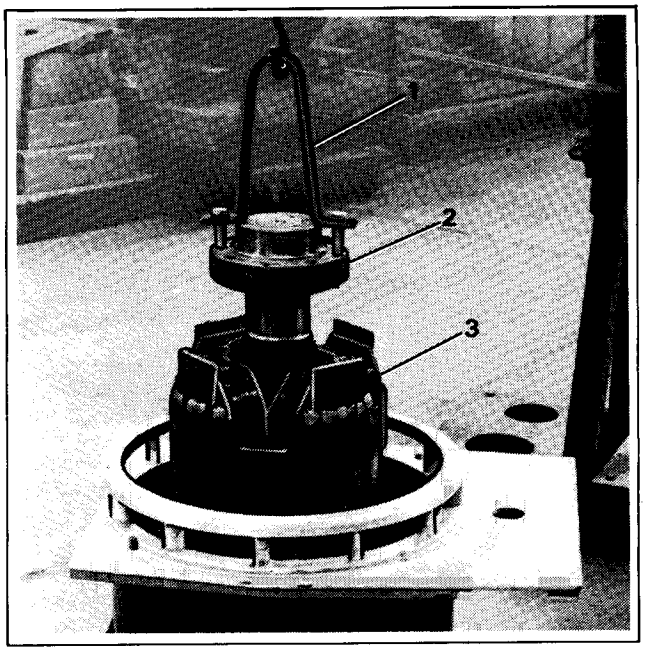


Figure 4-28. Generator Assembly



1. **Drive Discs**
2. **Generator Fan**
3. **Generator Adapter**

Figure 4-29. Drive Discs and Fan



1. **Lifting Eye**
2. **Rotor Flange**
3. **Rotor**

Figure 4-30. Rotor Removal

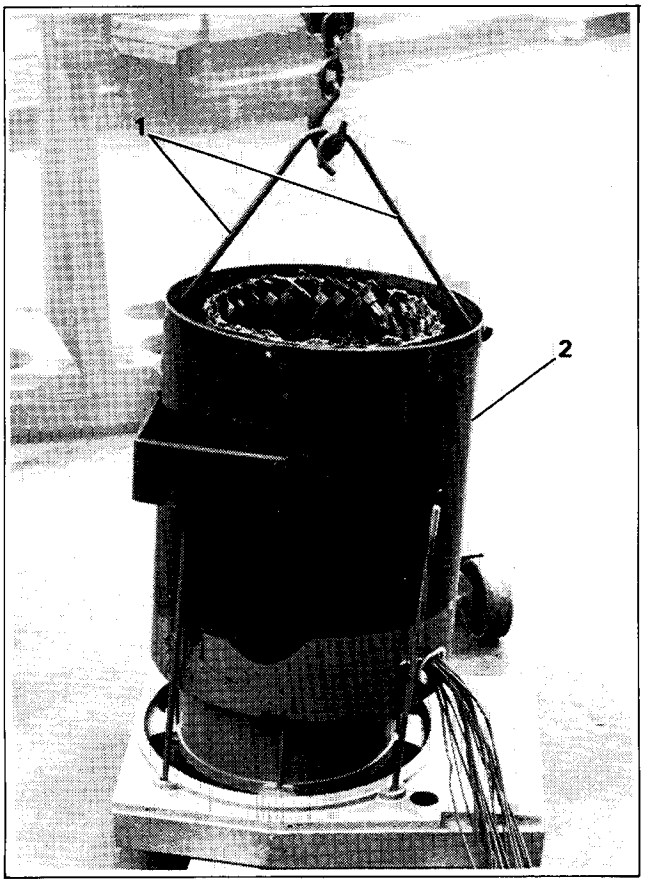
14. Fasten lifting eye and hoist hook to rotor flange. Hoist rotor to remove (Figure 4-30).

15. Finish removing four stator to end bracket and four stator to adapter attachment bolts (47.5 kW). Reach under supported end bracket and finish removing four long overbolts from adapter (all other models).

16. Remove adapter. It may be necessary to bump adapter free of pilot with a rubber mallet to remove.

17. Attach lifting hooks to holes in stator frame. Hoist stator away from end bracket and exciter field (Figure 4-31).

Brushless Models (RZ) Disassembly (Continued)



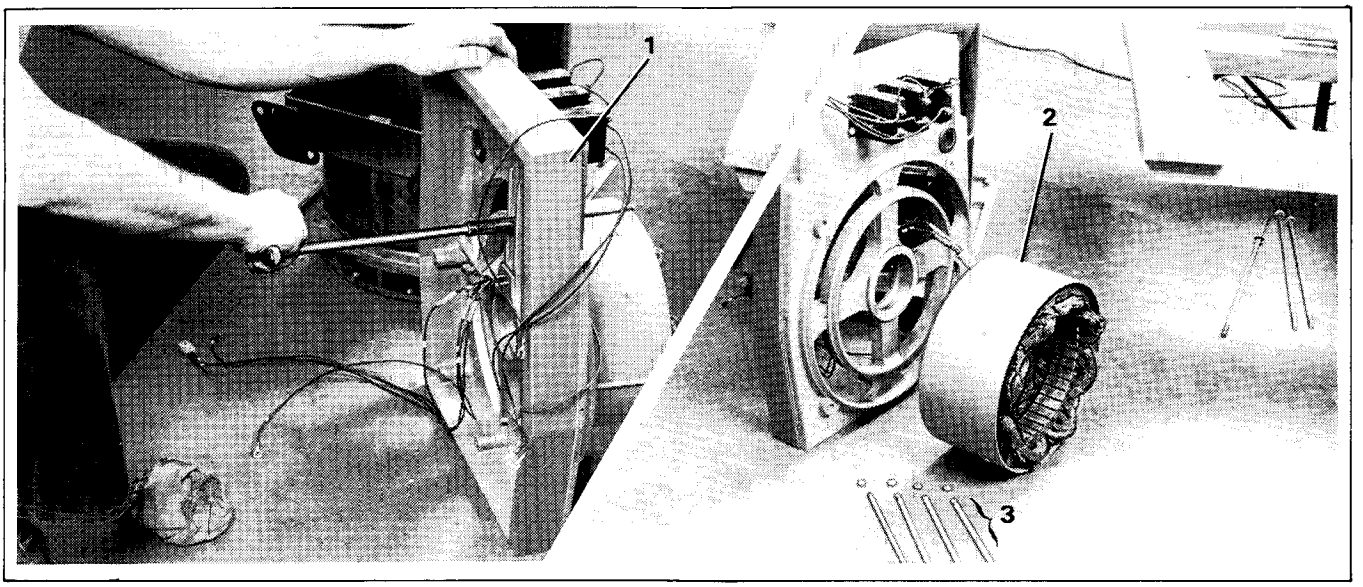
1. Lifting Hooks 2. Stator

Figure 4-31. Stator Removal

18. Remove the four J-bolts and exciter field from end bracket (Figure 4-32).

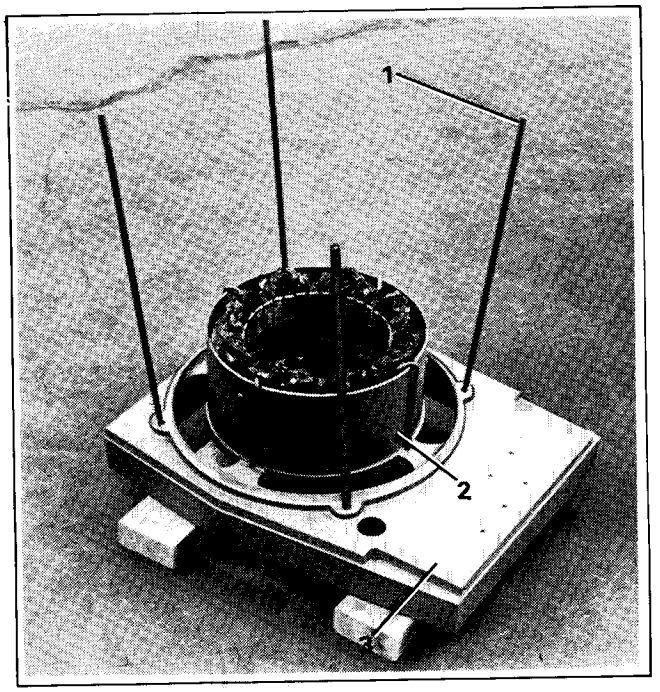
Brushless Models (RZ) — Reassembly

1. Clean end bracket pilots and replace exciter field. Replace J-bolts and tighten to 70 in. lbs. (.80 Kgm).
2. Replace hardened washers and four long overbolts; turn end bracket face down on wood blocks (all models except 47.5kW) (Figure 4-33).
3. Attach lifting hooks and hoist stator over end bracket. Position stator mounting parallel with base of end bracket and lower onto clean end bracket pilot.
4. Position generator adapter onto stator. Make sure adapter base, stator mounting and end bracket base are parallel. Bump adapter snugly into place with a rubber mallet (Figure 4-34).
5. Replace washers, four stator-to-end bracket, and four stator-to-adapter attachment bolts (47.5kW). Reach under supported end bracket and guide overbolts into adapter; hand tighten (all other models).
6. Hoist generator assembly into a horizontal position. Torque all mounting bolts to 260 in. lbs. (2.99 Kgm).
7. Hoist generator assembly (end bracket down) back to a vertical position. Assembly should rest on wood blocks.
8. Fasten lifting eye and hoist hook to rotor flange. Hoist rotor above stator and carefully guide into position.



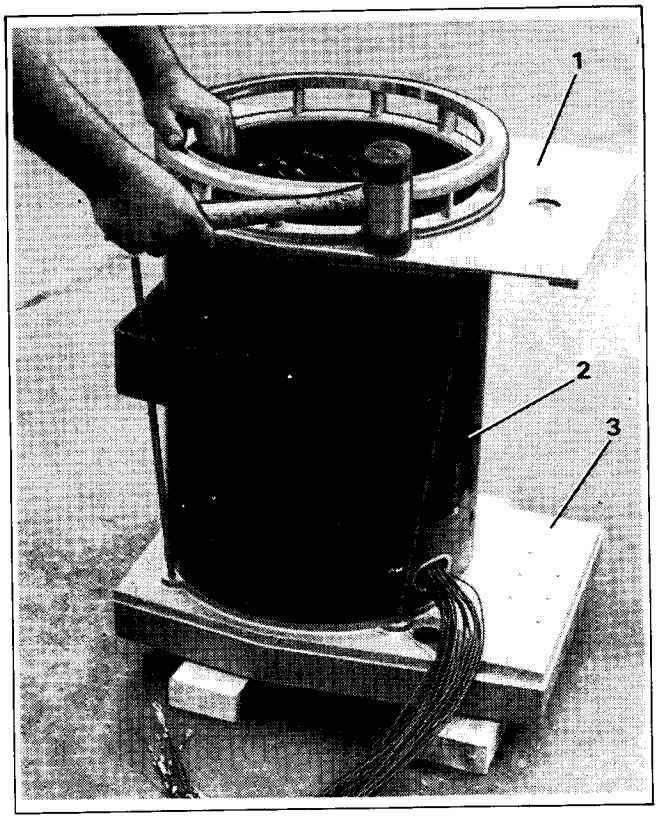
1. End Bracket 2. Exciter Field 3. J-Bolts

Figure 4-32. Exciter Field Removal



1. Overbolts
2. Exciter Field
3. End Bracket

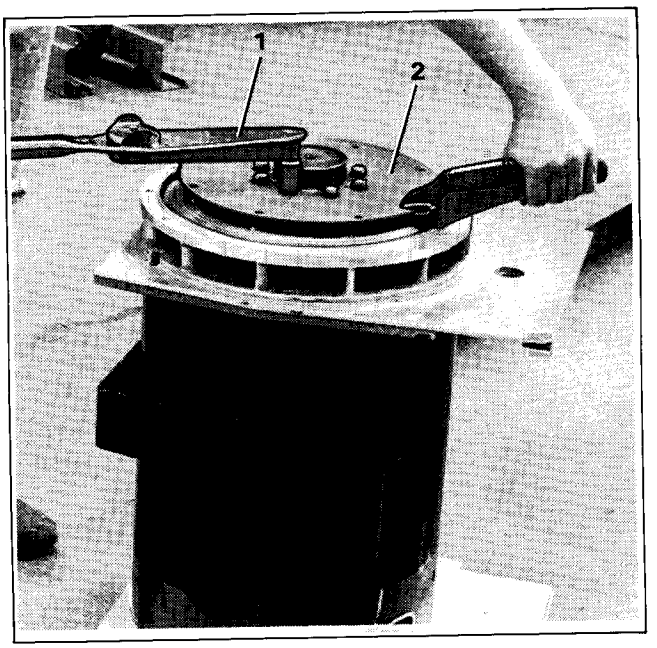
Figure 4-33. End Bracket — Face Down



1. Generator Adapter
2. Stator
3. End Bracket

Figure 4-34. Position Adapter

9. Place generator fan on rotor. Position drive discs on rotor flange. Make sure all holes are in proper alignment and replace eight hardened washers and mounting bolts. Torque bolts to 50 ft. lbs. (6.92 Kgm) (Figure 4-35).

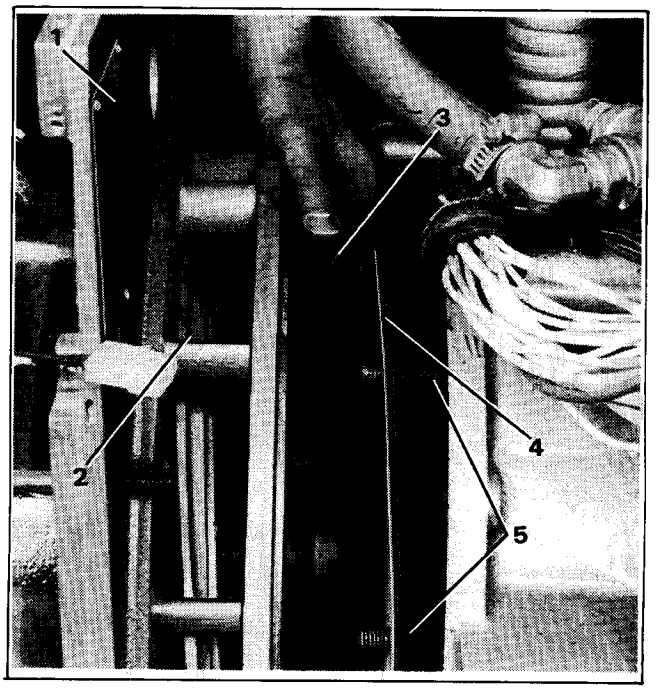


1. Torque Wrench
2. Drive Discs

Figure 4-35. Torque Drive Disc Bolts

10. Hoist assembled generator to a level position in line with studs on flywheel.
11. Guide generator as necessary to work drive discs over studs.
12. Slide spacers over studs between drive discs and fan (Figure 4-36).
13. Replace nuts fastening drive discs and fan to flywheel. Do not final tighten.
14. Move generator assembly as necessary to align stator mounting with holes in frame, and adapter to flywheel housing mounting holes. Replace bolts and final tighten adapter to flywheel housing.
15. Final tighten fan and drive discs to flywheel. Insert bar through fan blades to turn and hold engine and rotor.
16. Replace generator fan guard.
17. Raise generator assembly. Remove wood block(s) and return generator to normal position. Replace vibro-mount bolts and equipment ground strap (if removed).
18. Remount speed sensor (if equipped). Turn rotor to position sensing lobe directly below speed sensor. Use a feeler gauge to set air gap between sensor and lobe at 0.020" (0.508 mm) (Figure 4-37).

Brushless Models (RZ) — Reassembly (Continued)



1. Generator Adapter
2. Generator Fan
3. Spacer
4. Drive Discs
5. Flywheel Studs

Figure 4-36. Generator/Engine Connection

19. Replace end panel and enclosure side panels.

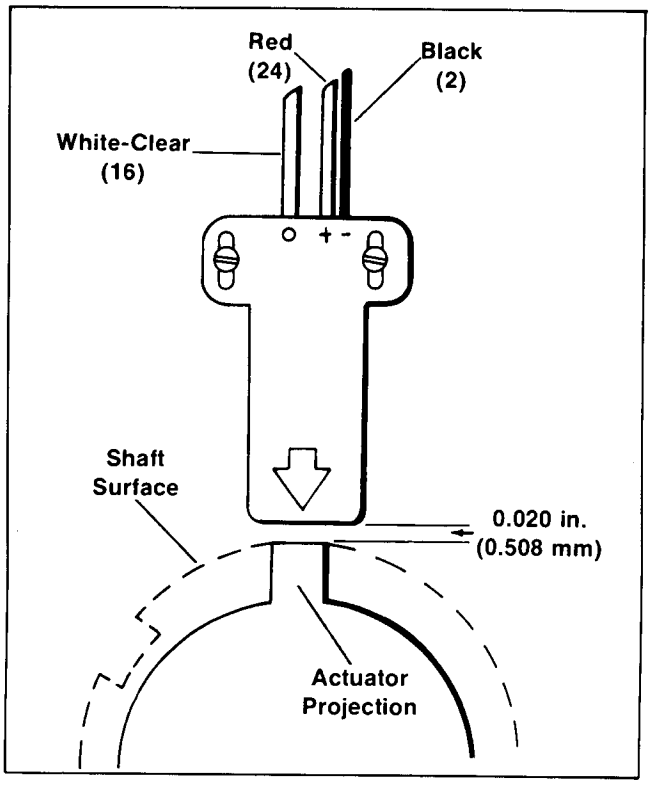


Figure 4-37. Speed Sensor Air Gap

20. To complete reassembly reverse procedure outlined in"Controller Removal" and refer to appropriate wiring diagram in Section 5.

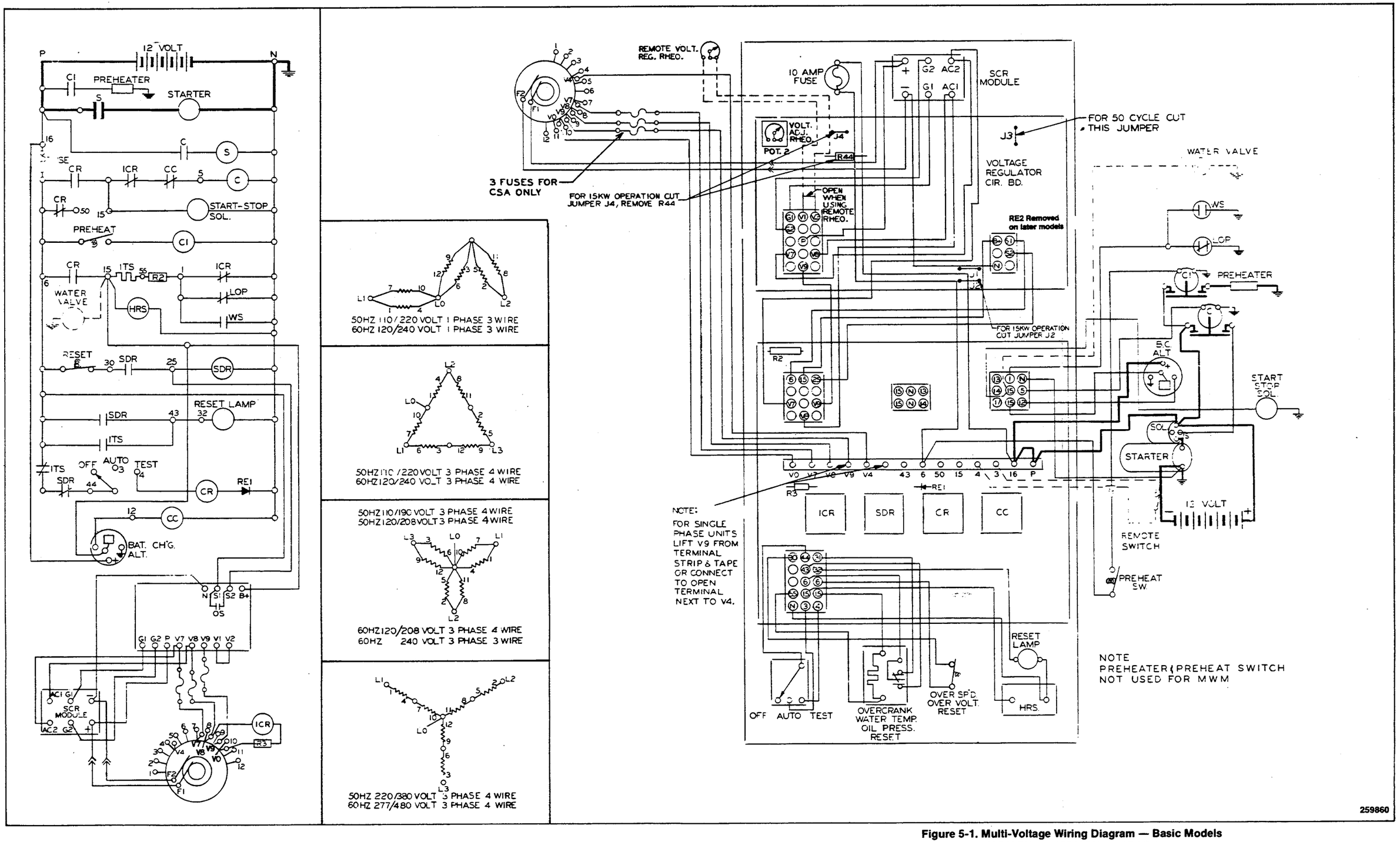
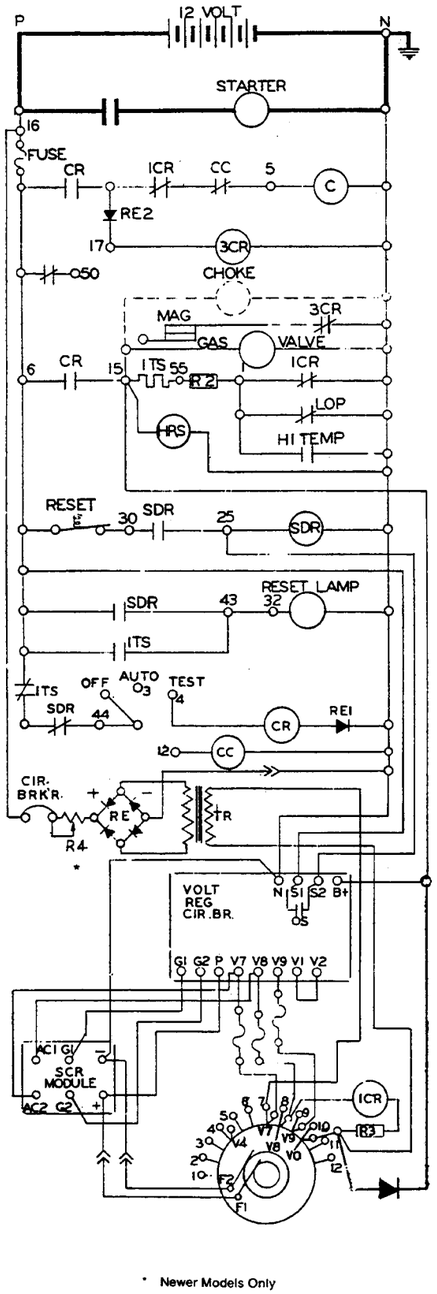
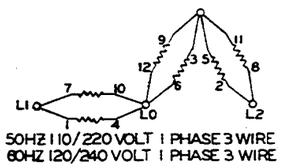
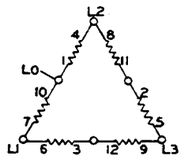


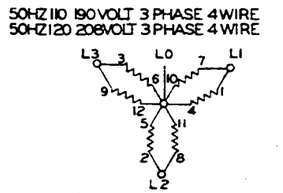
Figure 5-1. Multi-Voltage Wiring Diagram — Basic Models
10RMOY 15RMOY 15ROY

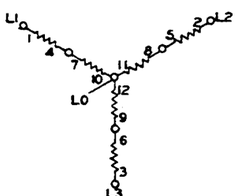


* Newer Models Only









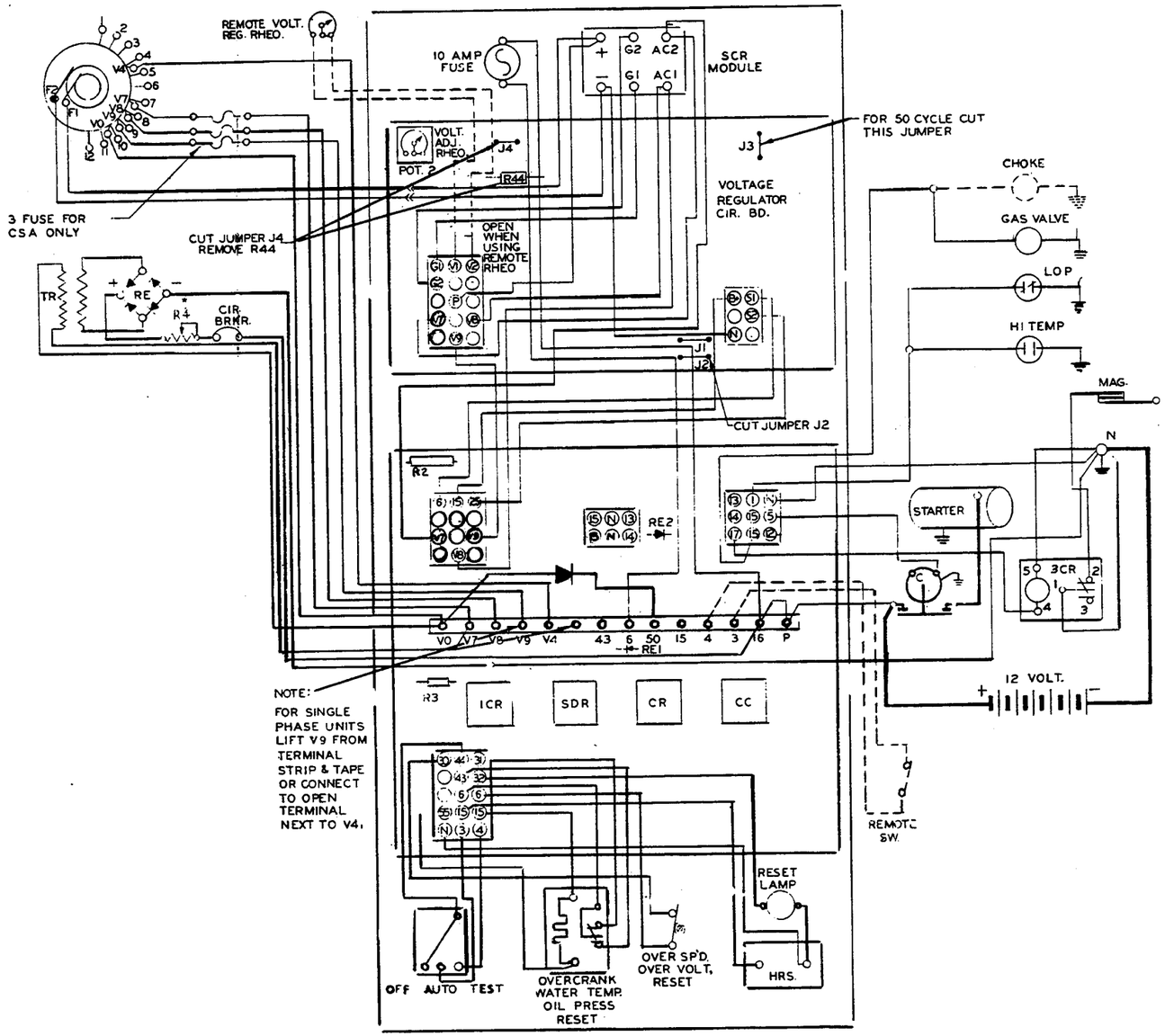


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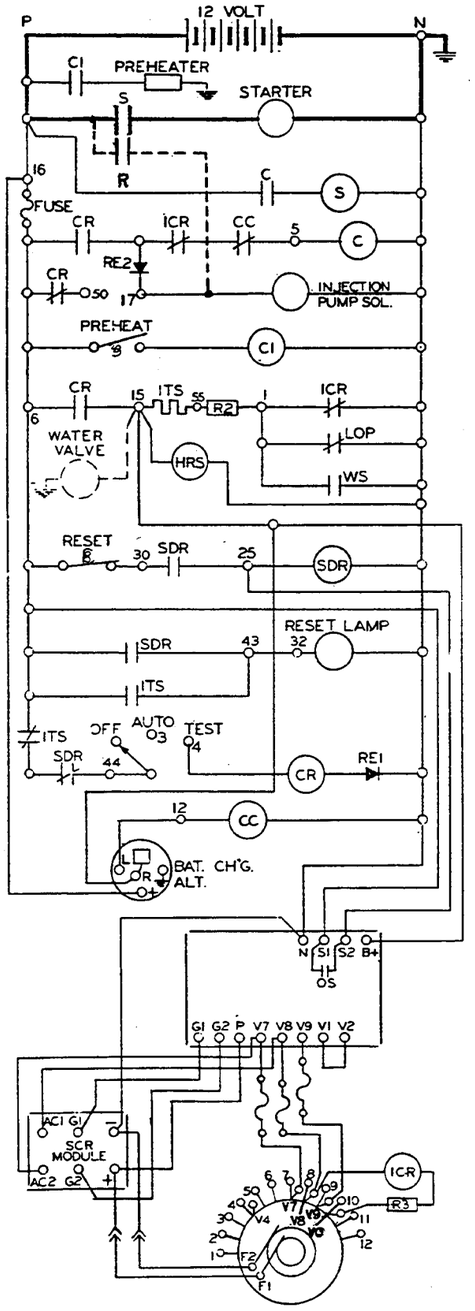
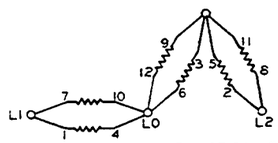
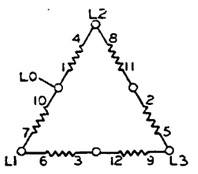
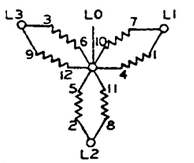
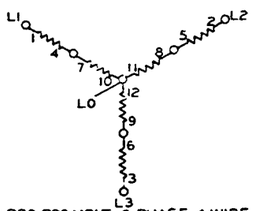
Figure 5-2. Multi-Voltage Wiring Diagram — Basic Models 15RMY

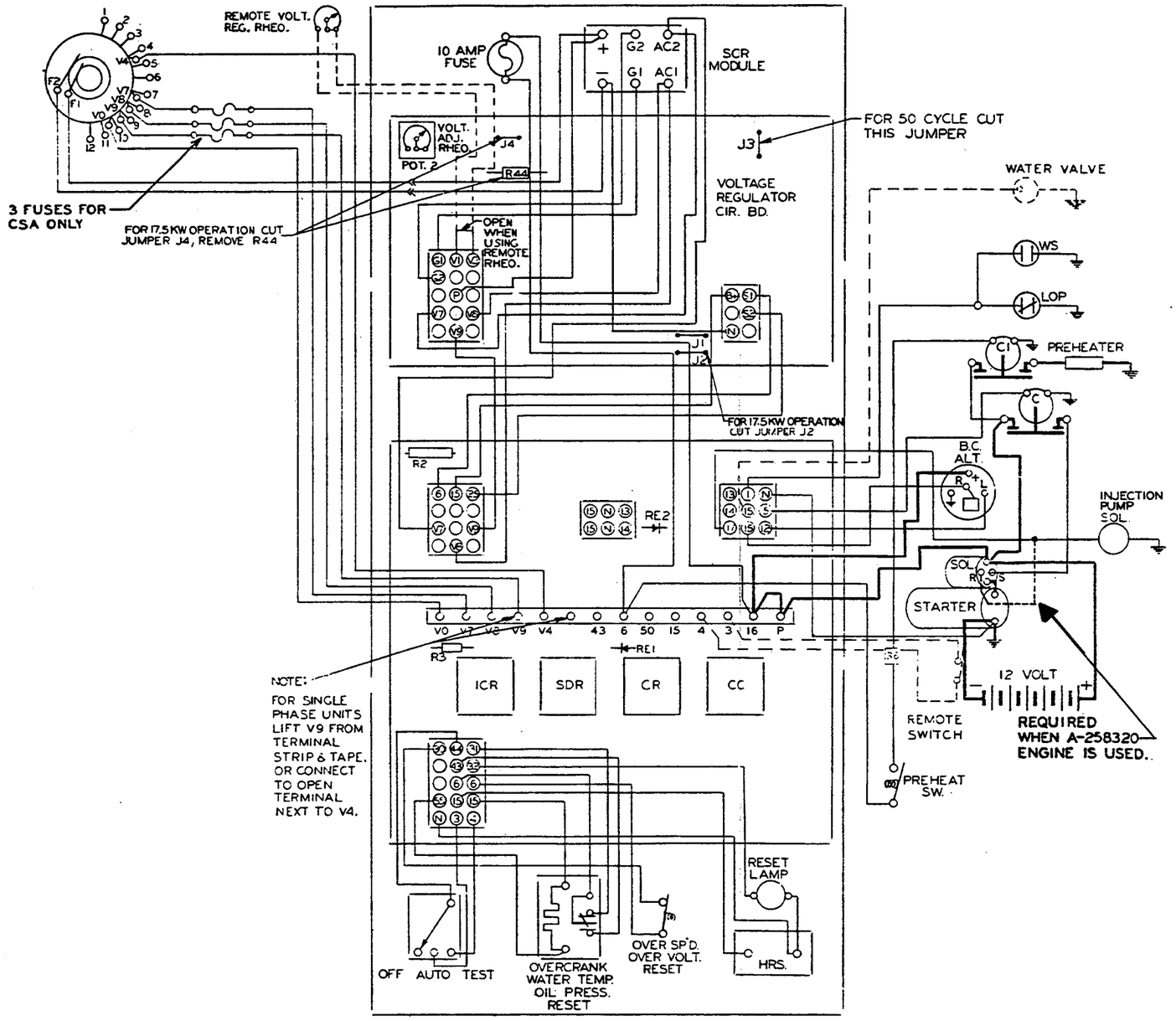












258306

Figure 5-3. Multi-Voltage Wiring Diagram — Basic Models 17.5ROY

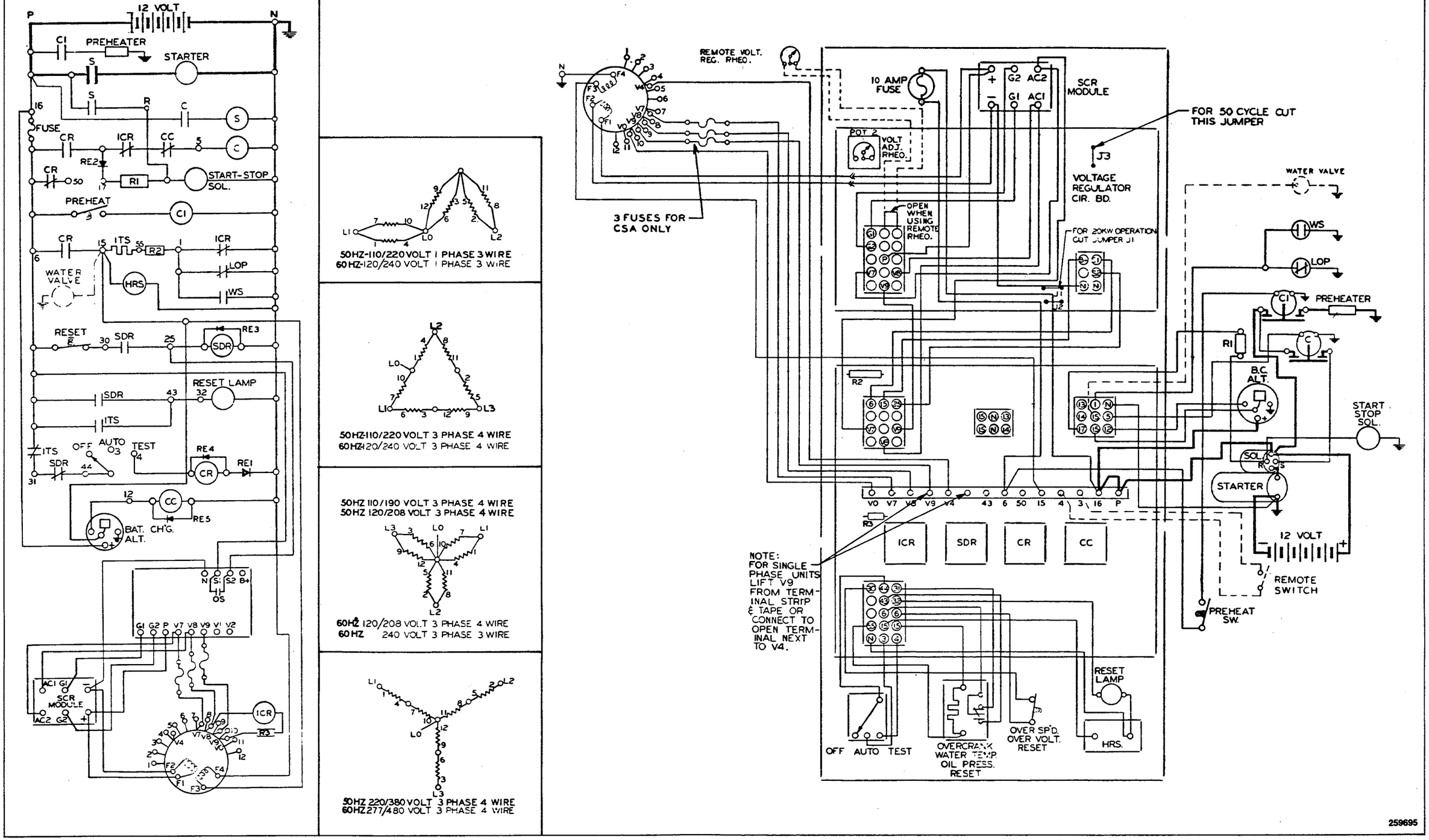
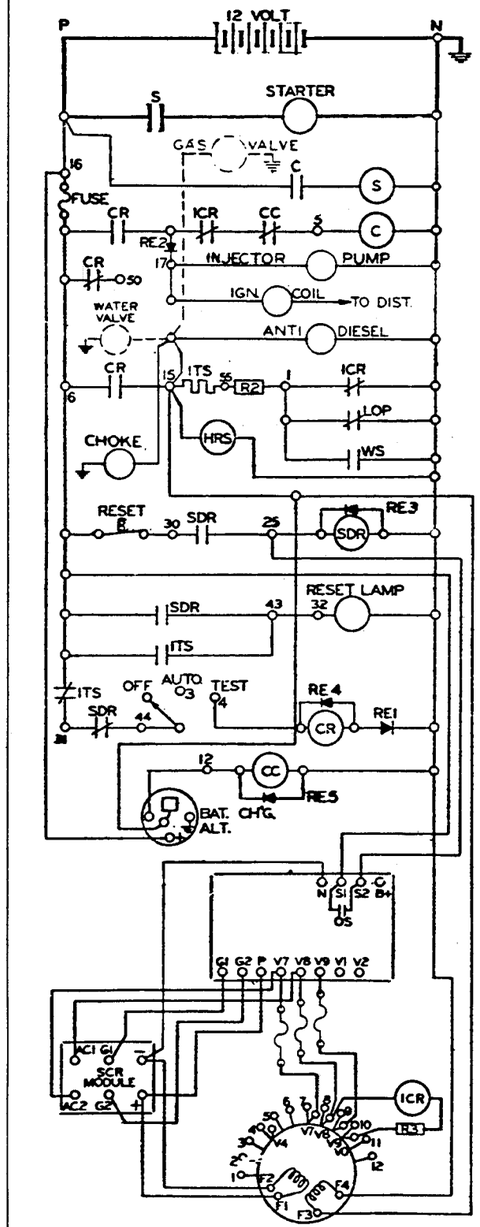
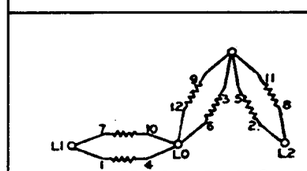
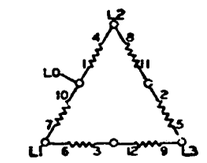


Figure 5-4. Multi-Voltage Wiring Diagram — Basic Models 22.5ROZ



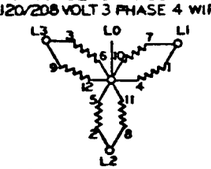


50HZ-110/220 VOLT 1 PHASE 3 WIRE
60HZ-120/240 VOLT 1 PHASE 3 WIRE

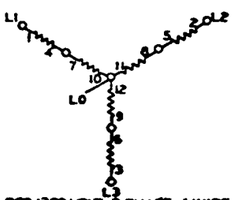


50HZ 110/220 VOLT 3 PHASE 4 WIRE
60HZ 120/240 VOLT 3 PHASE 4 WIRE

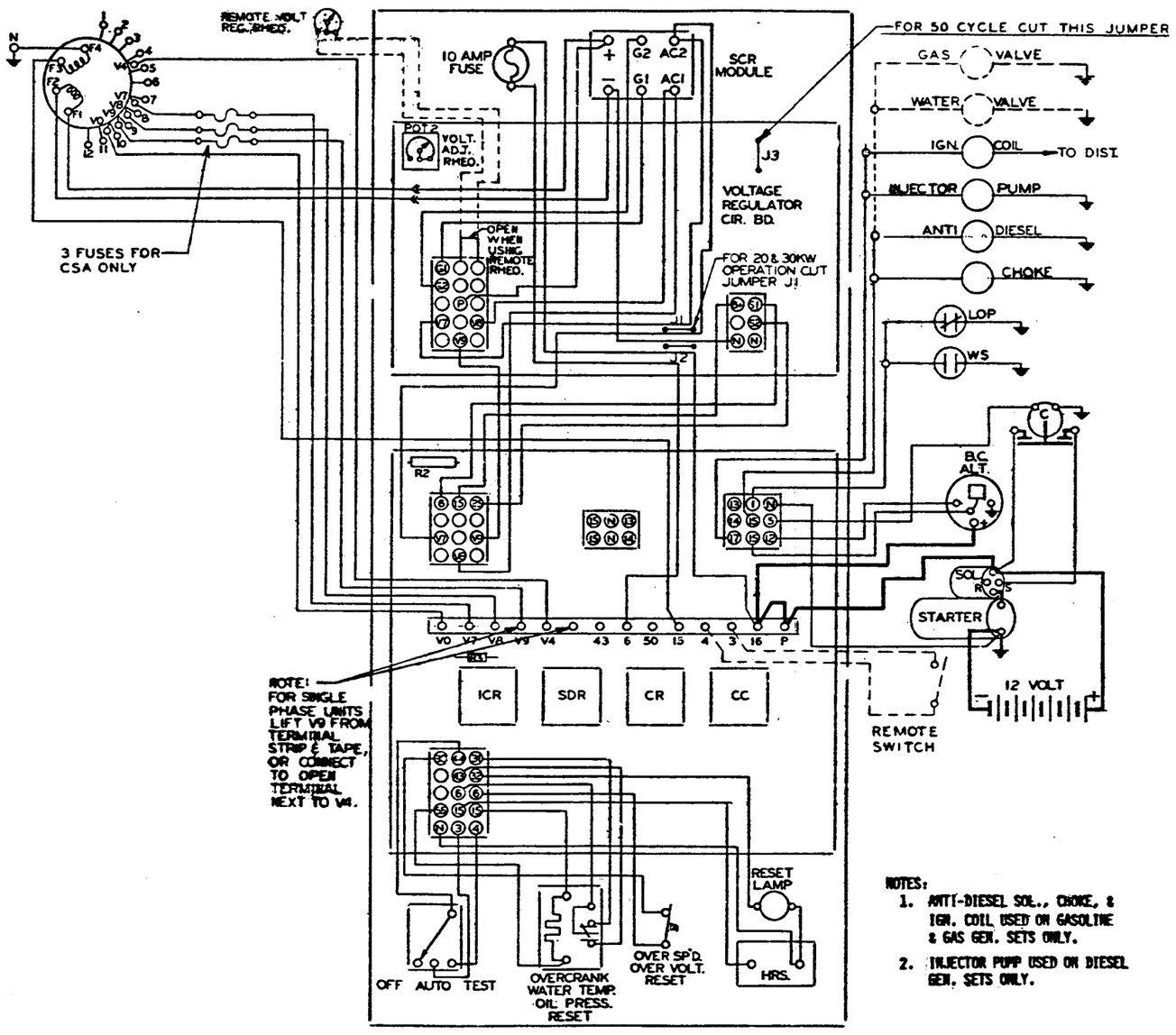
50HZ 110/190 VOLT 3 PHASE 4 WIRE
50HZ 120/208 VOLT 3 PHASE 4 WIRE



60HZ 120/208 VOLT 3 PHASE 4 WIRE
60 HZ 240 VOLT 3 PHASE 3 WIRE



50HZ 220/380 VOLT 3 PHASE 4 WIRE
60HZ 277/480 VOLT 3 PHASE 4 WIRE



NOTES:
1. ANTI-DIESEL SOL., CHOKE, & IGN. COIL USED ON GASOLINE & GAS GEN. SETS ONLY.
2. INJECTOR PUMP USED ON DIESEL GEN. SETS ONLY.

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Figure 5-5. Multi-Voltage Wiring Diagram — Basic Models
22.5RZ 32.5ROZ 32.5RZ 47.5ROZ

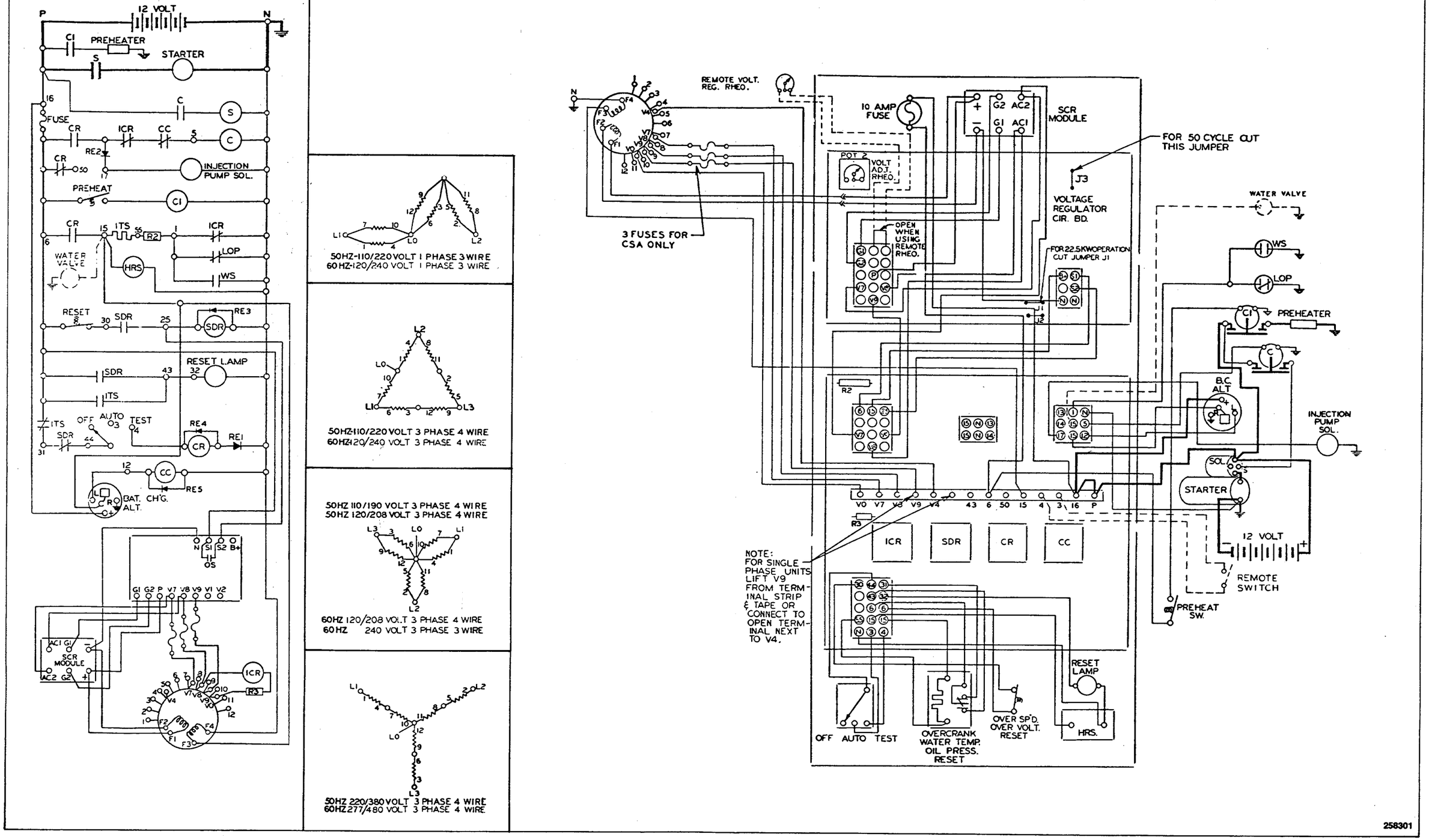


Figure 5-6. Multi-Voltage Wiring Diagram — Basic Models 24ROZ

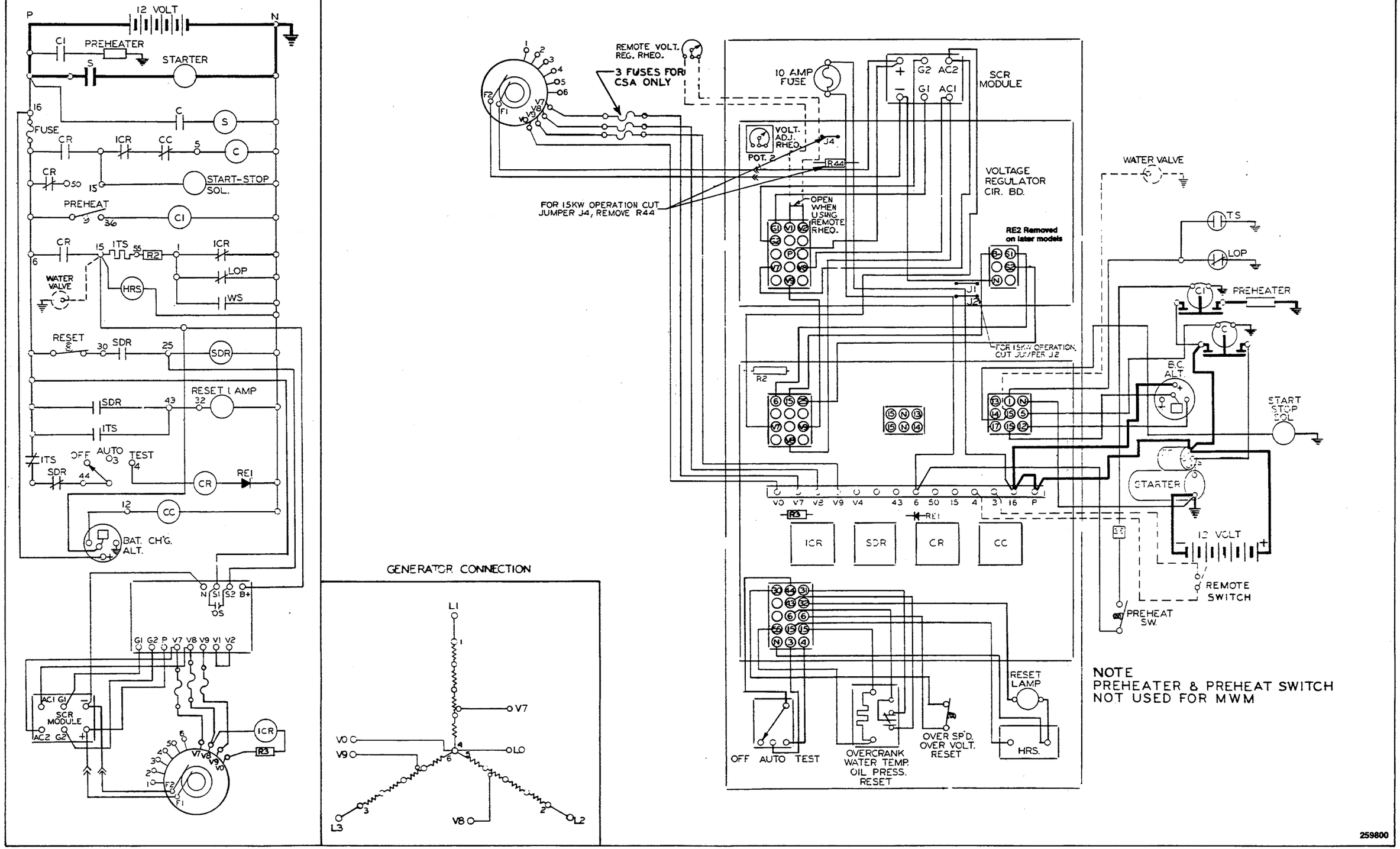
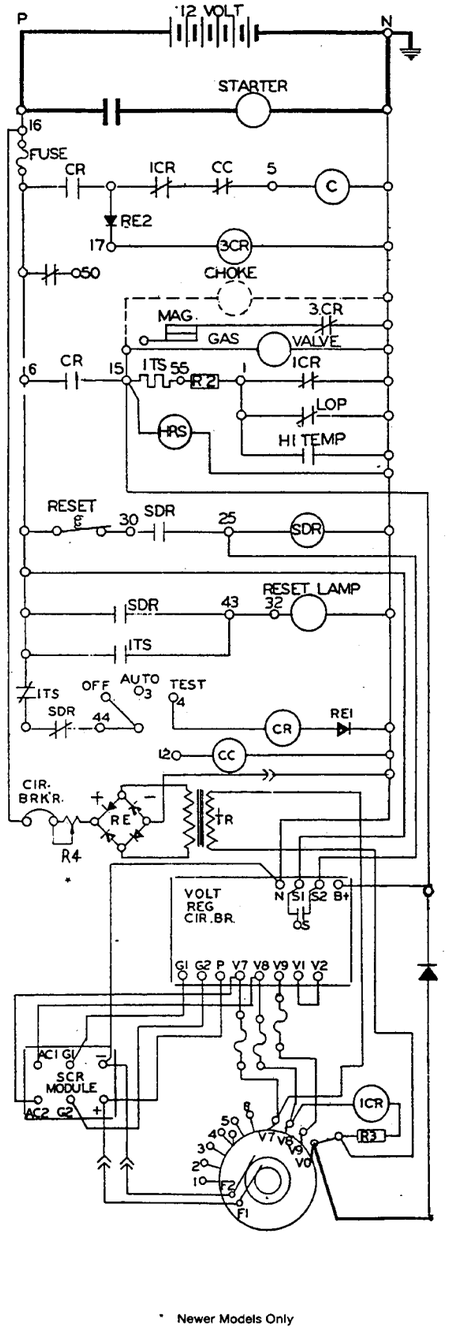
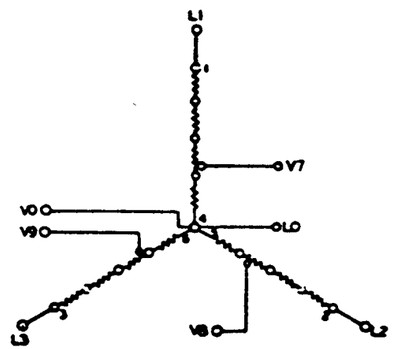


Figure 5-7. 600-Volt Wiring Diagram — Basic Models
10RMOY 15RMOY 15ROY



* Newer Models Only

GENERATOR CONNECTION



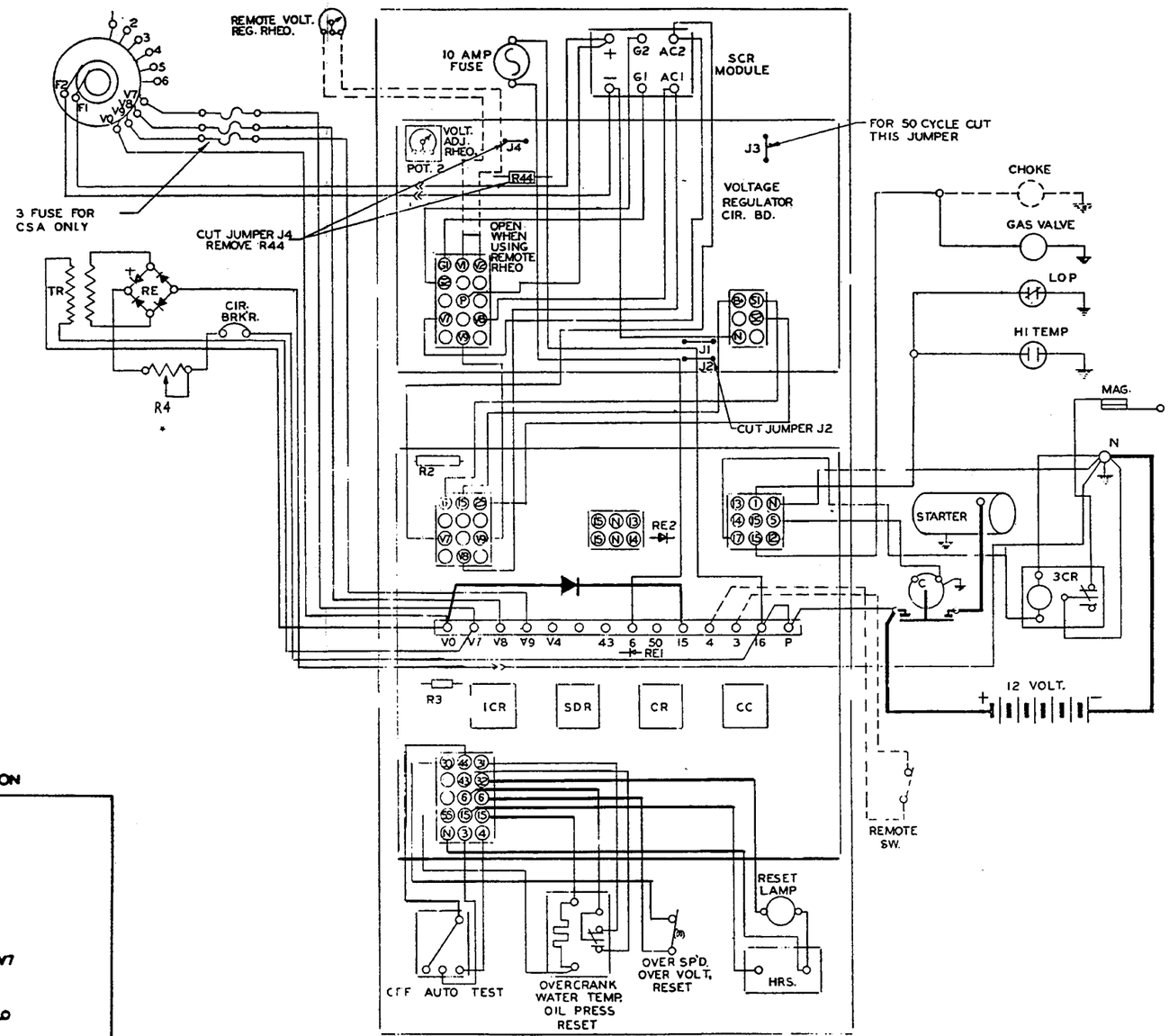


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Figure 5-8. 600-Volt Wiring Diagram — Basic Models 15RMY

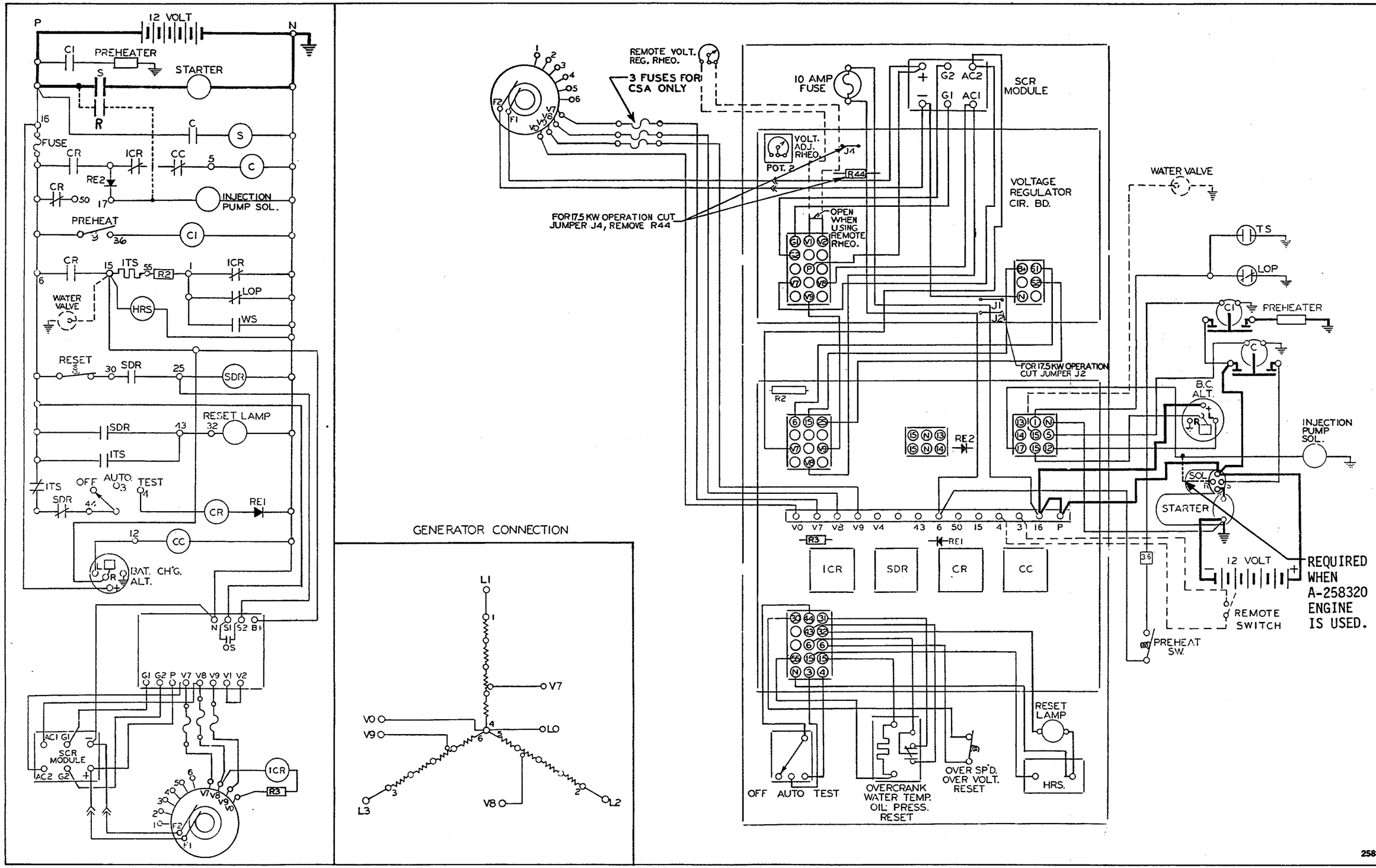


Figure 5-9. 600-Volt Wiring Diagram — Basic Models 17.5ROY

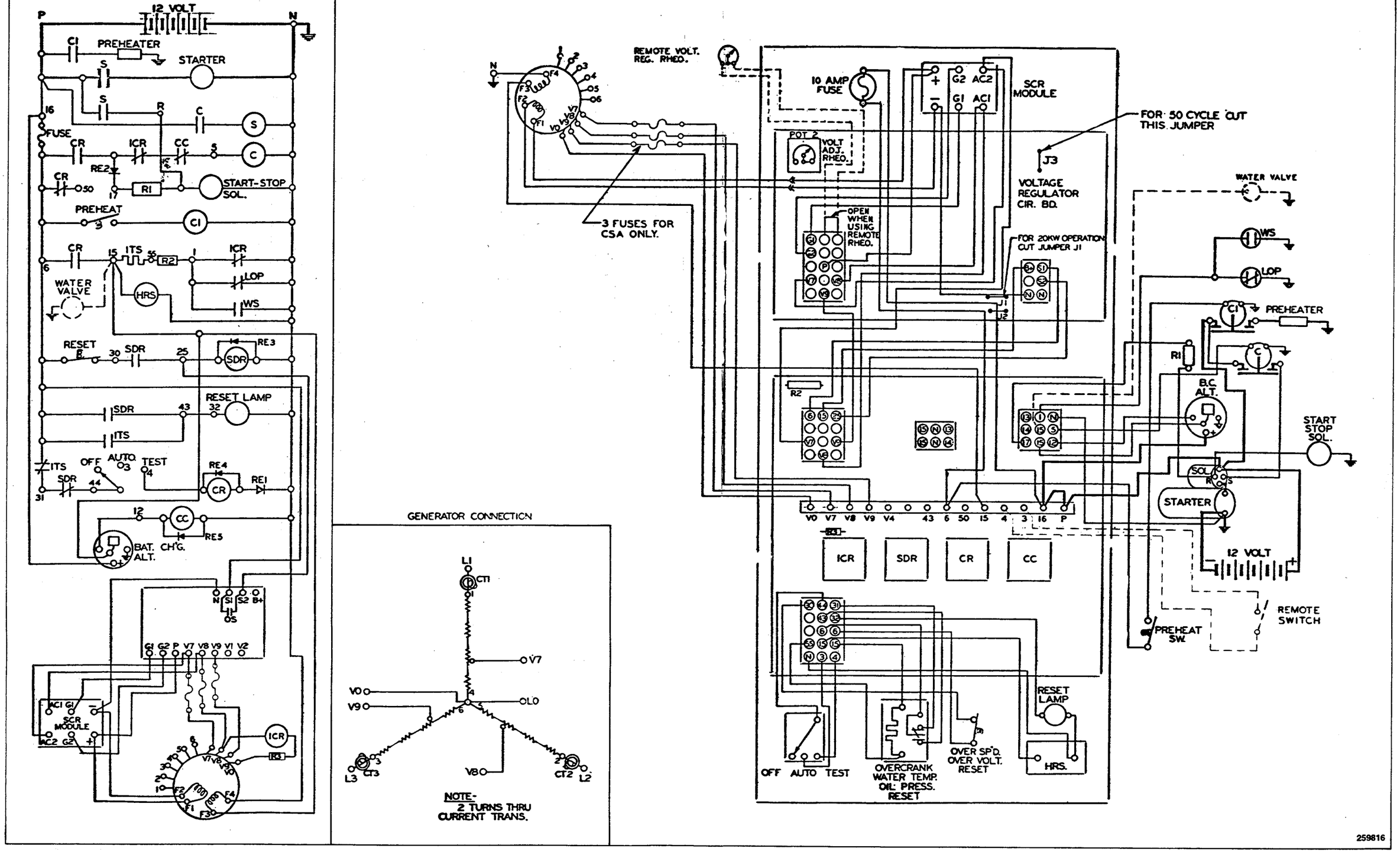


Figure 5-10. 600-Volt Wiring Diagram — Basic Models 22.5ROZ

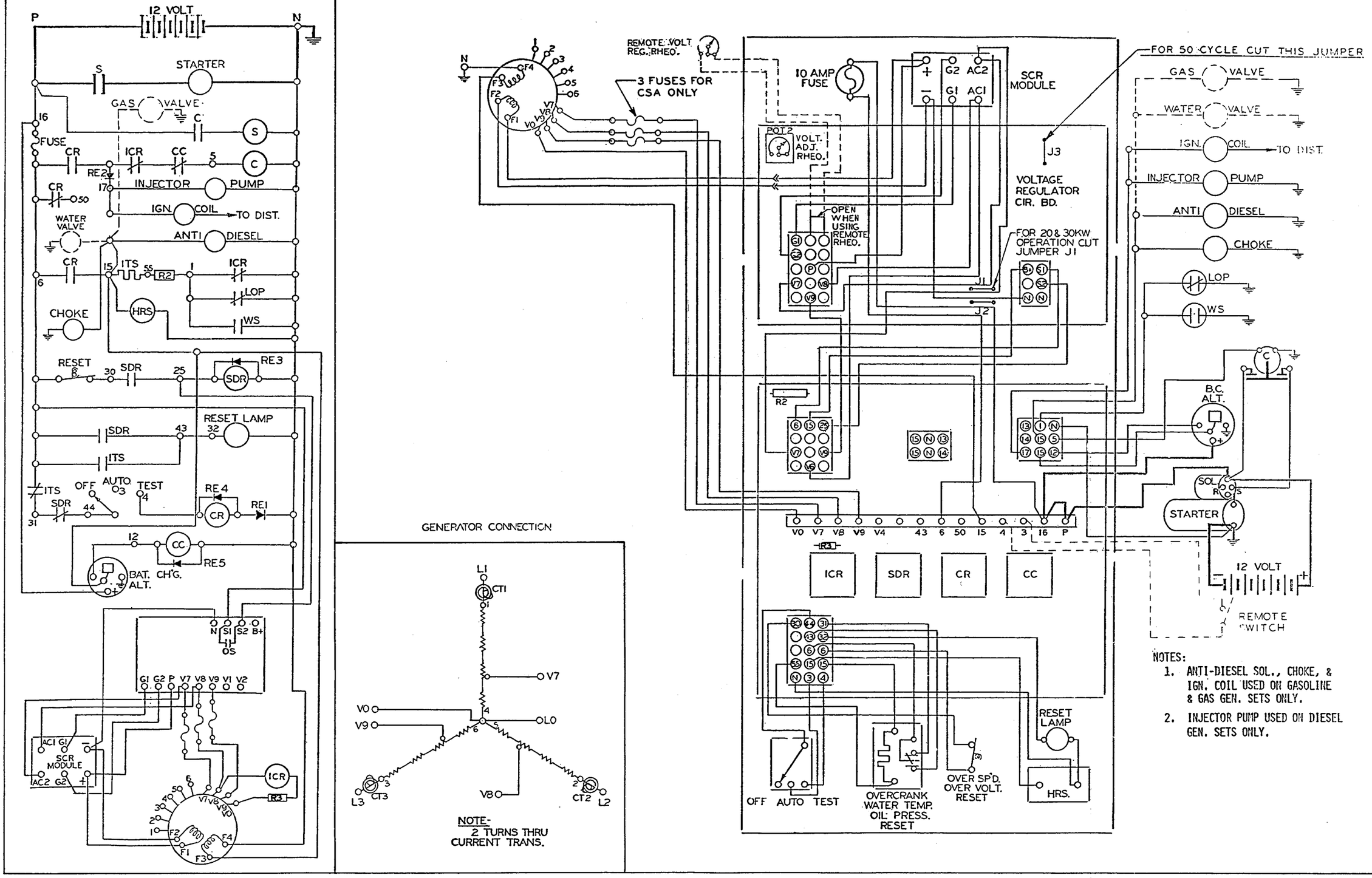


Figure 5-11. 600-Volt Wiring Diagram — Basic Models
22.5RZ 32.5ROZ 32.5RZ 47.5ROZ

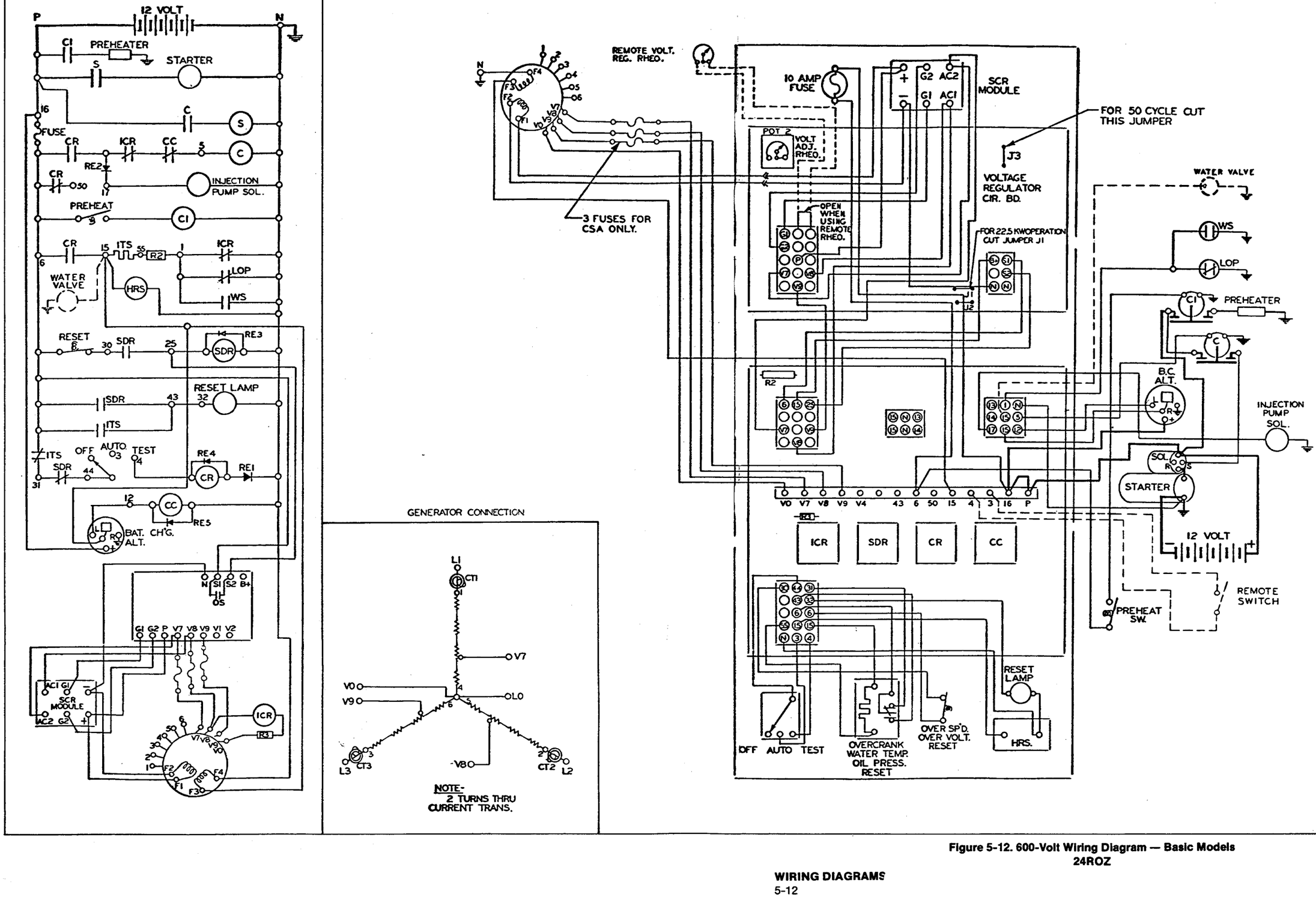
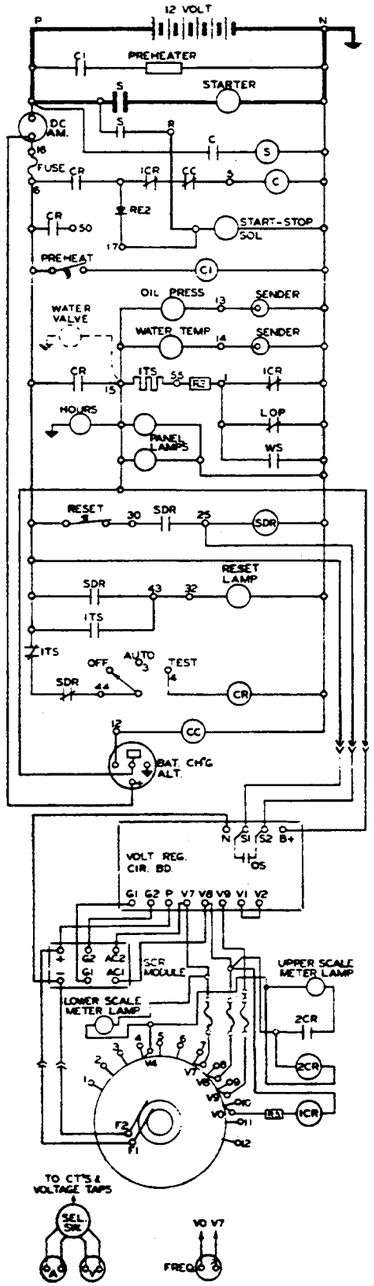
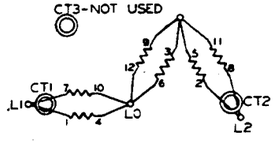


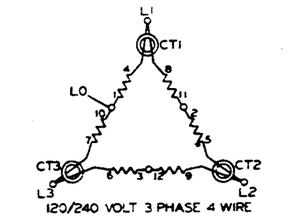
Figure 5-12. 600-Volt Wiring Diagram — Basic Models 24ROZ



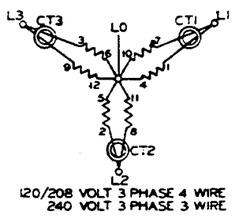
GENERATOR CONNECTIONS



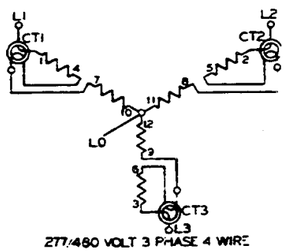
120/240 VOLT 1 PHASE 3 WIRE



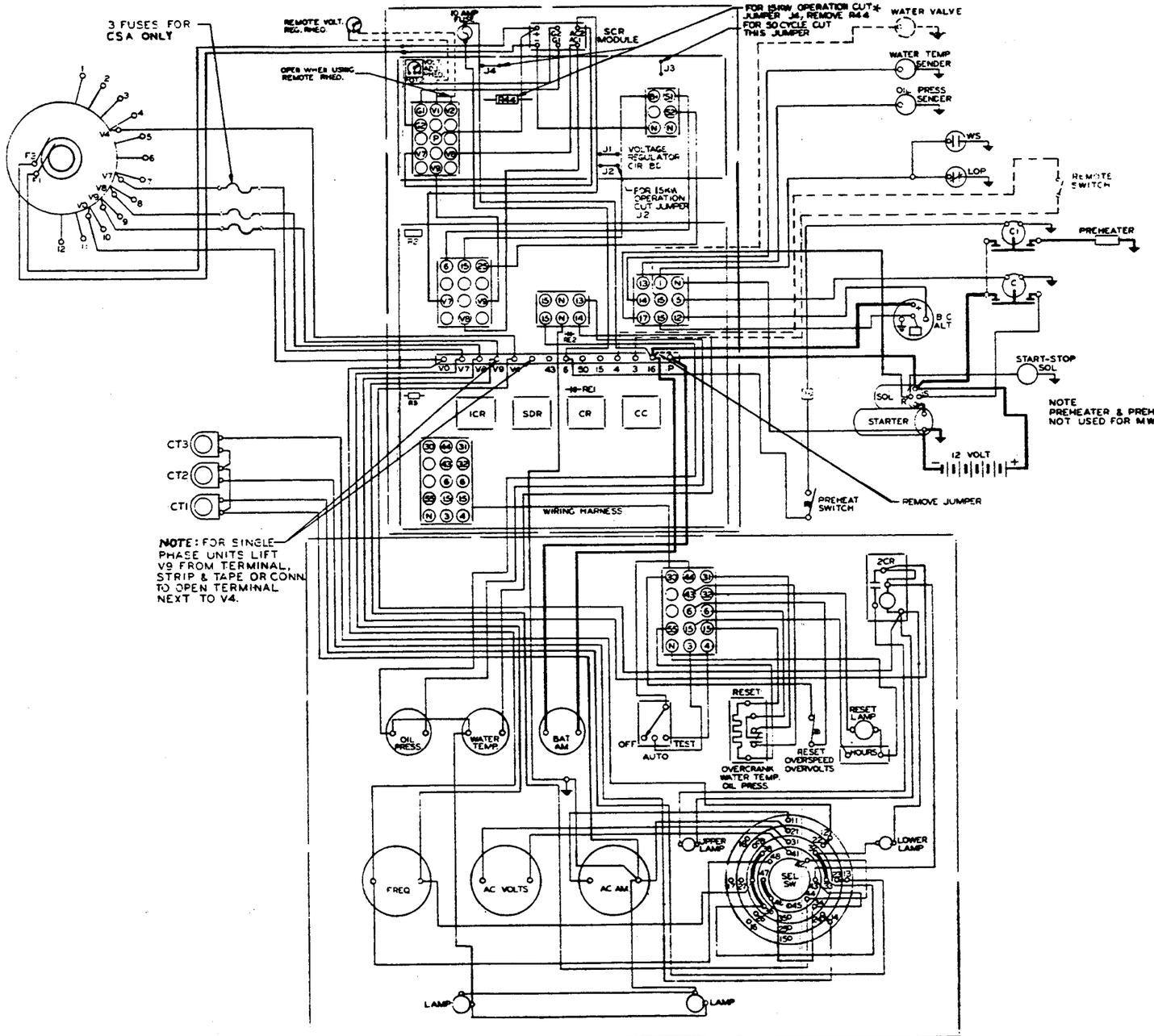
120/240 VOLT 3 PHASE 4 WIRE



120/208 VOLT 3 PHASE 4 WIRE
240 VOLT 3 PHASE 3 WIRE



277/480 VOLT 3 PHASE 4 WIRE



* Older 15kW Perkins models only

B-259861

Figure 5-13. Multi-Voltage Wiring Diagram — Meter Box Models
10RMOY 15RMOY 15ROY

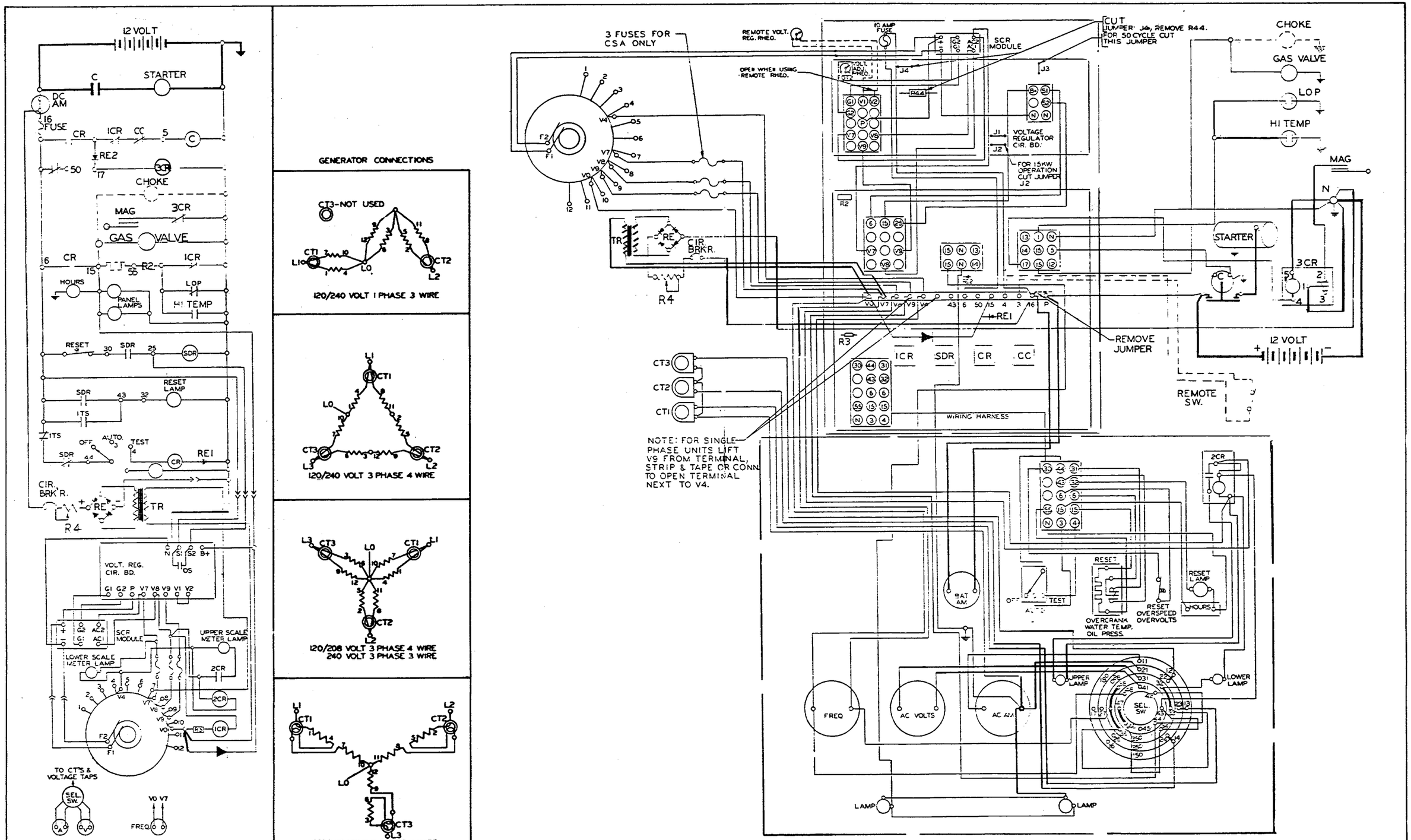


Figure 5-14. Multi-Voltage Wiring Diagram — Meter Box Models 15RMY

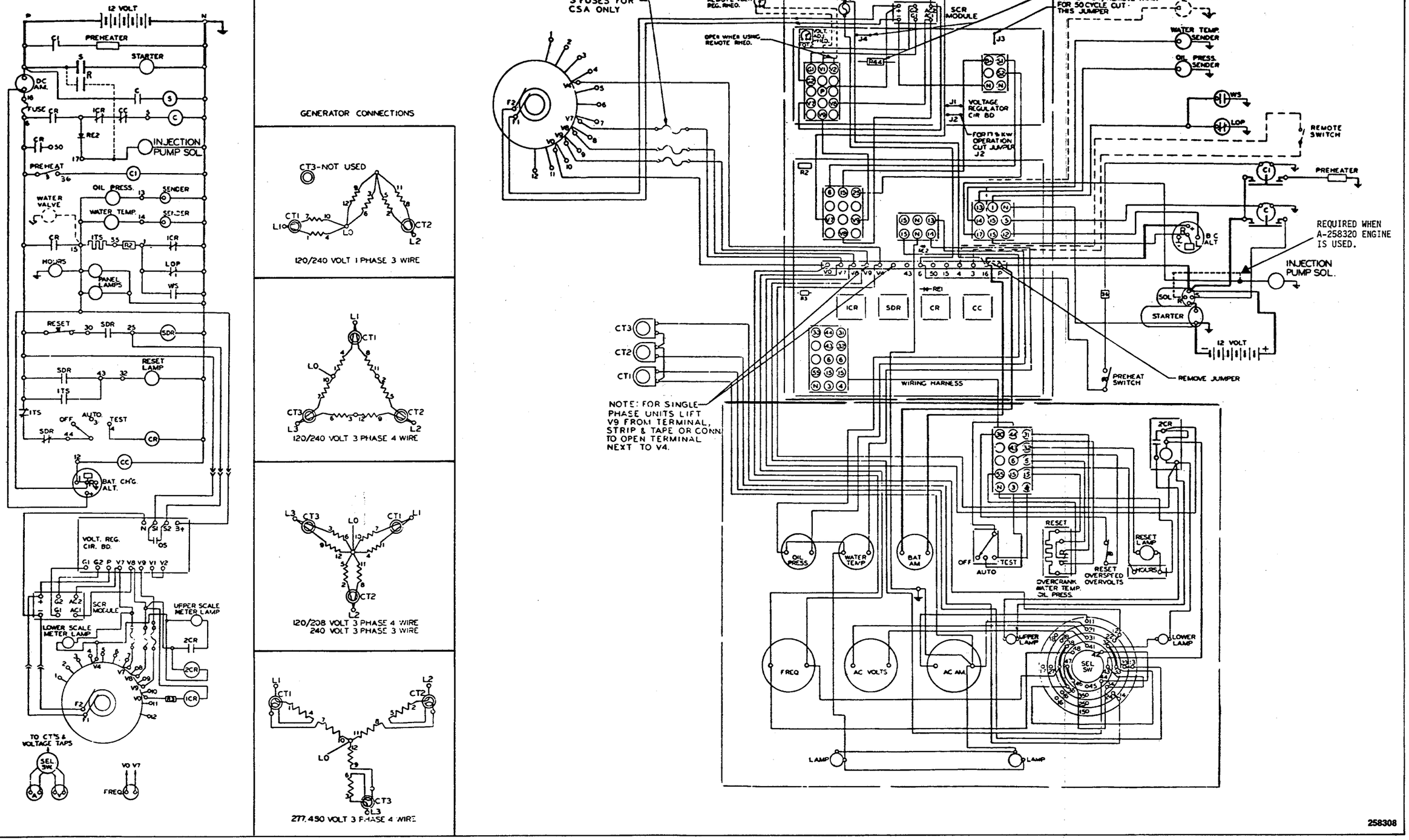


Figure 5-15. Multi-Voltage Wiring Diagram — Meter Box Models 17.5ROY

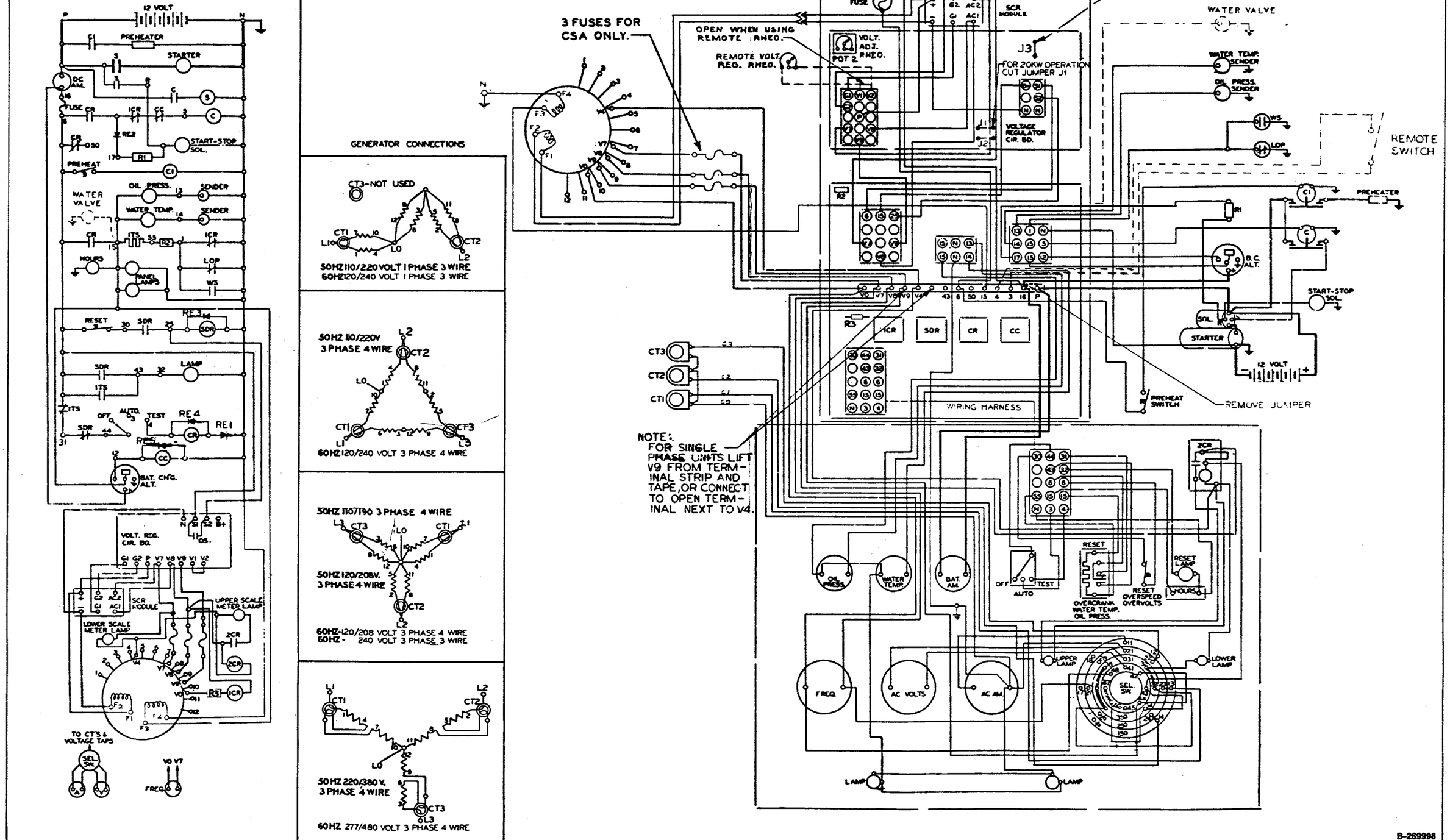
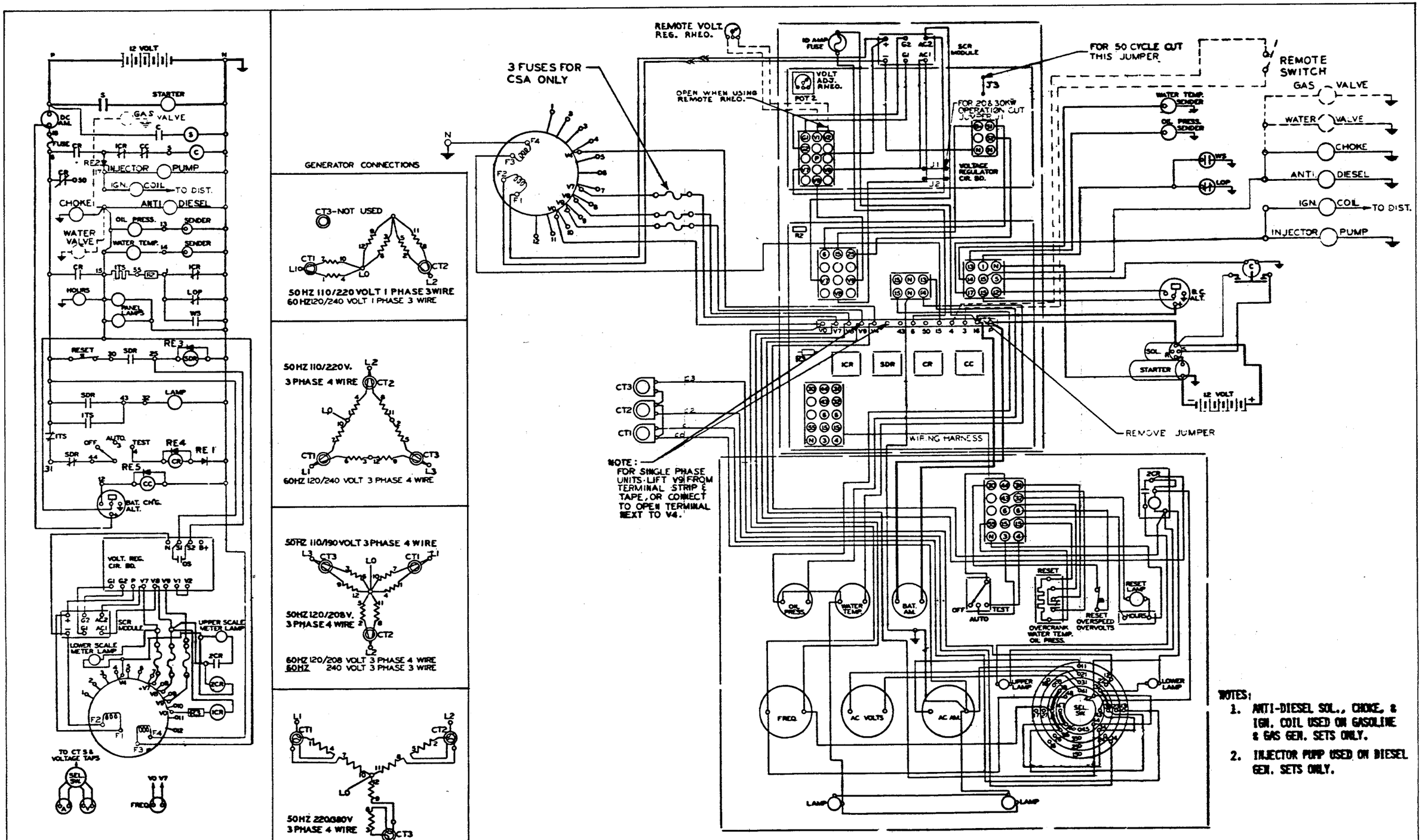


Figure 5-16. Multi-Voltage Wiring Diagram — Meter Box Models 22.5ROZ



NOTES:

1. ANTI-DIESEL SOL., CHOKE, & IGN. COIL USED ON GASOLINE & GAS GEN. SETS ONLY.
2. INJECTOR PUMP USED ON DIESEL GEN. SETS ONLY.

Figure 5-17. Multi-Voltage Wiring Diagram — Meter Box Models
22.5RZ 32.5ROZ 32.5RZ 47.5ROZ

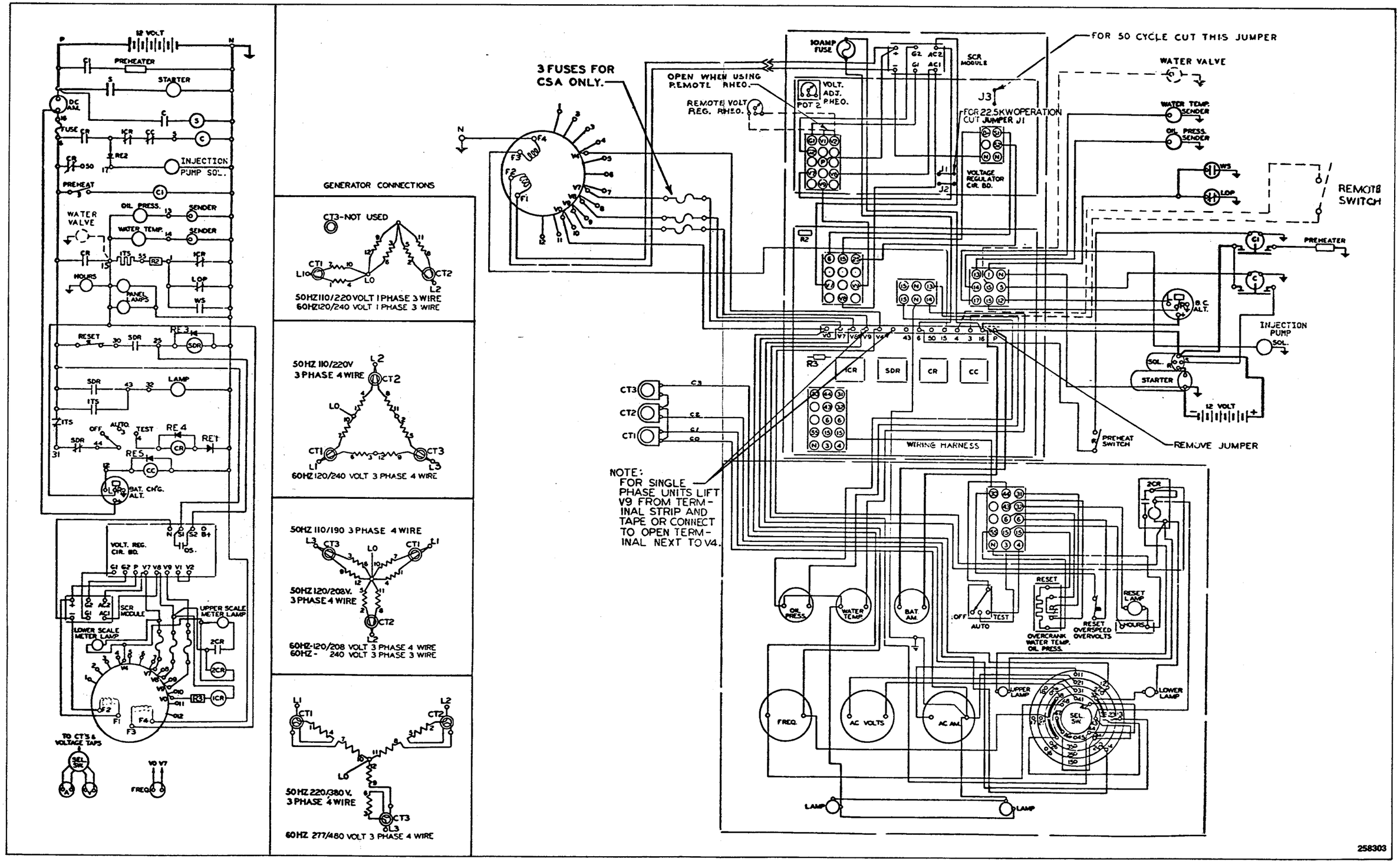


Figure 5-18. Multi-Voltage Wiring Diagram — Meter Box Models 24ROZ

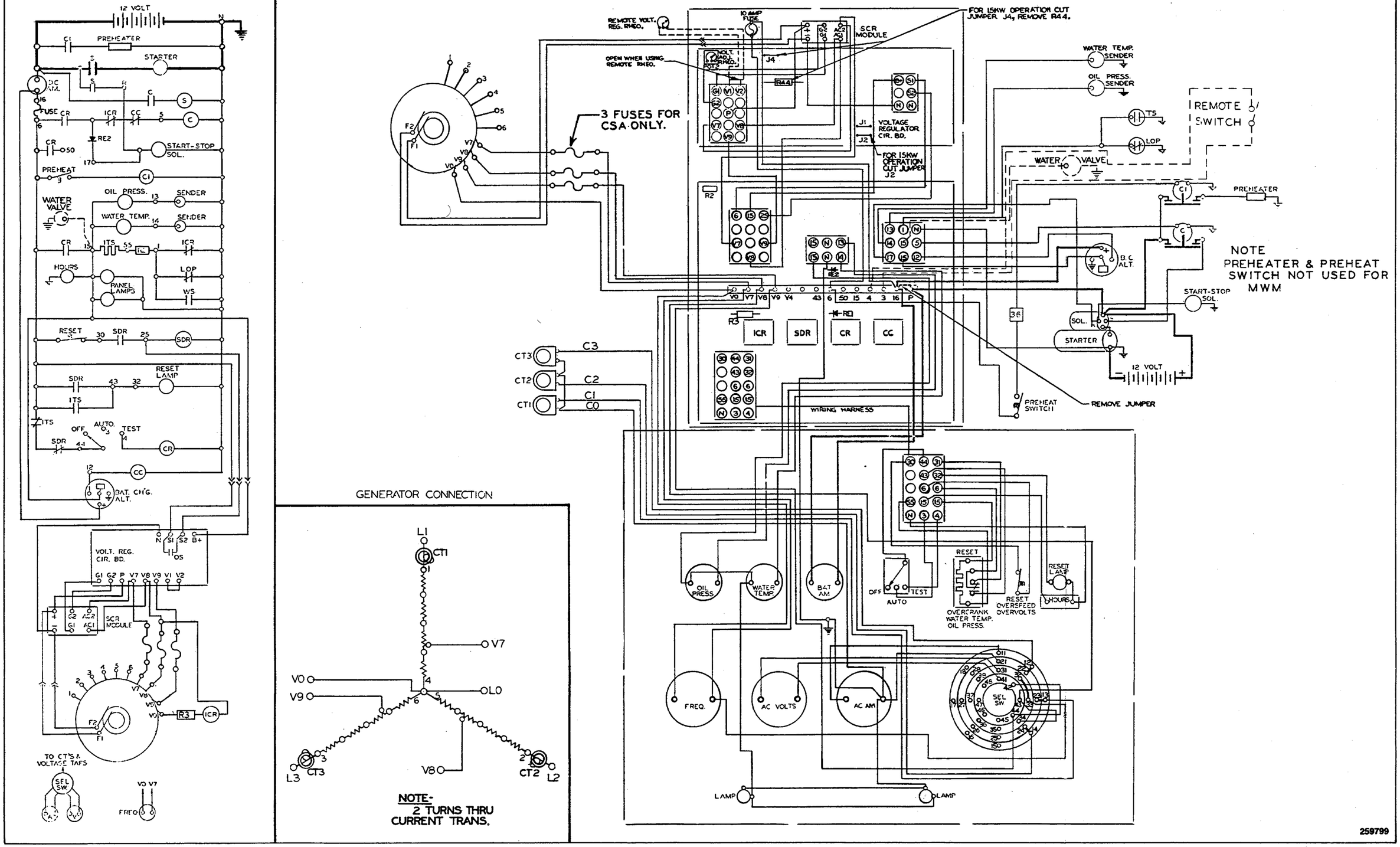
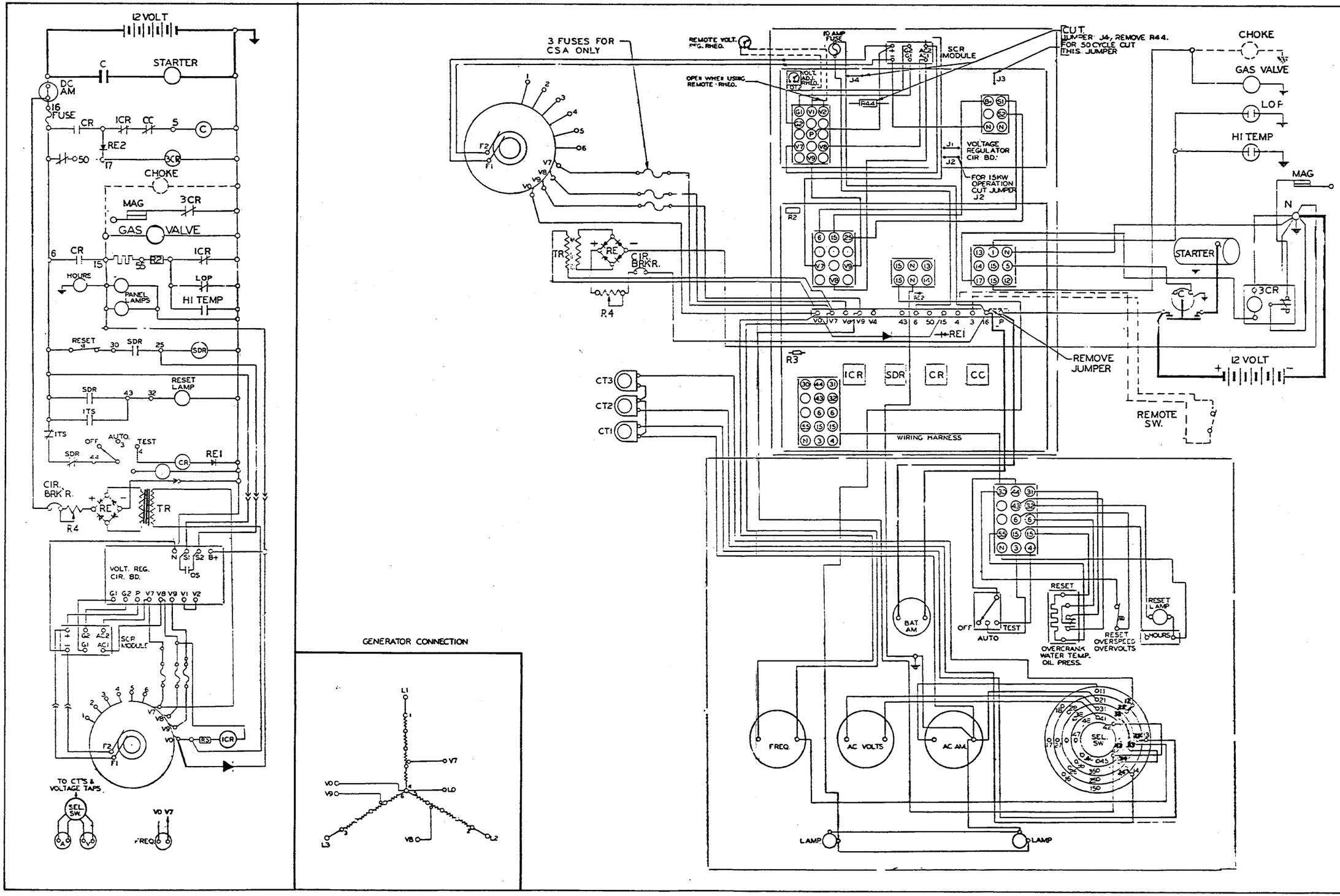
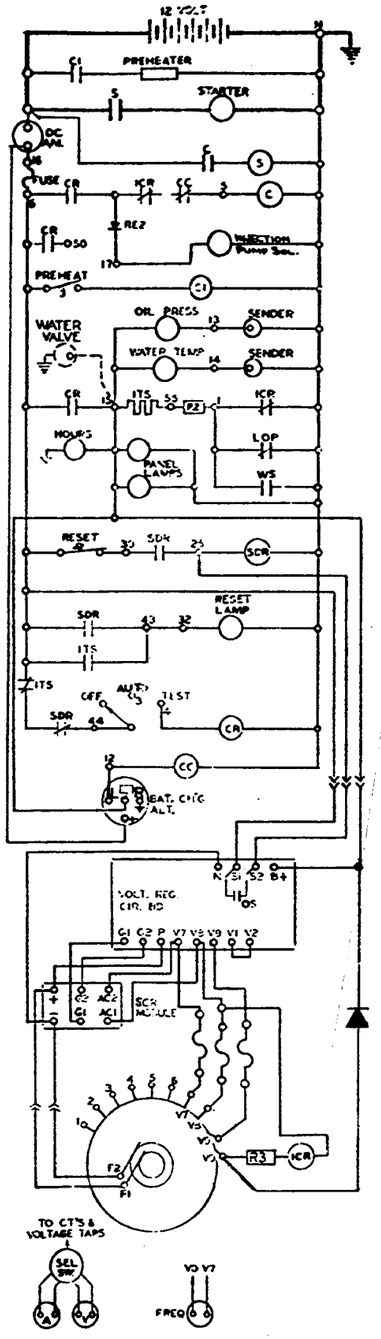


Figure 5-19. 600-Volt Wiring Diagram — Meter Box Models
10RMOY 15RMOY 15ROY

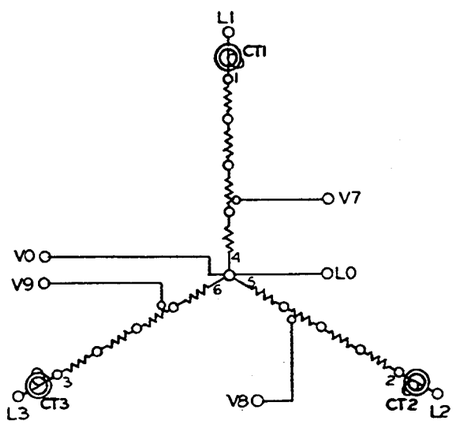


256295

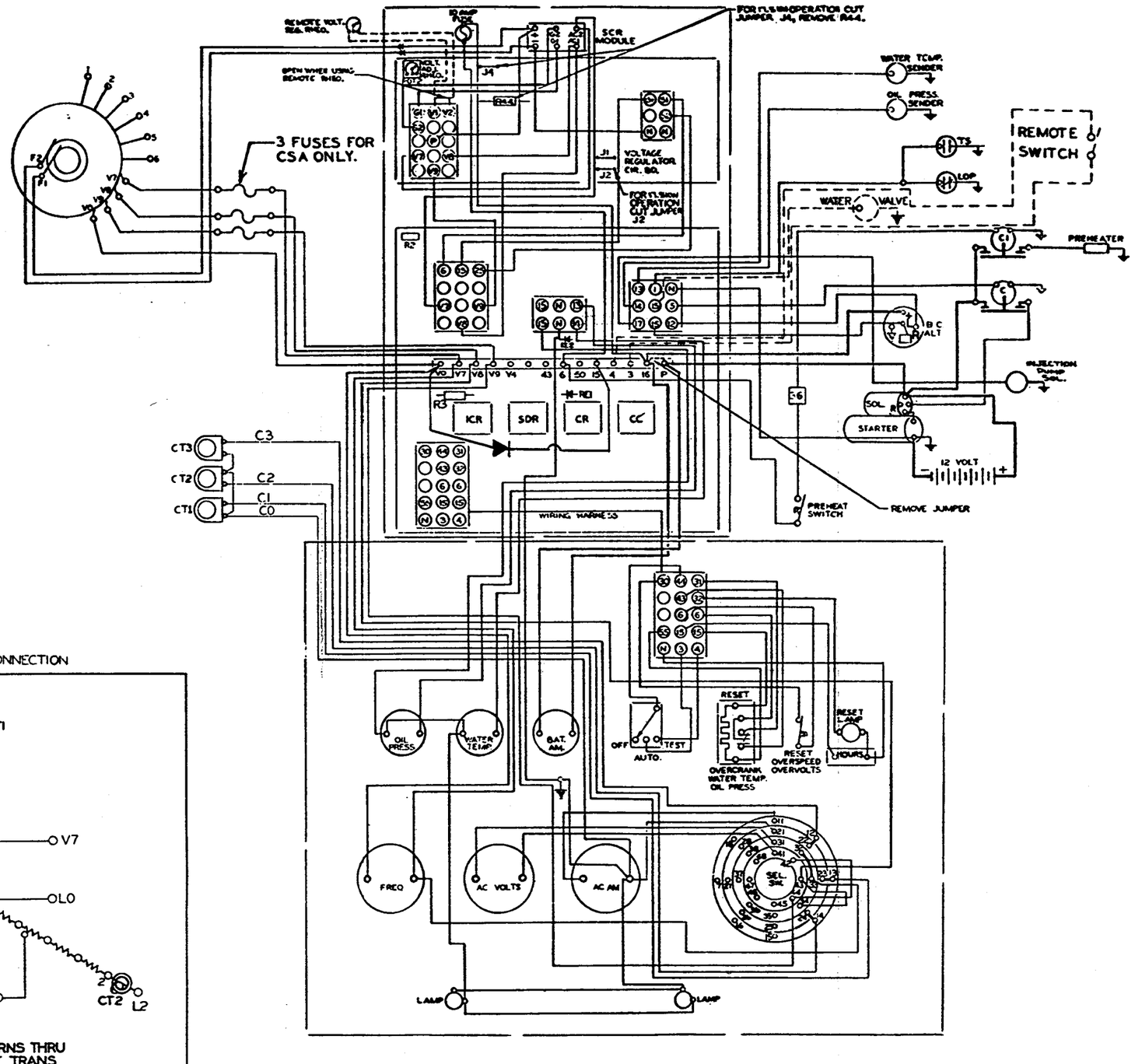
Figure 5-20. 600-Volt Wiring Diagram — Meter Box Models 15RMY



GENERATOR CONNECTION

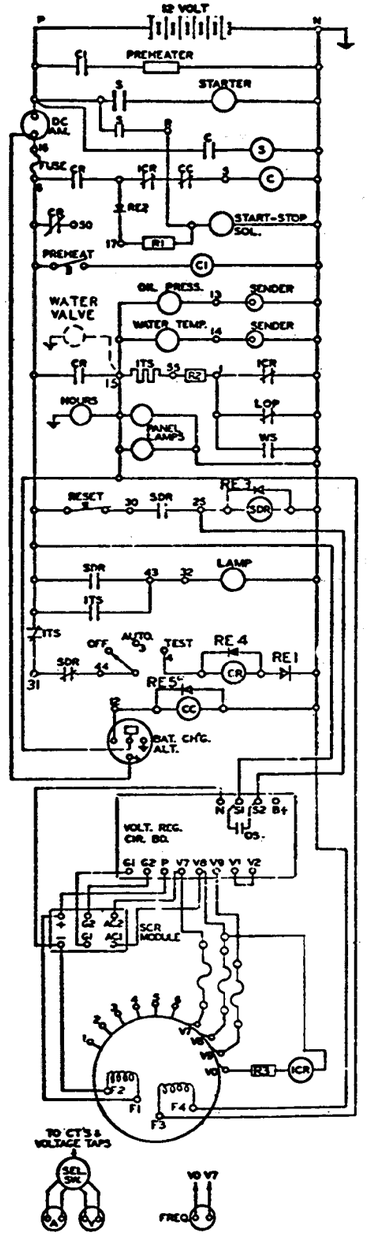


NOTE-
2 TURNS THRU CURRENT TRANS.

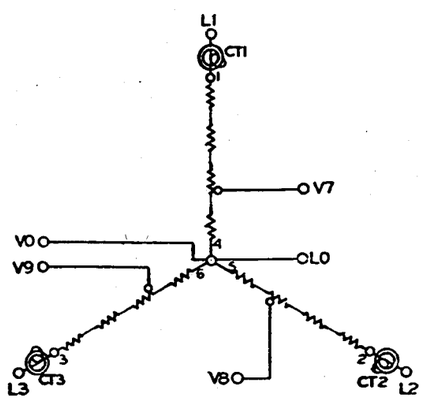


258309

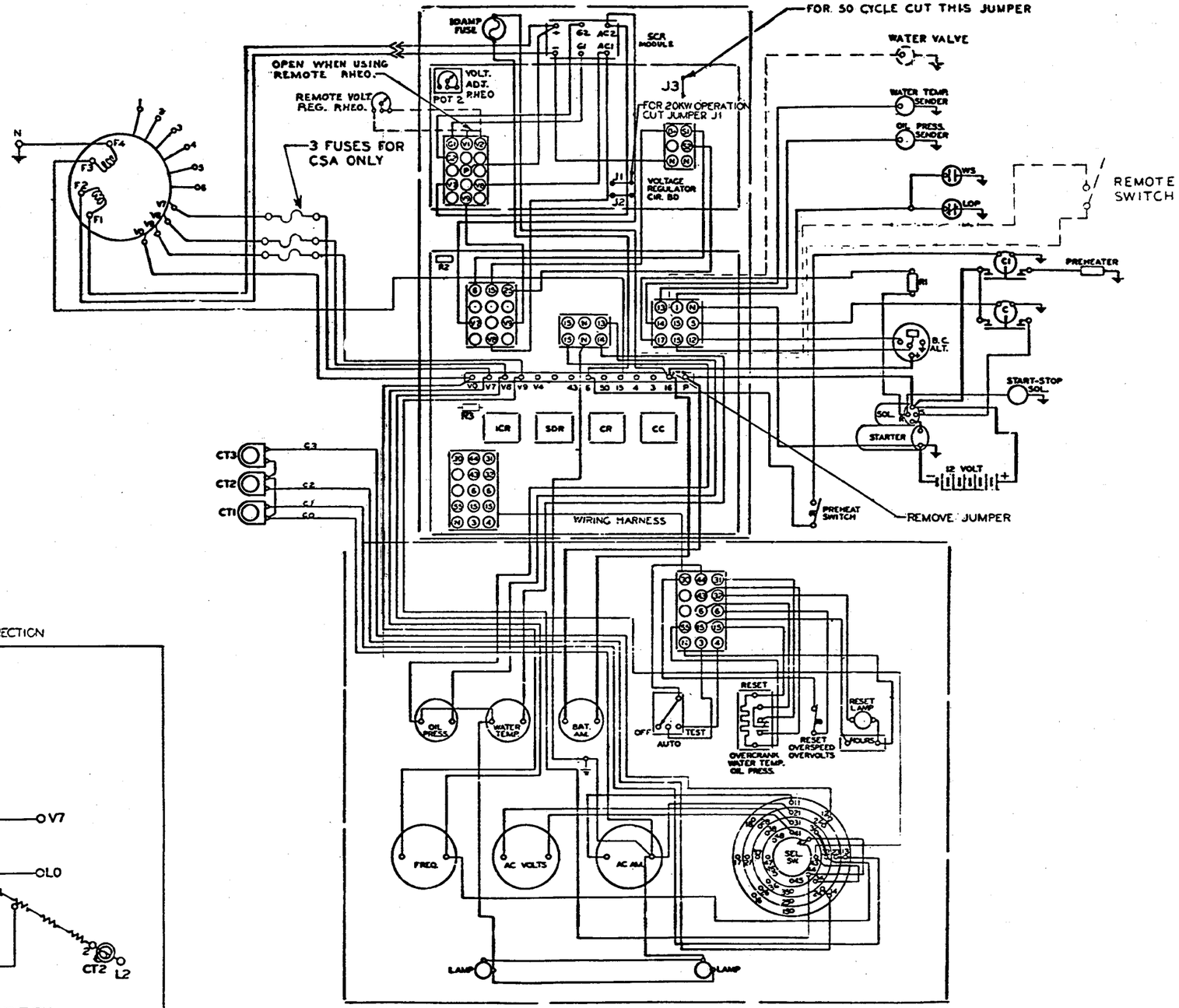
Figure 5-21. 600-Volt Wiring Diagram — Meter Box Models 17.5ROY



GENERATOR CONNECTION



NOTE-
2 TURNS THRU CURRENT TRANS.



259817

Figure 5-22. 600-Volt Wiring Diagram — Meter Box Models 22.5ROZ

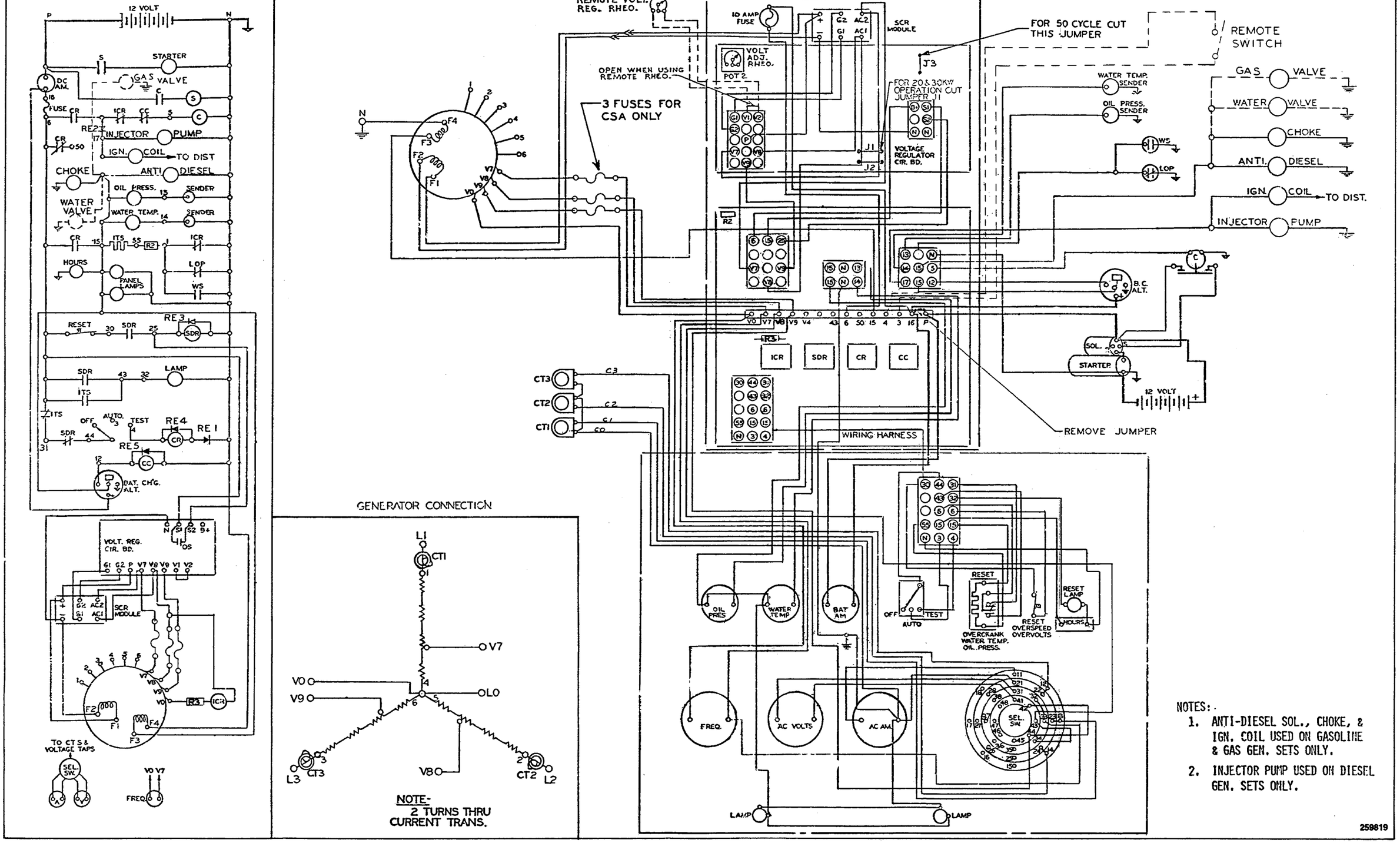
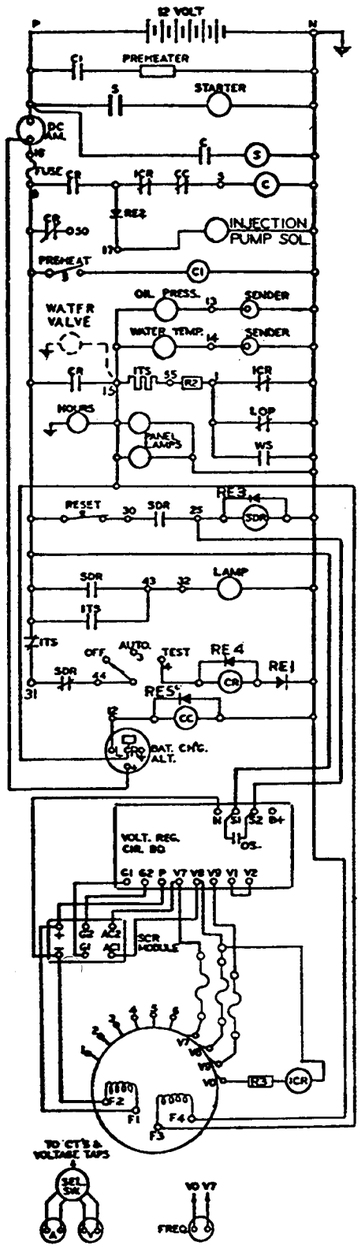
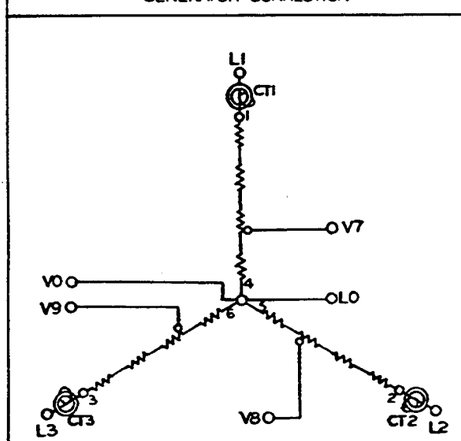


Figure 5-23. 600-Volt Wiring Diagram — Meter Box Models
22.5RZ 32.5ROZ 32.5RZ 47.5ROZ





NOTE-
2 TURNS THRU CURRENT TRANS.

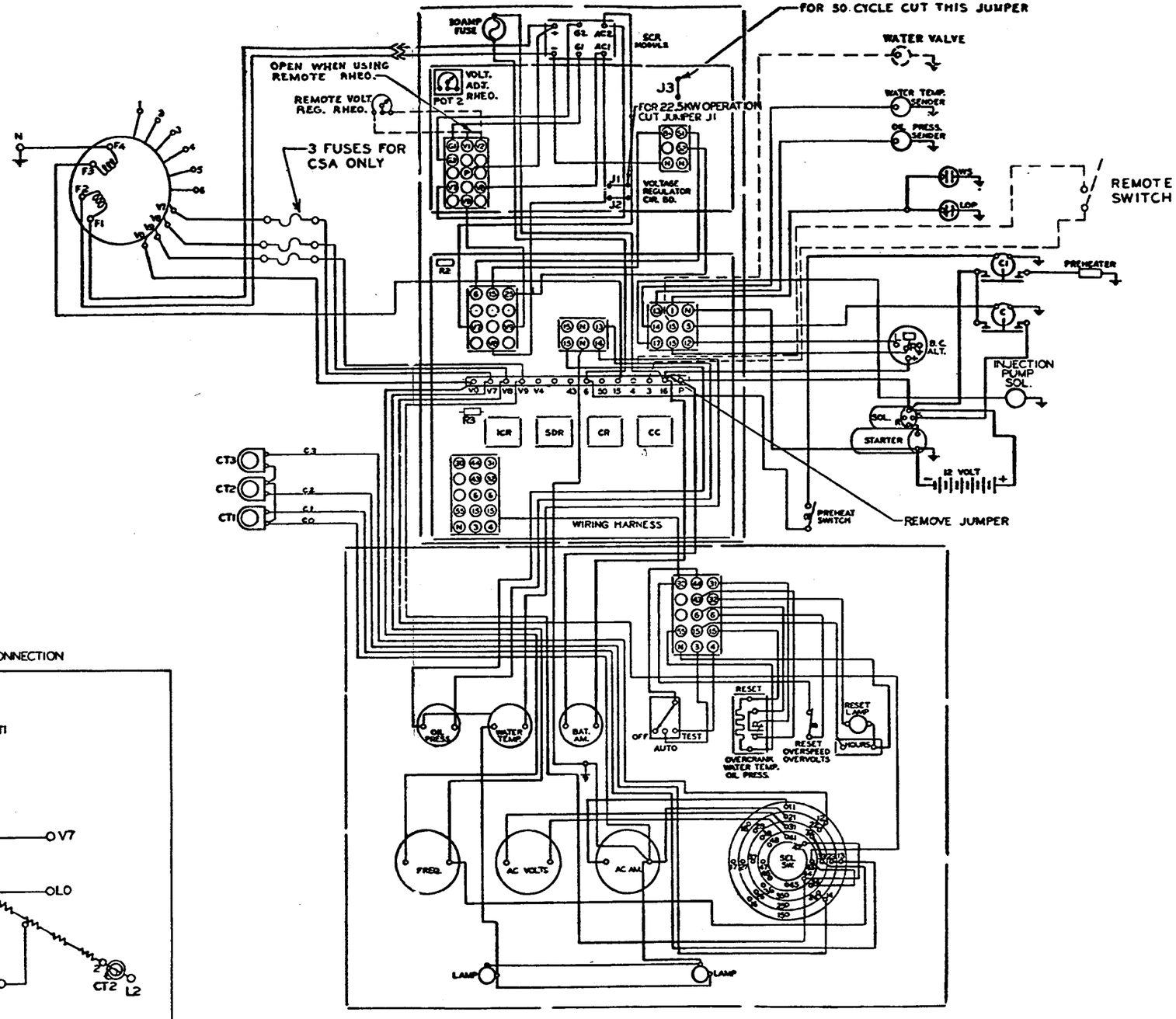


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Figure 5-24. 600-Volt Wiring Diagram — Meter Box Models 24ROZ

LEAD-NO.	DESCRIPTION
1	SWON-1804-9134
2	SW18-1850-9102
6	SWON-1850-3402
8	287951
9	SWHR-1804-9100
10	SWON-1806-3400
11	SW64-1806-9100
13	SWV4-1821-2222
14	SWV0-1821-2222
15	SWV9-1821-2222
16	SWV8-1821-2222
17	SWV7-1821-2222

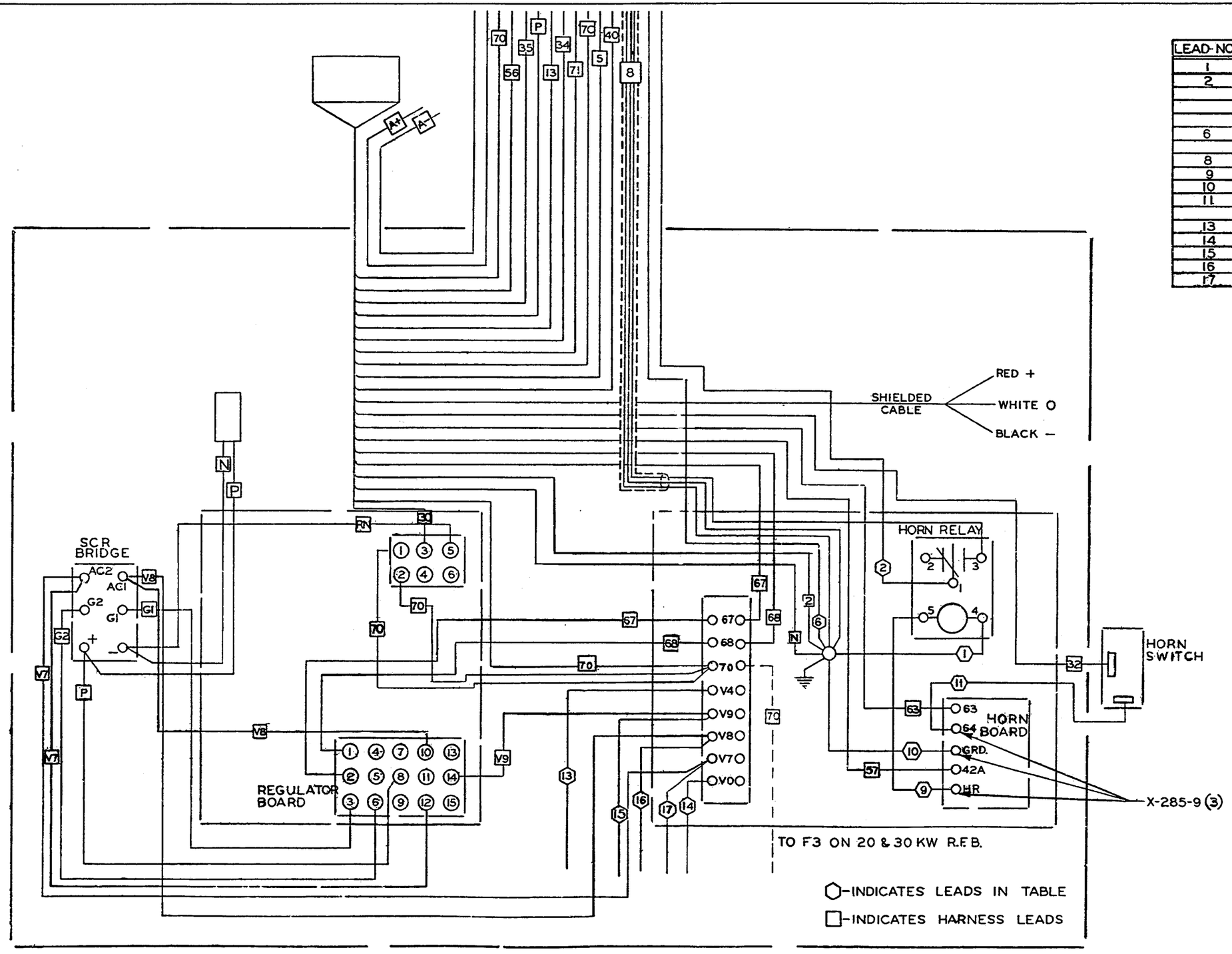
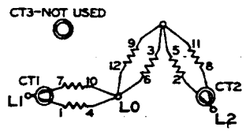
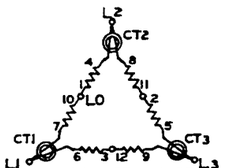


Figure 5-25. Engine-Generator Wiring — NFPA Models 10RMOY 15RMOY

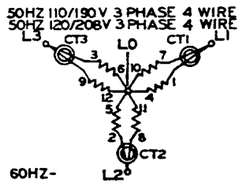
GENERATOR CONNECTIONS



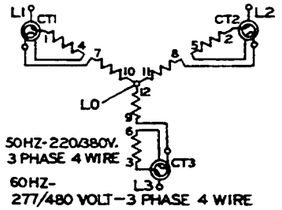
60HZ-
120/240 VOLT-1 PHASE 3 WIRE
50HZ 110/220V- 1 PHASE 3 WIRE



110/220V-3 PHASE 4 WIRE-50HZ
120/240 V-3 PHASE 4 WIRE-60HZ



50HZ 110/190 V 3 PHASE 4 WIRE
50HZ 120/208V 3 PHASE 4 WIRE
60HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE



50HZ-220/380V.
3 PHASE 4 WIRE
60HZ-
277/480 VOLT-3 PHASE 4 WIRE

NOTE-
PREHEATER; PREHEAT SWITCH; LOW WATER TEMP. SW; WATER TEMP. SENDER, AND ANTIC H.W.T. SW. NOT USED FOR MWM

OPTIONAL ANNUNCIATOR PANEL

REMOTE SWITCH

FOR INTERNAL WIRING SEE DWG. B-269387 SHT. 2

N.F.P.A. CONTROLLER B-269387

NOTE:
FOR SINGLE PHASE UNITS LIFT V9 FROM TERMINAL STRIP & TAPE.

JUNCTION BOX

3 FUSES FOR CSA ONLY

SHIELDED

BLK WHT RED

SPEED SENSOR

REG. BOX ASSEM. A-259699 FOR INTERNAL WIRING SEE DWG. A-259699 SHT. 2

HORN

FLASHER

BLK.

(SHIELDED)

CLEAR

WATER VALVE

INJECTOR PUMP OR START STOP SOL.

OIL PRESS. SENDER

ANTIC. L.O.P. SW

L.O.P. SW.

LOW WATER TEMP. SW.

WATER TEMP. SENDER

ANTIC. H.W.T. SW.

HIGH TEMP. SW.

ALT

BAT.

DIODE NOT USED ON 17.5 KW.

PREHEAT SWITCH

PREHEATER

SOL

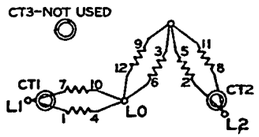
12 VOLT

STARTER

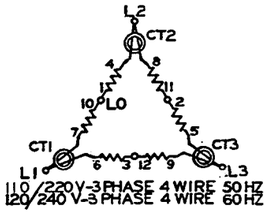
259859

Figure 5-26. Engine-Generator Wiring — NFPA Models
15ROY 17.5ROY

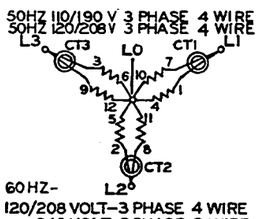
GENERATOR CONNECTIONS



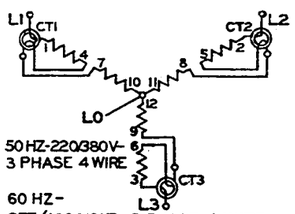
60 HZ-
120/240 VOLT-1 PHASE 3 WIRE
50 HZ 110/220V-1PHASE 3 WIRE



110/220V-3PHASE 4 WIRE 50HZ
120/240 V-3 PHASE 4 WIRE 60HZ



60HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE



60 HZ-
277/480 VOLT-3 PHASE 4 WIRE

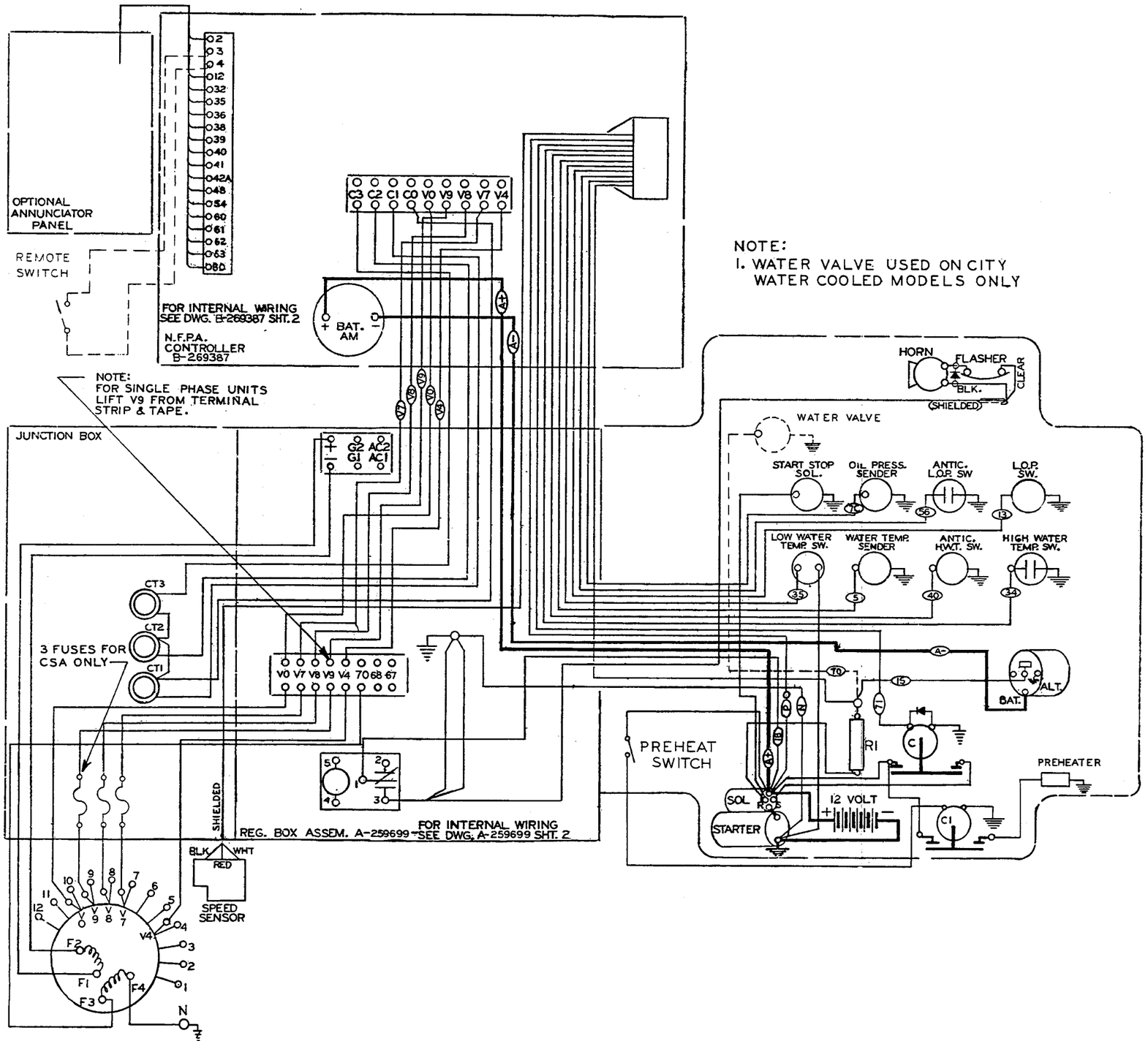


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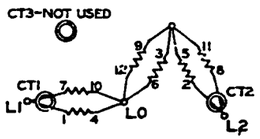
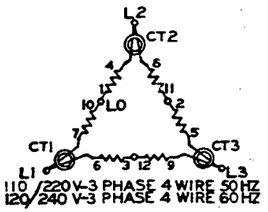
Figure 5-27. Engine-Generator Wiring — NFPA Models 22.5ROZ

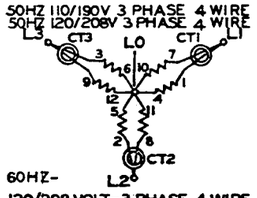
GENERATOR CONNECTIONS



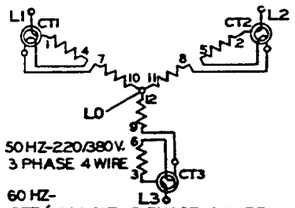
60HZ-
120/240 VOLT-1 PHASE 3 WIRE
50HZ 110/220V-1 PHASE 3 WIRE



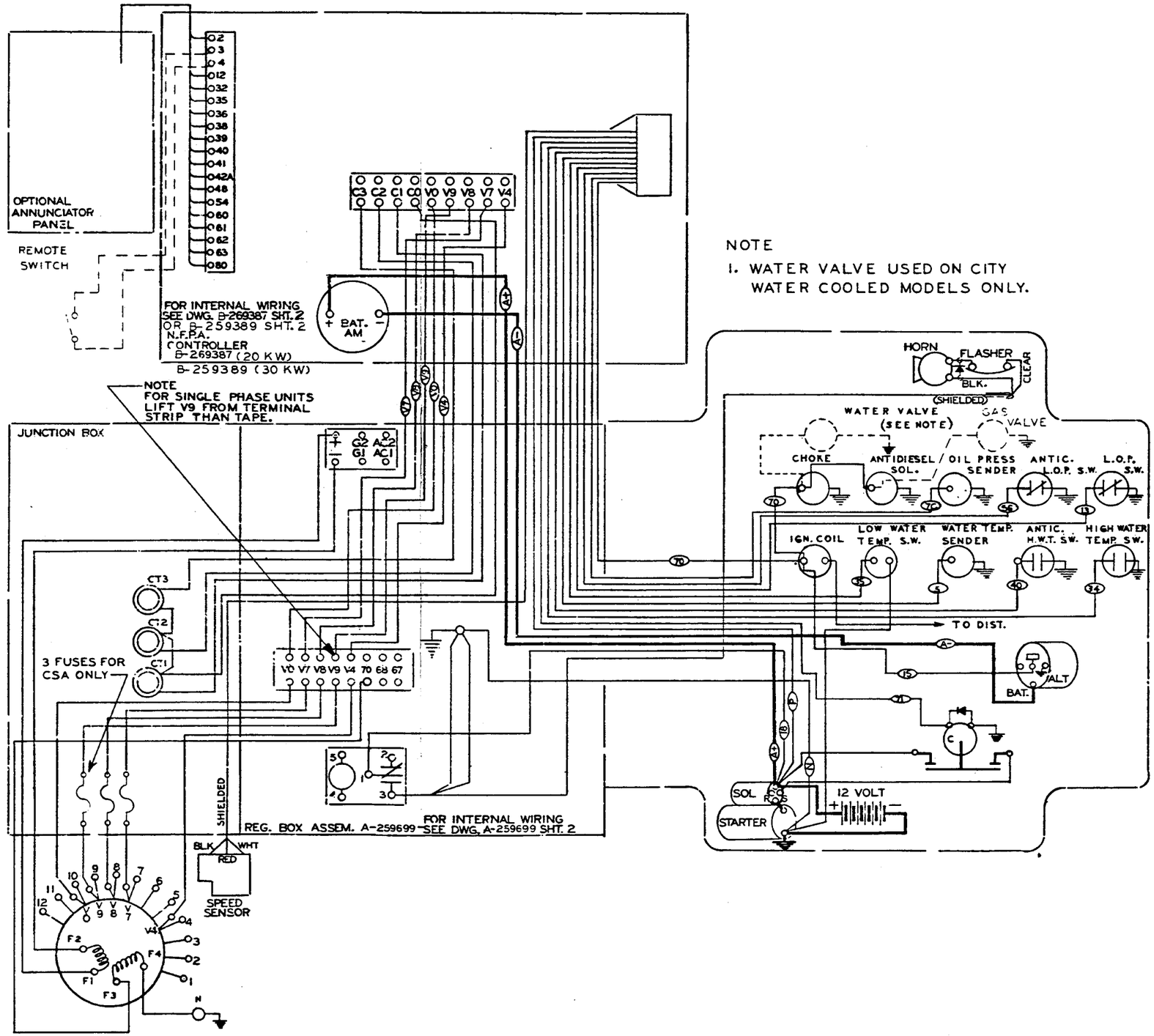
110/220V-3 PHASE 4 WIRE 50HZ
120/240 V-3 PHASE 4 WIRE 60HZ



50HZ 110/190V 3 PHASE 4 WIRE
50HZ 120/208V 3 PHASE 4 WIRE
60HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE



50HZ-220/380V.
3 PHASE 4 WIRE
60 HZ-
277/480 VOLT-3 PHASE 4 WIRE

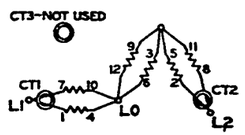


NOTE
1. WATER VALVE USED ON CITY WATER COOLED MODELS ONLY.

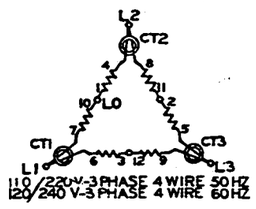
291754

Figure 5-28. Engine-Generator Wiring — NFPA Models 22.5RZ 32.5RZ

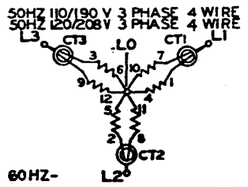
GENERATOR CONNECTIONS



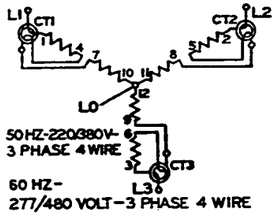
60 HZ-
120/240 VOLT-1 PHASE 3 WIRE
50 HZ 110/220 V-1 PHASE 3 WIRE



110/220V-3 PHASE 4 WIRE 50 HZ
120/240 V-3 PHASE 4 WIRE 60 HZ



60 HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE



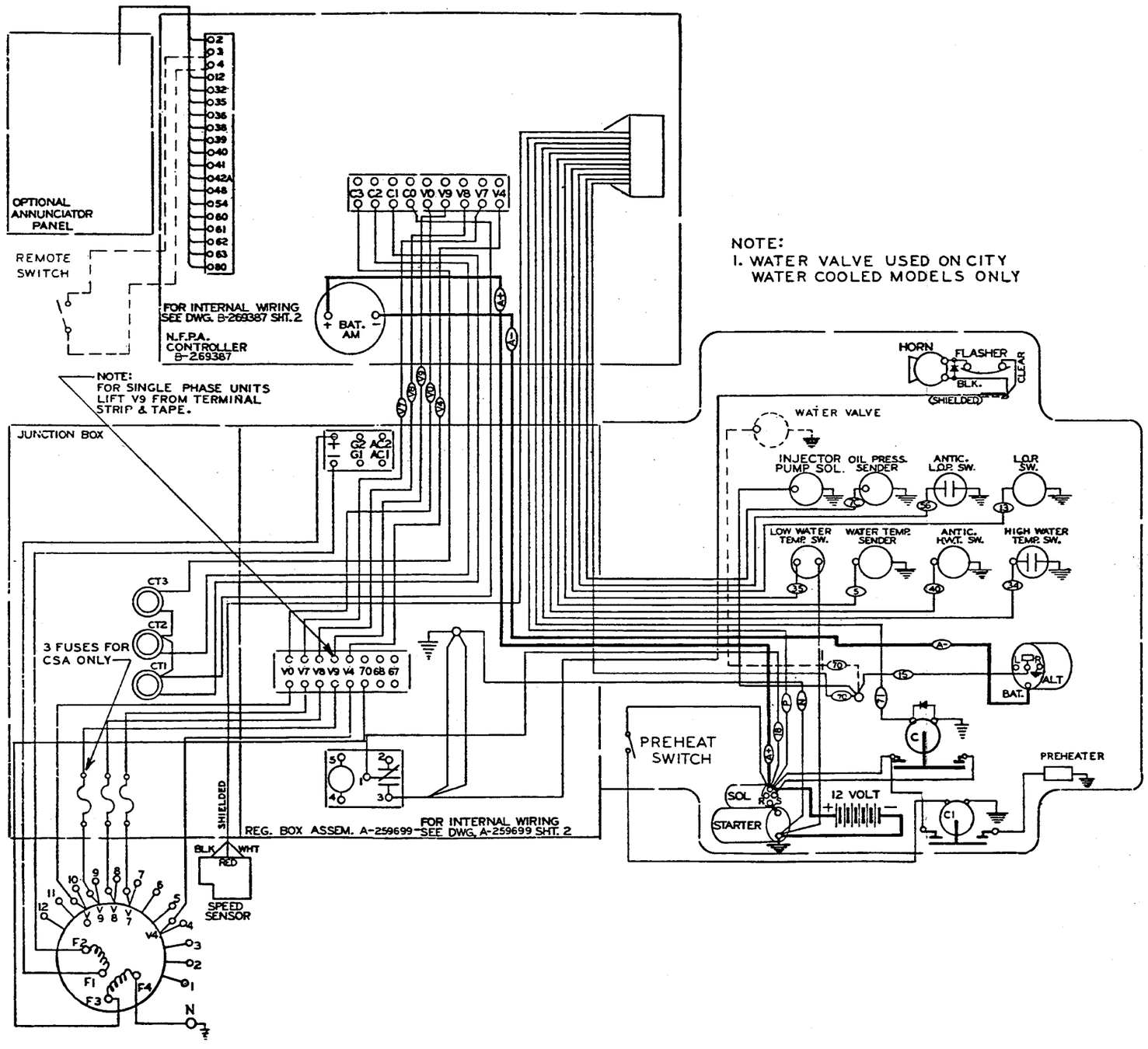


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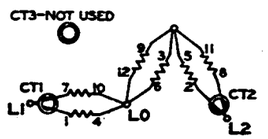
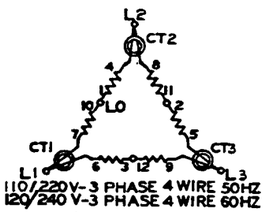
Figure 5-29. Engine-Generator Wiring — NFPA Models 24ROZ

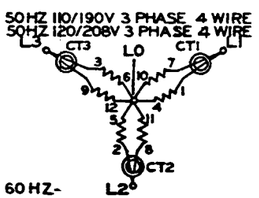
GENERATOR CONNECTIONS



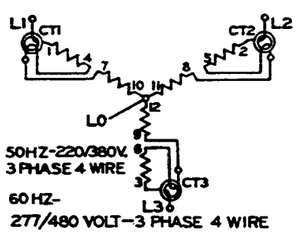
60HZ-
120/240 VOLT-1 PHASE 3 WIRE
50HZ-110/220V-1 PHASE 3 WIRE

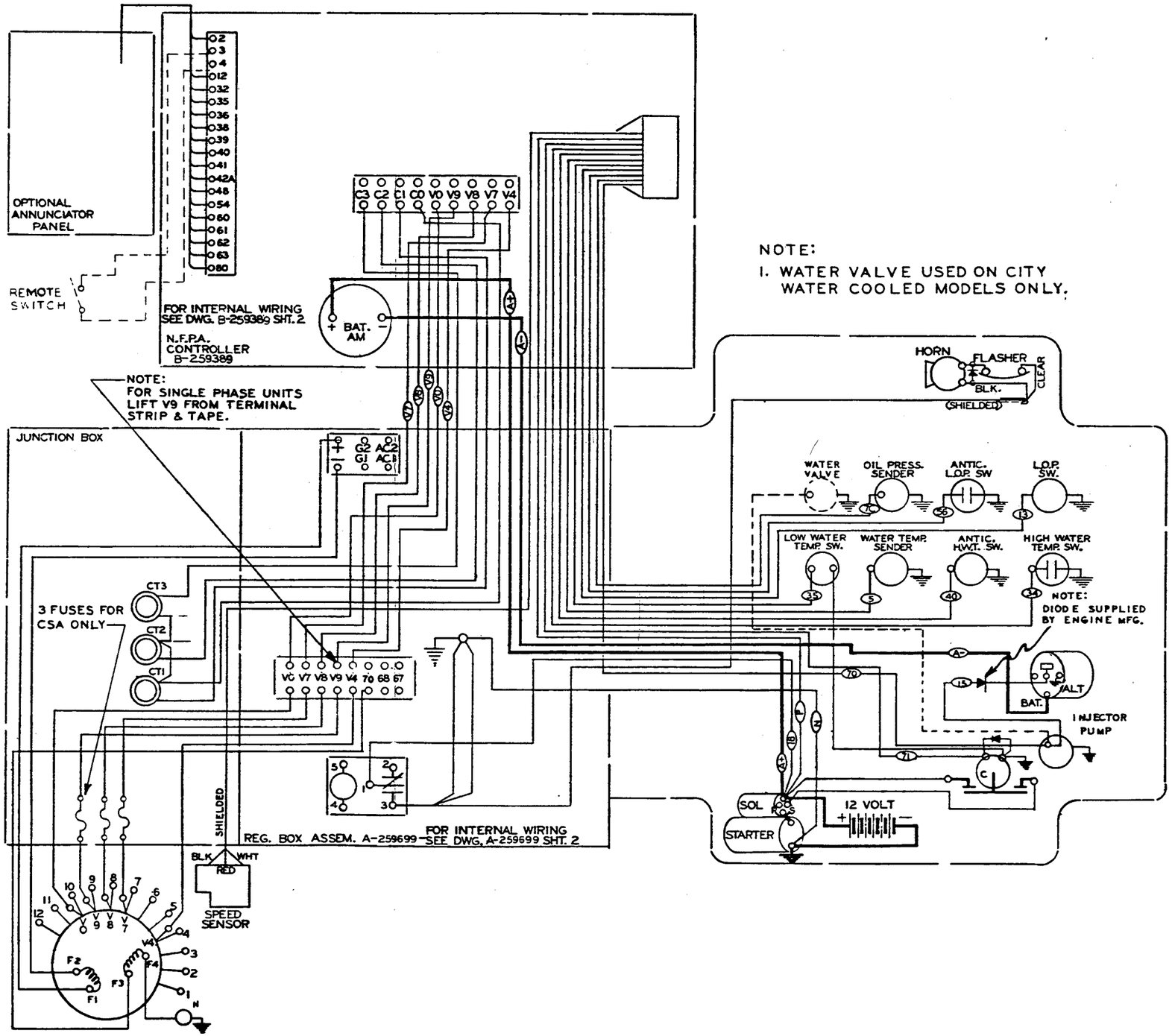


110/220V-3 PHASE 4 WIRE 50HZ
120/240 V-3 PHASE 4 WIRE 60HZ



60 HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE





NOTE:
1. WATER VALVE USED ON CITY WATER COOLED MODELS ONLY.

291753

Figure 5-30. Engine-Generator Wiring — NFPA Models
32.5ROZ 47.5ROZ

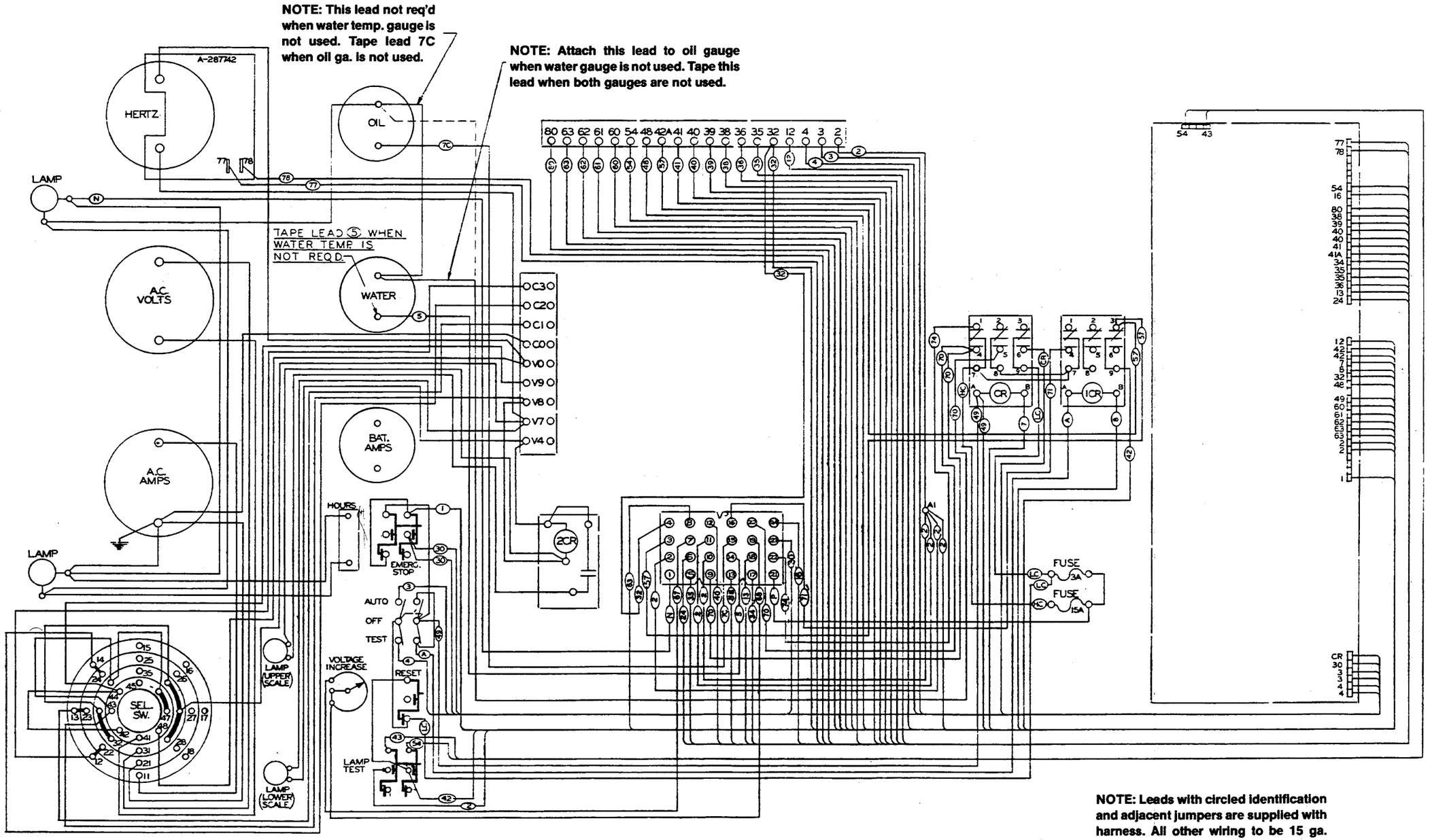


Figure 5-31. NFPA Controller Wiring — All NFPA Models

GENERATOR CONNECTIONS

CT3-NOT USED

60HZ-
120/240 VOLT-1 PHASE 3 WIRE
50HZ 110/220V- 1 PHASE 3 WIRE

110/220V-3 PHASE 4 WIRE-50HZ
120/240 V-3 PHASE 4 WIRE-60HZ

50HZ 110/190V 3 PHASE 4 WIRE
50HZ 120/208V 3 PHASE 4 WIRE

60HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE

50HZ-220/380V.
3 PHASE 4 WIRE

60HZ-
277/480 VOLT-3 PHASE 4 WIRE

OPTIONAL ANNUNCIATOR PANEL

REMOTE SWITCH

FOR INTERNAL WIRING SEE DWG. B-269387 SHT. 2

N.F.P.A. CONTROLLER B-269387

NOTE:
FOR SINGLE PHASE UNITS LIFT V9 FROM TERMINAL STRIP & TAPE.

JUNCTION BOX

3 FUSES FOR CSA ONLY

SHIELDED

BLK WHT RED

SPEED SENSOR

REG. BOX ASSEM. A-259699

FOR INTERNAL WIRING SEE DWG. A-259699 SHT. 2

NOTE-
PREHEATER; PREHEAT SWITCH; LOW WATER TEMP SW; WATER TEMP SENDER, AND ANTIC H.W.T. SW. NOT USED FOR MWM

HORN
FLASHER
CLEAR
BLK.
(SHIELDED)

WATER VALVE

INJECTOR PUMP OR START STOP SOL.
OIL PRESS. SENDER
ANTIC. L.O.P. SW
L.O.P. SW.

LOW WATER TEMP. SW.
WATER TEMP. SENDER
ANTIC. H.W.T. SW.
HIGH TEMP. SW.

ALT
BAT.
D
DIODE NOT USED ON 17.5 KW.

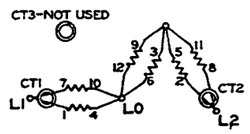
PREHEAT SWITCH
PREHEATER
SOL
12 VOLT
STARTER

259859

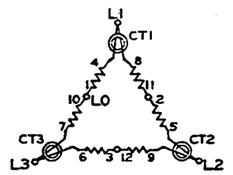
Figure 5-32. AC Voltage Control and Alarm Horn Circuits — NFPA Models

10RMOY 15RMOY

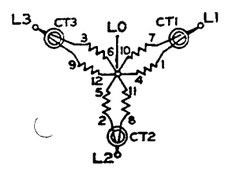
GENERATOR CONNECTIONS



60 Hz-120/240 Volt-1 Phase 3 Wire
50 Hz-110/220 Volt-1 Phase 3 Wire

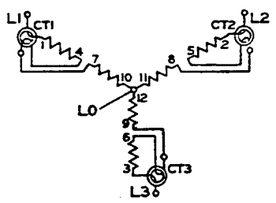


60 Hz-120/240 Volt-3 Phase 4 Wire
50 Hz-110/220 Volt-3 Phase 4 Wire

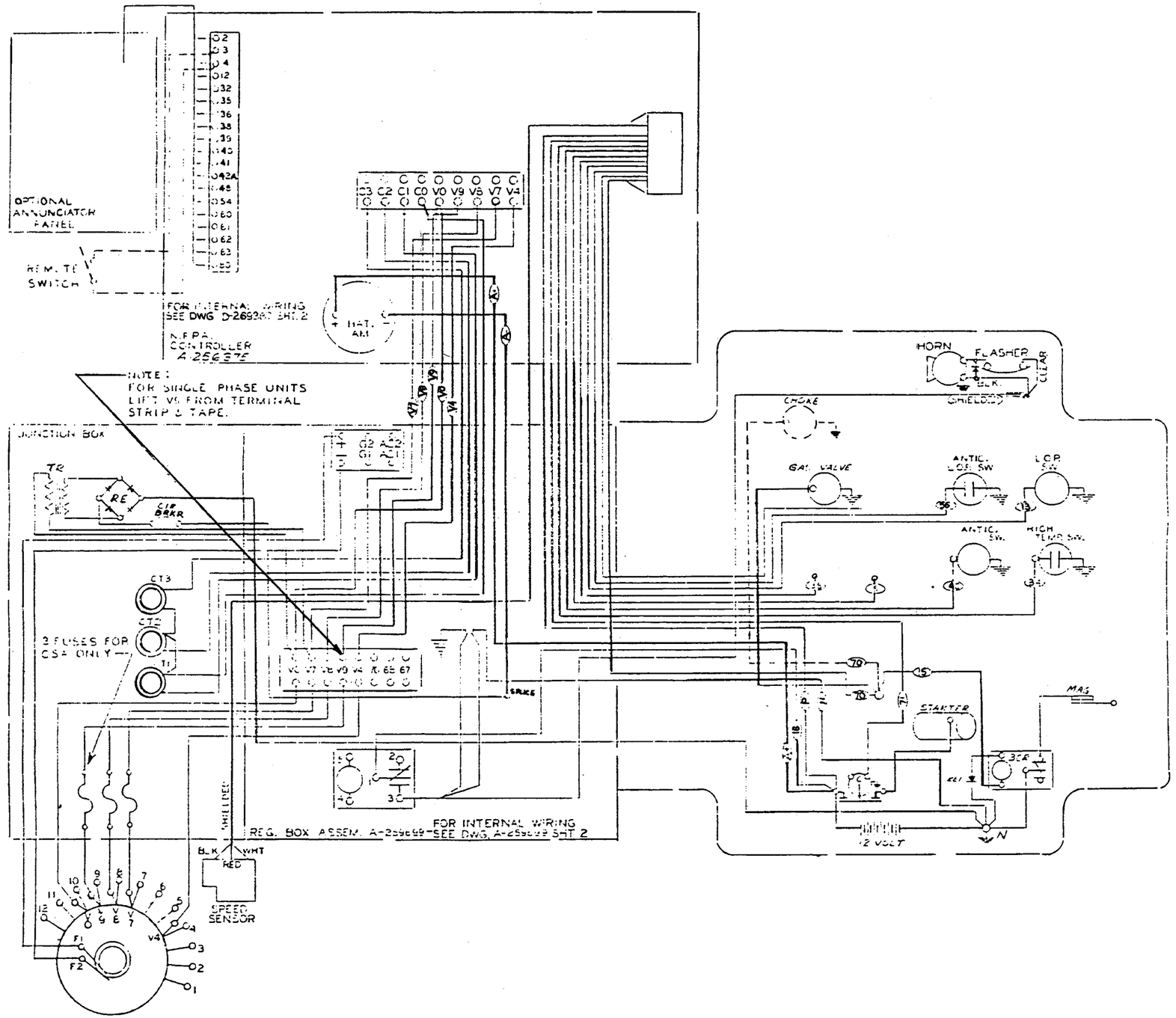


60 Hz-120/208 Volt-3 Phase 4 Wire
240 Volt-3 Phase 3 Wire

50 Hz-110/190 Volt-3 Phase 4 Wire
120/208 Volt-3 Phase 4 Wire



60 Hz-277/480 Volt-3 Phase 4 Wire
50 Hz-220/380 Volt-3 Phase 4 Wire



256378

Figure 5-33. AC Voltage Control and Alarm Horn Circuits (NFPA Models)

15 RMY

LEAD NO.	DESCRIPTION
1	SWON-1804-9134
2	SW18-1850-9102
6	SWON-1850-3402
8	287951
9	SWHR-1804-9100
10	SWON-1806-3400
11	SW64-1806-9100
13	SW4-1821-2222
14	SW0-1821-2222
15	SW9-1821-2222
16	SW8-1821-2222
17	SW7-1821-2222

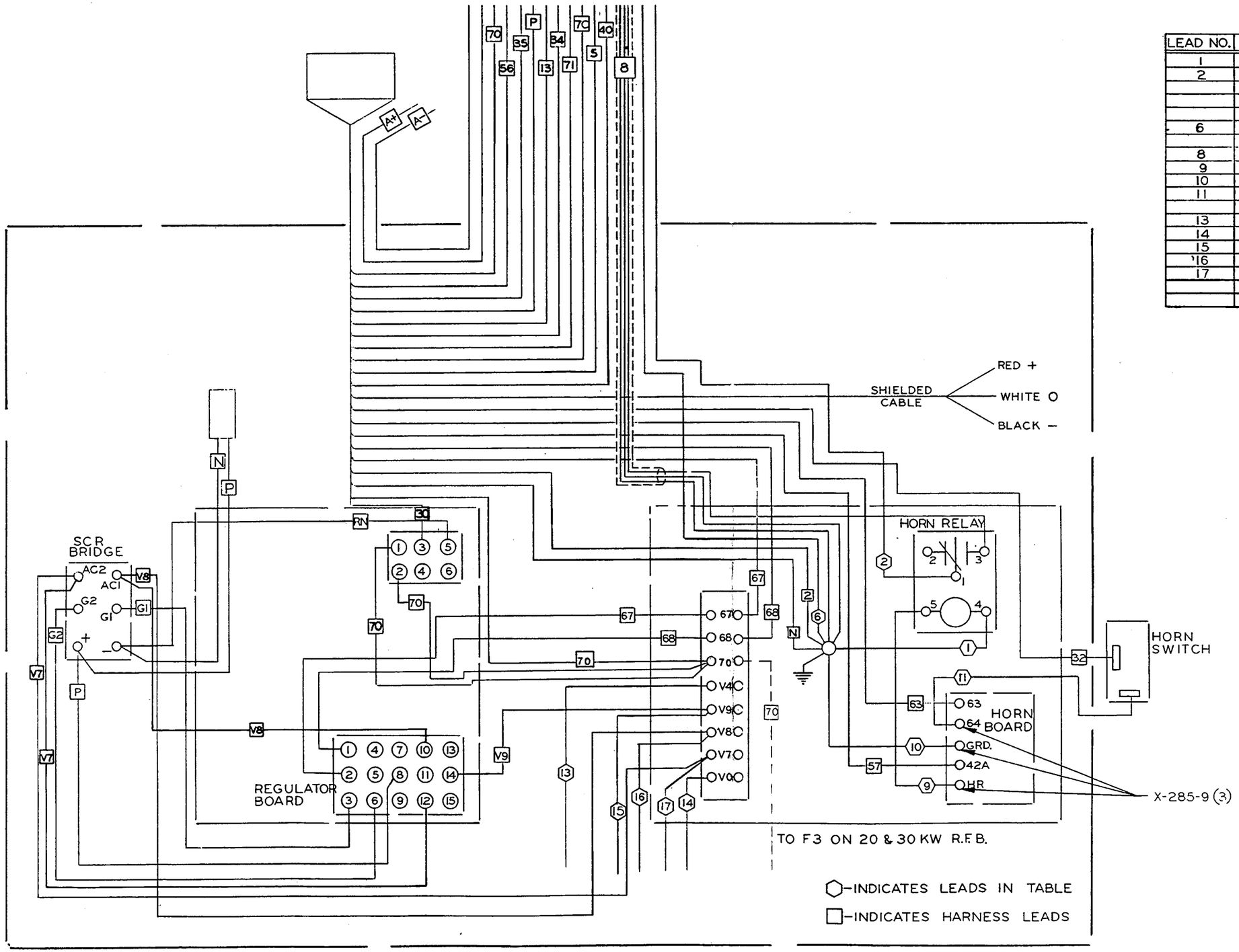


Figure 5-34. AC Voltage Control and Alarm Horn Circuits — NFPA Models

15ROY 17.5ROY

LEAD NO.	DESCRIPTION
1	SWON-1804-9134
2	SW18-1850-9102
6	SWON-1850-3402
8	287951
9	SWHR-1804-9100
10	SWON-1806-3400
11	SW64-1806-9100
13	SWV4-1821-2222
14	SWV0-1821-2222
15	SWV9-1821-2222
16	SWV8-1821-2222
17	SWV7-1821-2222
18	SWV8-1809-9122
19	SWV7-1809-9122

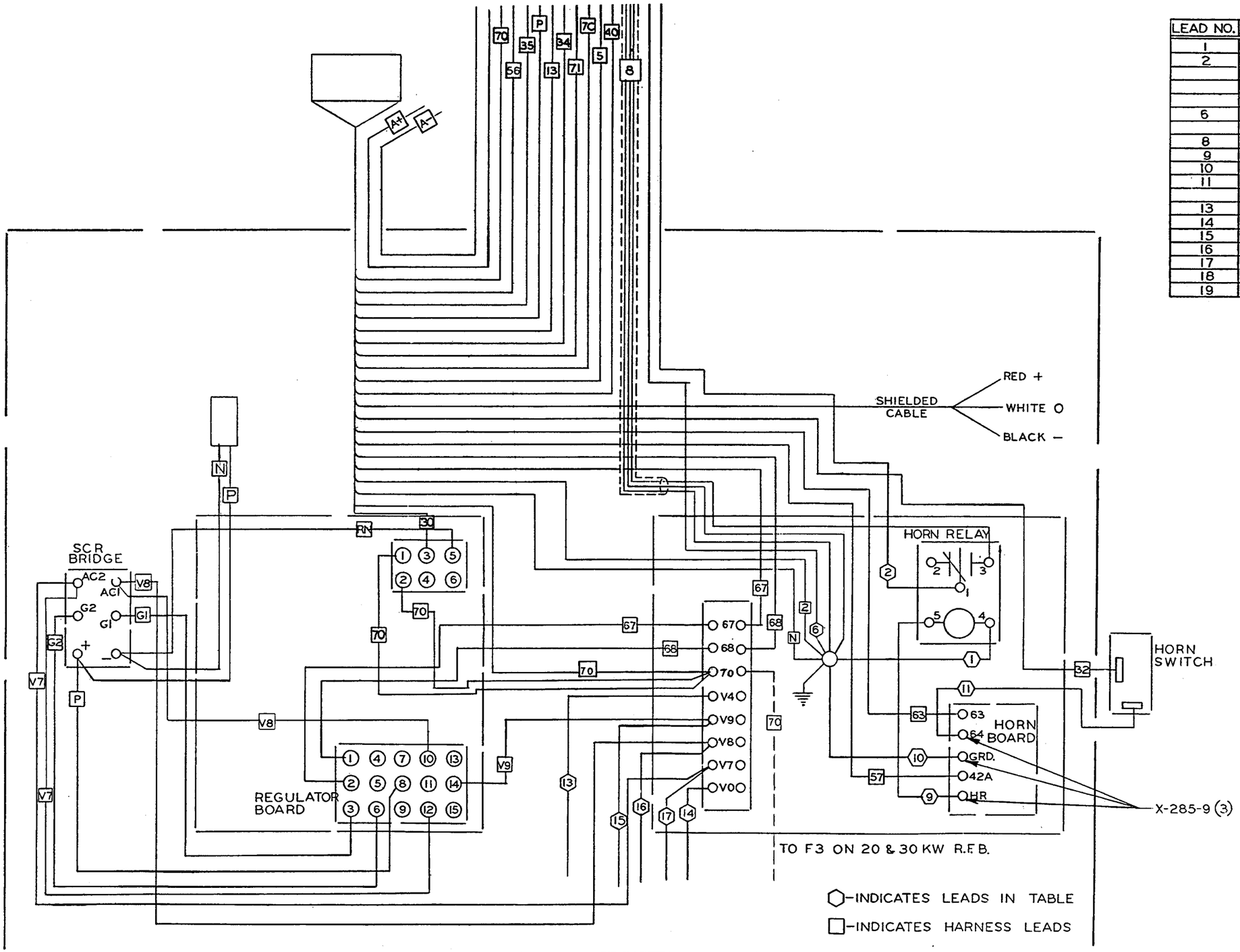
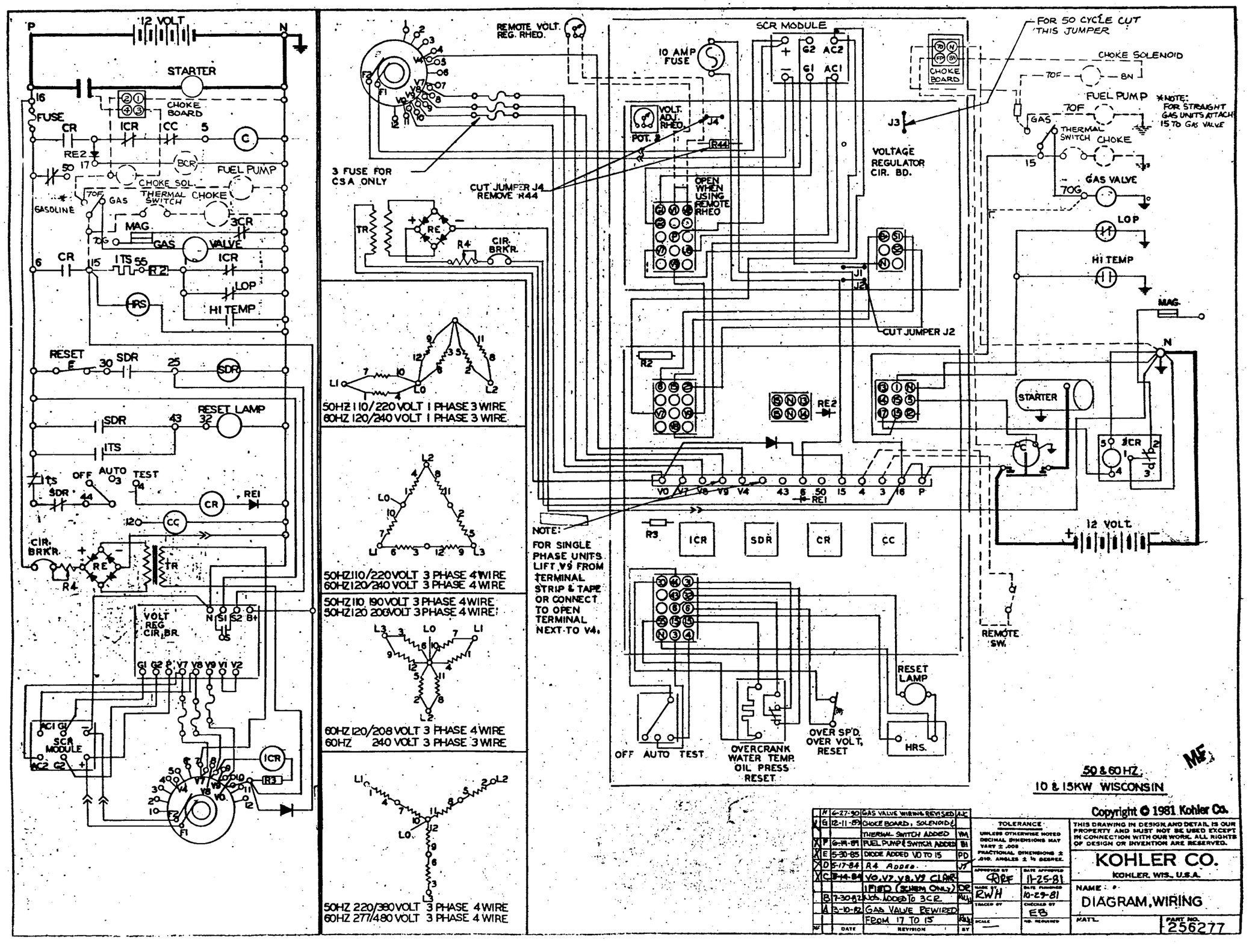


Figure 5-35. AC Voltage Control and Alarm Horn Circuits — NFPA Models

22.5ROZ 22.5RZ 24ROZ 32.5ROZ 32.5RZ 47.5ROZ

Appendix A. Wiring Diagrams

Description	Wiring Diagram
Multi-Voltage Wiring Diagram—Basic Models 15RMY	256277-H
Multi-Voltage Wiring Diagram—Meter Box Models 15RMY	256278-E
600-Volt Wiring Diagram—Basic Models 15RMY	256294-F
600-Volt Wiring Diagram—Meter Box Models 15RMY	256295-D
AC Voltage Control and Alarm Horn Circuits (NFPA Models) 15RMY	256378-B
600-Volt Wiring Diagram—Basic Models 10RMOY, 15RMOY, 15ROY	259800-J
Engine-Generator Wiring—NFPA Models 15ROY, 17.5ROY	259859-M
Multi-Voltage Wiring Diagram—Basic Models 10RMOY, 15RMOY, 15ROY	259860-K
Multi-Voltage Wiring Diagram—Meter Box Models 22.5ROZ	B-269998-J



H	6-27-90	GAS VALVE WIRING REVISED	AJC	
G	12-11-89	CHOKE BOARD, SOLENOID & THERMAL SWITCH ADDED	WH	
F	6-19-89	FUEL PUMP & SWITCH ADDED	BH	
E	5-30-85	DIODE ADDED V0 TO 15	PD	
D	5-17-84	R4 ADDED.	JT	
C	3-14-84	V0, V7, V8, V9 CLIPS TIED (SCHEM ONLY)	DR	
B	7-30-82	ICR ADDED TO 3CR	RW	
A	3-10-82	GAS VALVE REWIRED FROM 17 TO 15	RW	
	DATE	REVISION	BY	

TOLERANCE: UNLESS OTHERWISE NOTED DECIMAL DIMENSIONS MAY VARY ± .005 FRACTIONAL DIMENSIONS ± 1/64, ANGLES ± ½ DEGREE.

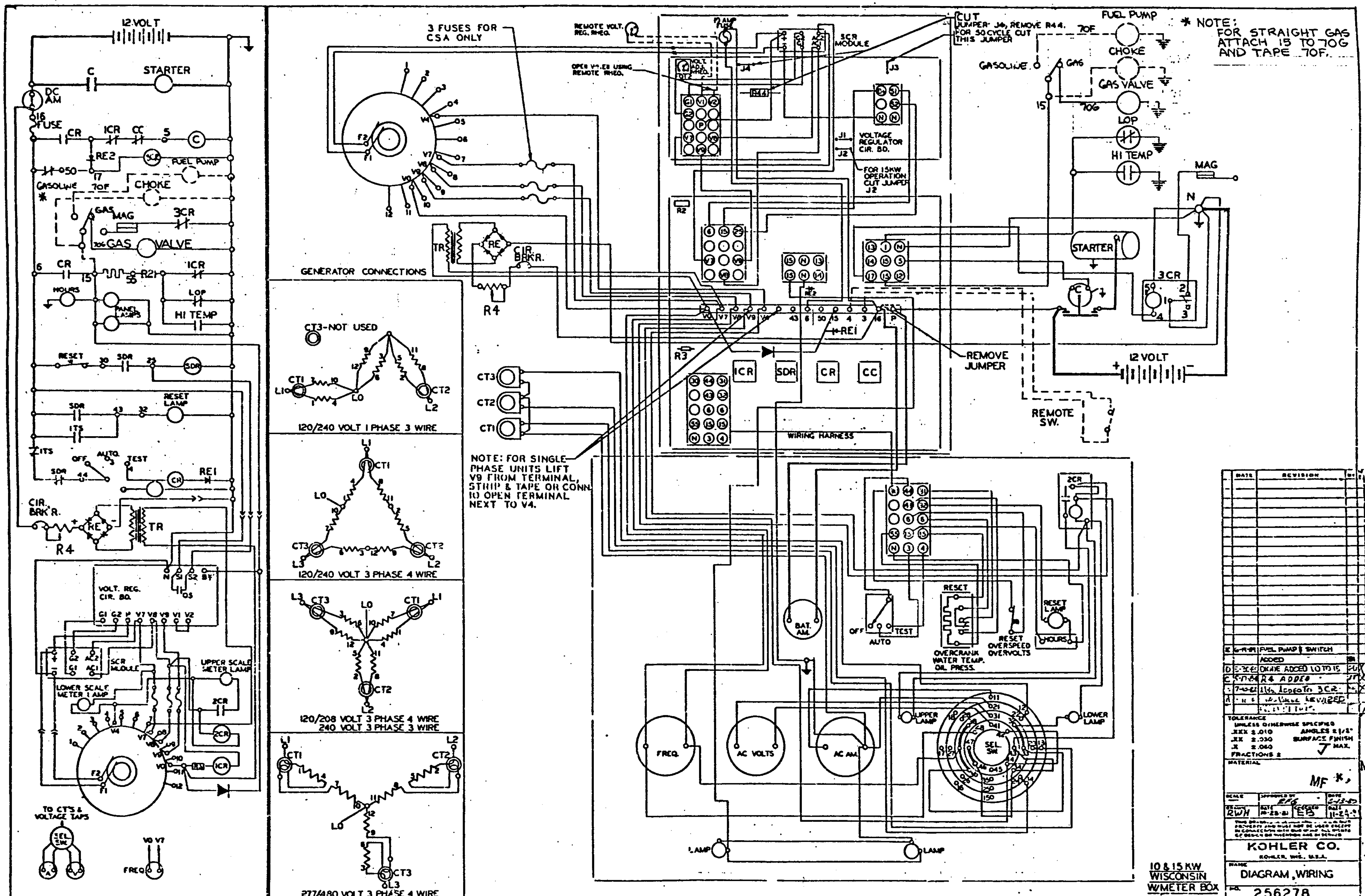
APPROVED BY: RDF — DATE APPROVED: 11-25-81
DRAWN BY: RWH — DATE DRAWN: 10-29-81
TRACED BY: — CHECKED BY: EB
SCALE: — NO. REQUIRED:

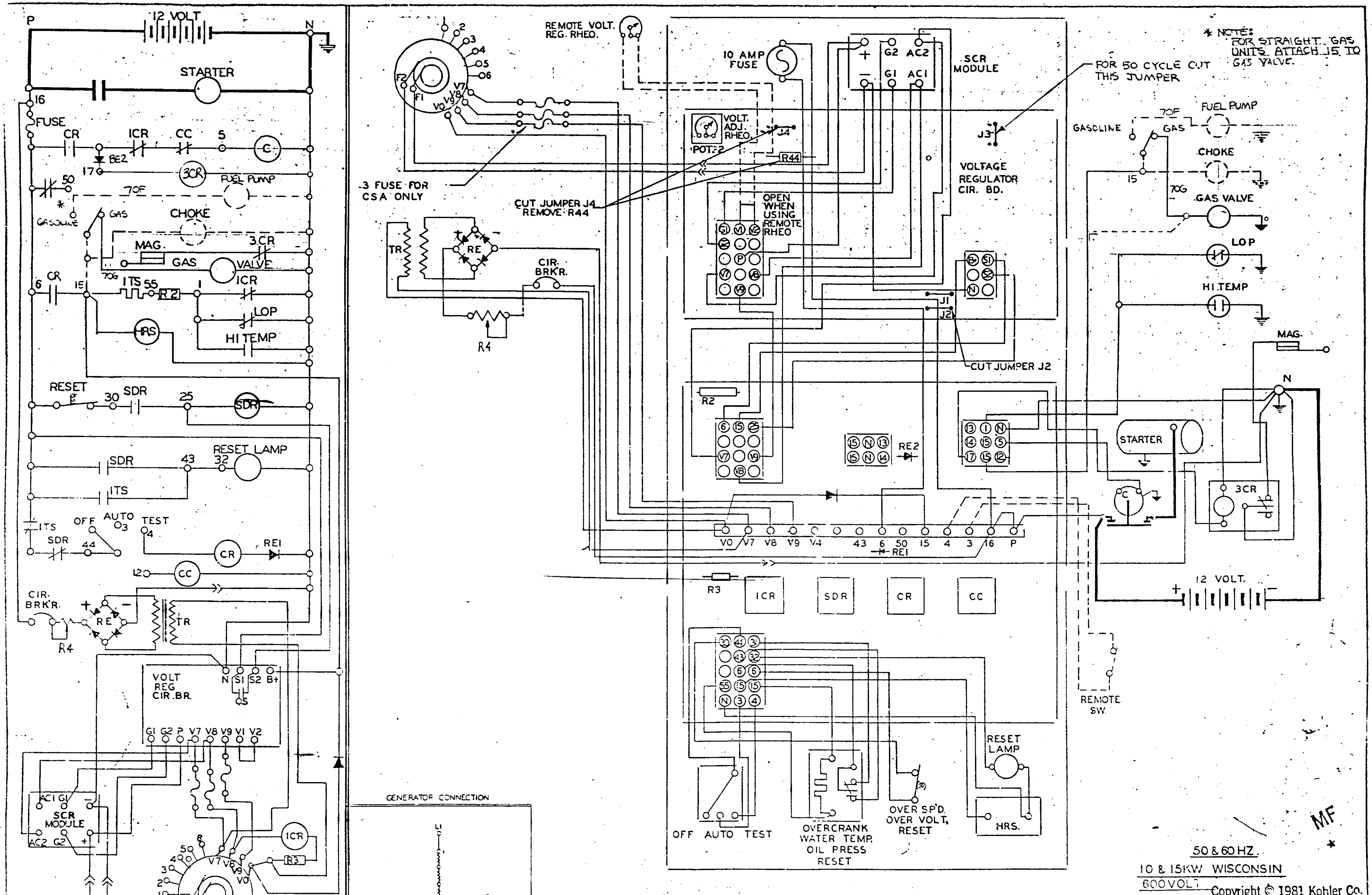
KOHLER CO.
KOHLER, WIS., U.S.A.

NAME: DIAGRAM, WIRING

MATL. — PART NO. 256277

50 & 60 HZ.
10 & 15KW WISCONSIN





50 & 60 HZ.

10 & 15KW WISCONSIN

600 VOLT

KOHLER CO.

KOHLER, WIS., U.S.A.

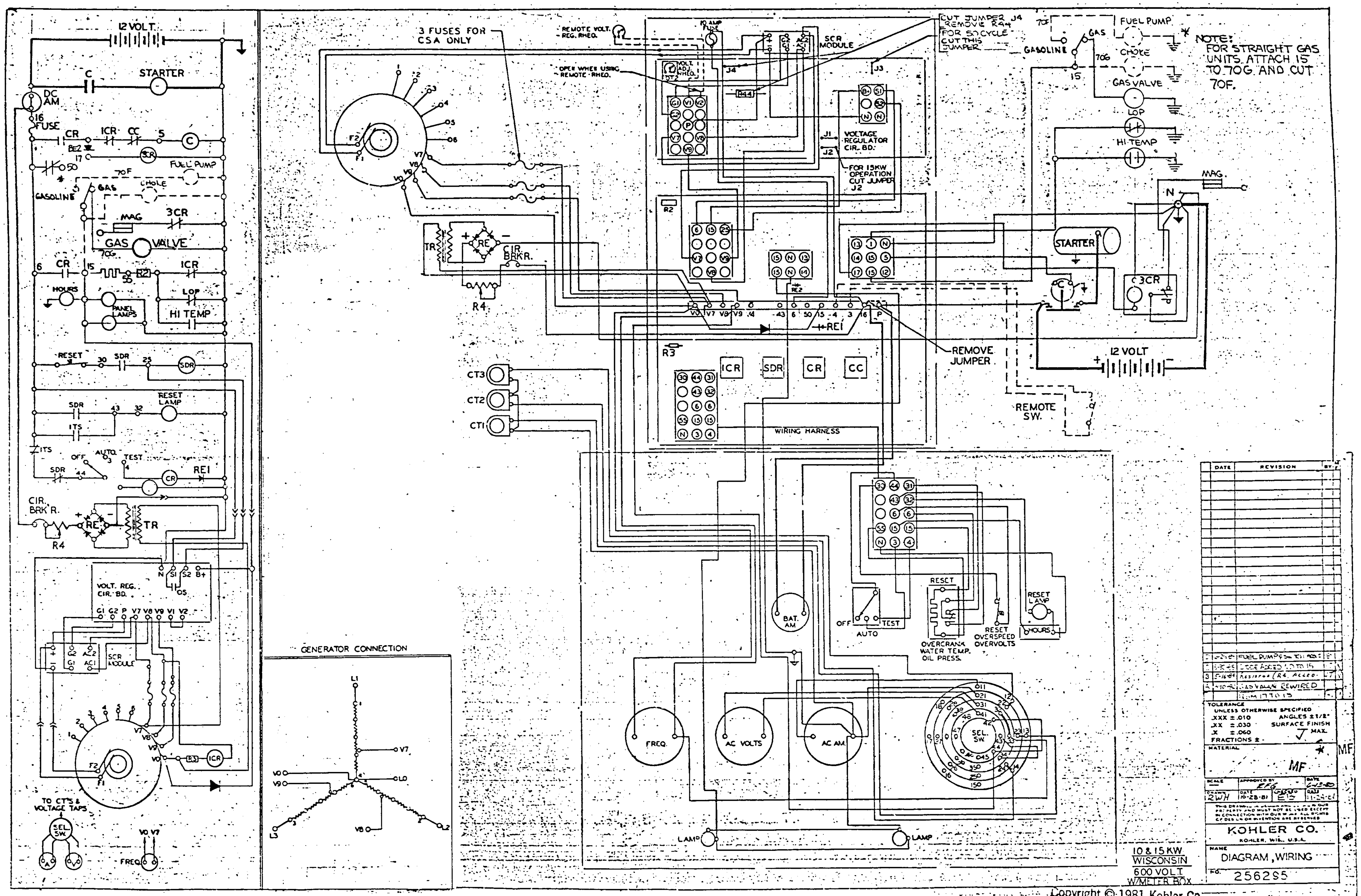
NAME: DIAGRAM, WIRING

PART NO. 256294

APPROVED BY: RWH 11-25-81

MADE BY: RWH 10-29-81

F	GAS VALVE WIRING REVISED	
E	FUEL PUMP & SWITCH ADDED	
D	DIODE ADDED V0 TO 15	
C	R4 ADDED	
B 5-15-84	V0 V7, V8, V9 CLARIFIED (SCHEM ONLY)	
	DATE	REVISION


12 VOLT
STARTER
DC AM
FUSE
CR
ICR
CC
FUEL PUMP
GASOLINE
GAS
CHOKE
MAG
3CR
GAS VALVE
HOURS
PANEL LAMPS
LOP
HI TEMP
RESET
SDR
RESET LAMP
ITS
OFF
AUTO
TEST
RE1
CIR. BRK'R.
R4
TR
RE
VOLT. REG. CIR. BD.
SCR MODULE
TO CT'S & VOLTAGE TAPS
SEL. SW.
FREQ.
GENERATOR CONNECTION
3 FUSES FOR CSA ONLY
REMOTE VOLT. REG. RHEO.
OPEN WHEN USING REMOTE RHEO.
CUT JUMPER J4 REMOVE R44 FOR 50 CYCLE CUT THIS JUMPER
VOLTAGE REGULATOR CIR. BD.
FOR 15KW OPERATION CUT JUMPER J2
REMOVE JUMPER
R3
WIRING HARNESS
CT3
CT2
CT1
NOTE: FOR STRAIGHT GAS UNITS ATTACH 15 TO 70G AND CUT 70F.
REMOTE SW.
BAT. AM
OVERCRANK WATER TEMP. OIL PRESS.
RESET OVERSPEED OVERVOLTS
AC VOLTS
AC AM
LAMP
10 & 15 KW WISCONSIN 600 VOLT W/METER BOX
KOHLER CO.
KOHLER, WIS., U.S.A.
DIAGRAM, WIRING
256295
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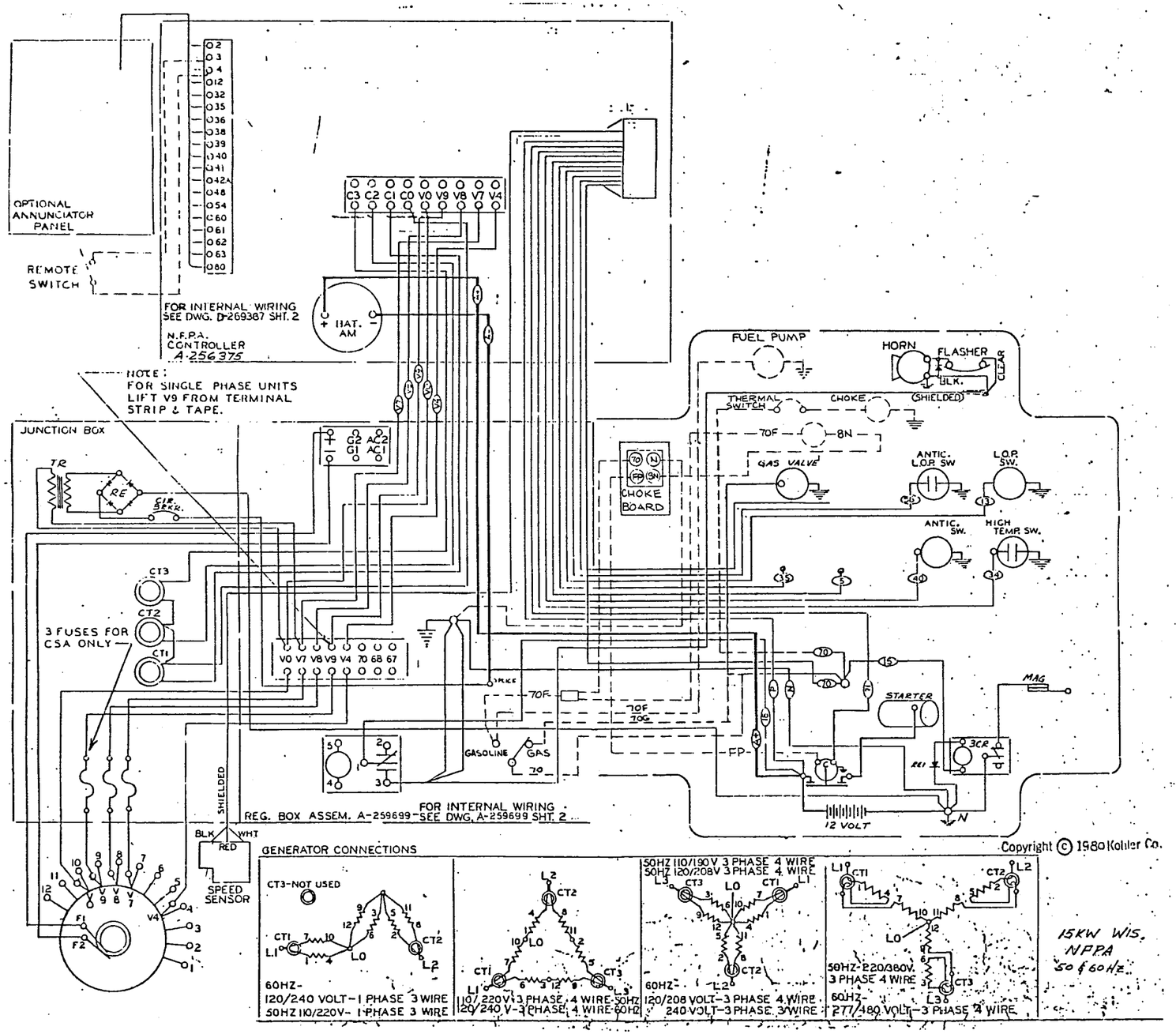


	DATE	REVISION	BY	M F
B	12-11-85	CHOKE BOARD & THERMAL SWITCH ADDED.	YM	
A	6-19-85	FUEL PUMP & SWITCH ADDED	BI	

TOLERANCE
UNLESS OTHERWISE SPECIFIED
.XXX ±.010 ANGLES ±1/2°
.XX ±.030 SURFACE FINISH
.X ±.060 √ MAX.
FRACTIONS ±

MATERIAL

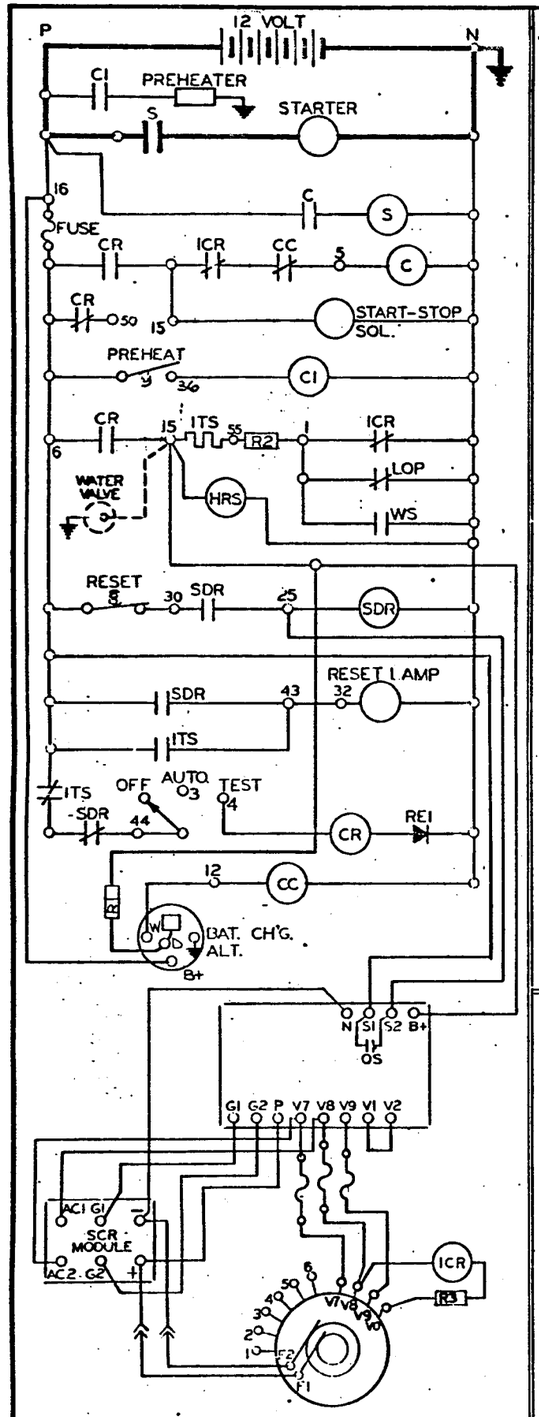
MF

SCALE	APPROVED BY	DATE
	RFG	6-14-84
DRAWN	DATE	CHECKED	DATE
RFG	6-5-84	DH	6-13-84

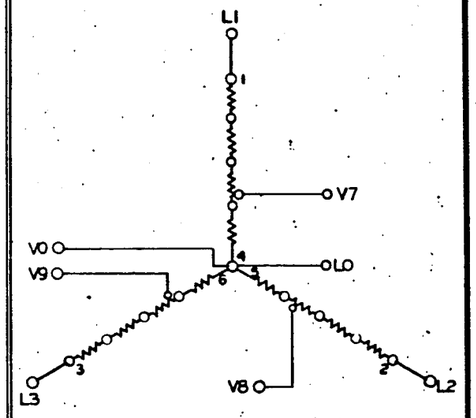
KOHLER CO.
KOHLER, WIS., U.S.A.

NAME
DIAGRAM, INTERCONNECT.

NO. 256378



GENERATOR CONNECTION



NOTE
PREHEATER & PREHEAT SWITCH NOT USED FOR MWM

⚠ NOT USED FOR MOTOROLA (PRESTOLITE)
"R" TERMINAL = "W" TERMINAL

60 HZ
10 & 15 MWM & 15KW PERKINS MF
600 VOLT

J	7-17-82	RESISTORS + NOTE ADDED	YM		
H	7-8-81	STARTER SOL. REWIRED & RE2 REMOVED	KW	TOLERANCE	THIS DRAWING IS DESIGN AND DETAIL IS OUR PROPERTY AND MUST NOT BE USED EXCEPT
G	3-5-81	WIRE ROUTED IN SWITCH ONLY	RD		KOHLER CO.
F	6-29-81	NOTE FOR MWM ADDED	RD		KOHLER, WIS. U.S.A.
E	5-14-81	FUSES FOR CSA ADDED	JD		
D	3-6-81	50 HZ REMOVED	RD	EFG 3-14-80	TITLE
C	2-4-81	50 & 60 HZ & REMOTE SWITCH ADDED	RD	M.W.K 2-19-80	DIAGRAM, WIRING
B	7-23-80	RESISTOR R3 ADDED	MK	EB	
A	5-6-80	LEAD 36 LABELED	JD		259800

MF

OPTIONAL ANNUNCIATOR PANEL

REMOTE SWITCH

FOR INTERNAL WIRING SEE DWG. B-269387 SHT. 2

N.F.P.A. CONTROLLER B-269387

NOTE:
FOR SINGLE PHASE UNITS LIFT V9 FROM TERMINAL STRIP & TAPE.

JUNCTION BOX

3 FUSES FOR CSA ONLY

SHIELDED

SPEED SENSOR

BLK WHT RED

FOR INTERNAL WIRING REG. BOX ASSEM. A-259699 -SEE DWG. A-259699 SHT. 2

NOTE-
PREHEATER; PREHEAT SWITCH; LOW WATER TEMP. SW; WATER TEMP. SENDER, AND ANTIC H.W.T. SW. NOT USED FOR MWM

⚠ NOT USED FOR MOTOROLA (PRESTOLITE)

HORN
FLASHER
BLK.
CLEAR
(SHIELDED)
WATER VALVE
INJECTOR PUMP OR START STOP SOL.
OIL PRESS. SENDER
ANTIC. LOR SW
LOP. SW.
LOW WATER TEMP. SW.
WATER TEMP SENDER
ANTIC. H.W.T. SW.
HIGH TEMP. SW.
R1
D
ALT
BAT.
DIODE NOT USED ON 17.5 KW.
PREHEAT SWITCH
PREHEATER
SOL
STARTER
12 VOLT

GENERATOR CONNECTIONS

CT3-NOT USED

60HZ-
120/240 VOLT-1 PHASE 3 WIRE
50HZ 110/220V-1 PHASE 3 WIRE

110/220V-3 PHASE 4 WIRE-50HZ
120/240 V-3 PHASE 4 WIRE-60HZ

50HZ 110/190 V 3 PHASE 4 WIRE
50HZ 120/208V 3 PHASE 4 WIRE

60HZ-
120/208 VOLT-3 PHASE 4 WIRE
240 VOLT-3 PHASE 3 WIRE

50HZ-220/380V. 3 PHASE 4 WIRE
60HZ-
277/480 VOLT-3 PHASE 4 WIRE

17.5 KW & 15 KW N.F.P.A.
50 & 60 HZ

	DATE	REVISION	BY
M	7-13-90	RESISTOR & NOTE ADDED	VM
L	11-6-85	DIODE NOTE ADDED	KW
K	9-9-83	DIODE ADDED TO HORN	DR
J	4-12-82	DIODE ADDED TO C RELAY	DH
H	1-8-82	17.5 KW ADDED	RM
G	11-11-81	241739 DIODE ADDED	RM
F	6-29-81	NOTE ADDED FOR MWM	RO
E	5-1-81	FUSES FOR CSA ADDED	JD
D	3-16-81	CT3 CONNECTION CHANGE	MKO
C	3-10-81	50HZ & V9 TERM. NOTE ADDED	MKO
B	2-5-81	CONNECTION # CHANGE	MKO
A	2-5-81	50 & 60 HZ & REMOTE SWITCH ADDED	MKO

TOLERANCE
UNLESS OTHERWISE SPECIFIED
.XXX ±.010 ANGLES ±1/2°
.XX ±.030 SURFACE FINISH
.X ±.060 √ MAX.
FRACTIONS

MATERIAL MF

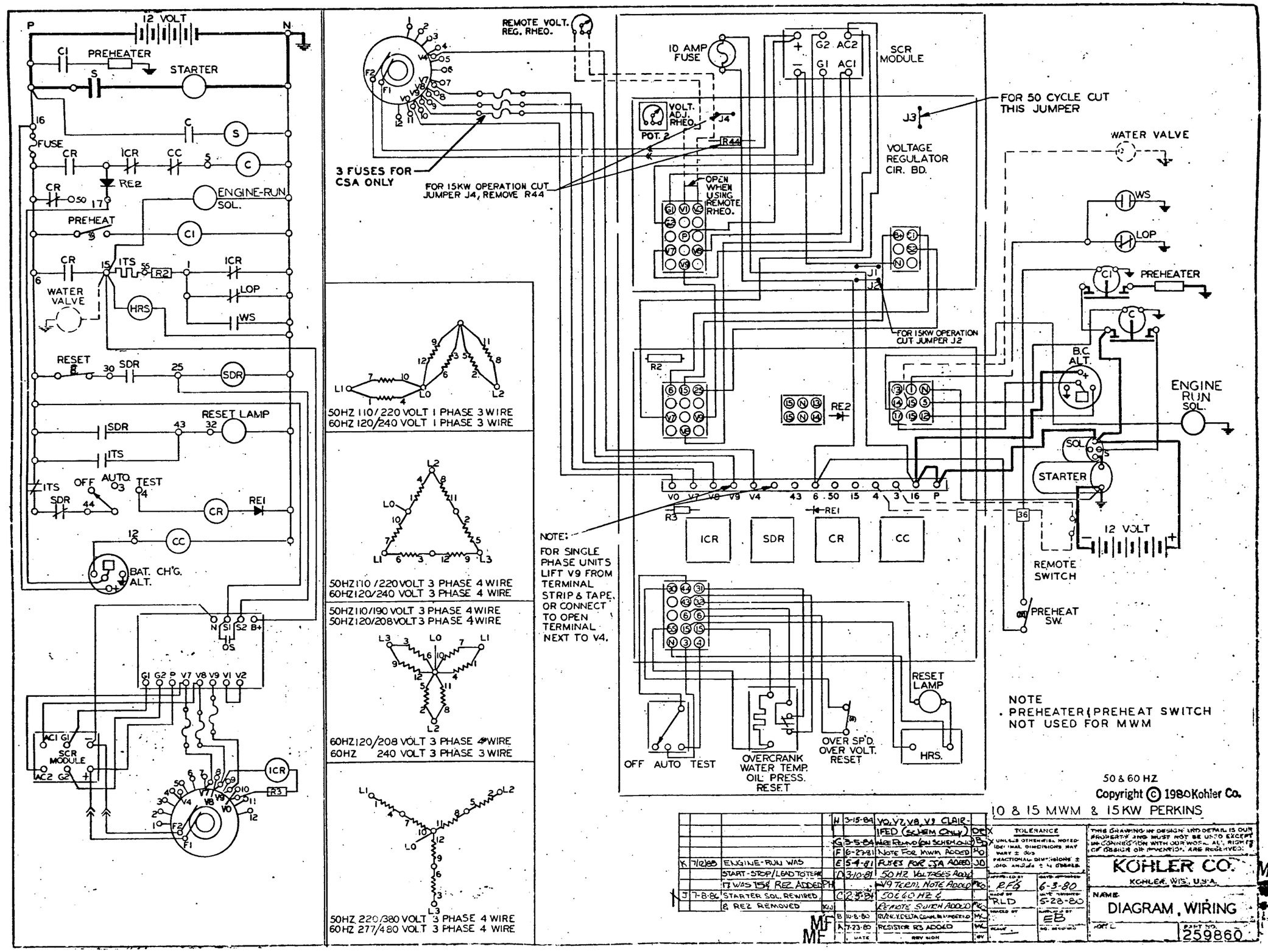
MF

SCALE	APPROVED BY	DATE
—	EFG	6-3-80
DRAWN	DATE	CHECKED	DATE
RLD	5-28-80	EB	6-2-80

KOHLER CO.
KOHLER, WIS., U.S.A.

NAME
DIAGRAM, INTERCONNECT.

NO. 259859



		H	3-15-84	V0, V7, V8, V9 CLARIFIED (SCHEM ONLY)	DCK	
		G	3-5-84	WIRE RUNS ON SCHEM ONLY	BD	
		F	6-27-81	NOTE FOR MWM ADDED	RO	
K	7/12/88	ENGINE-RUN WAS	E	5-4-81	FUSES FOR CSA ADDED	JD
		START-STOP/LEAD TO TERM	D	3/10/81	50 HZ VOLTAGES ADDED	
		17 WAS 15A REZ ADDED	PH		V9 TERM. NOTE ADDED	PK
J	7-8-86	STARTER SOL. REWIRED	C	2-25-81	50 & 60 HZ &	
		& RE2 REMOVED	KJJ		REMOTE SWITCH ADDED	PK
			B	10-8-80	12/24 V DELTA CONN. IS WRONG	MK
			A	7-23-80	RESISTOR R3 ADDED	WL
				DATE	REVISION	BY

TOLERANCE: UNLESS OTHERWISE NOTED IDENTIFICATIONAL DIMENSIONS MAY VARY ± .005 FRACTIONAL DIMENSIONS ± .010 ANGLES ± ½ DEGREES

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DRAWN BY	RFG 6-3-80
TRACED BY	RLD 5-28-80
DESIGNED BY	EB
CHECKED BY	
APPROVED BY	

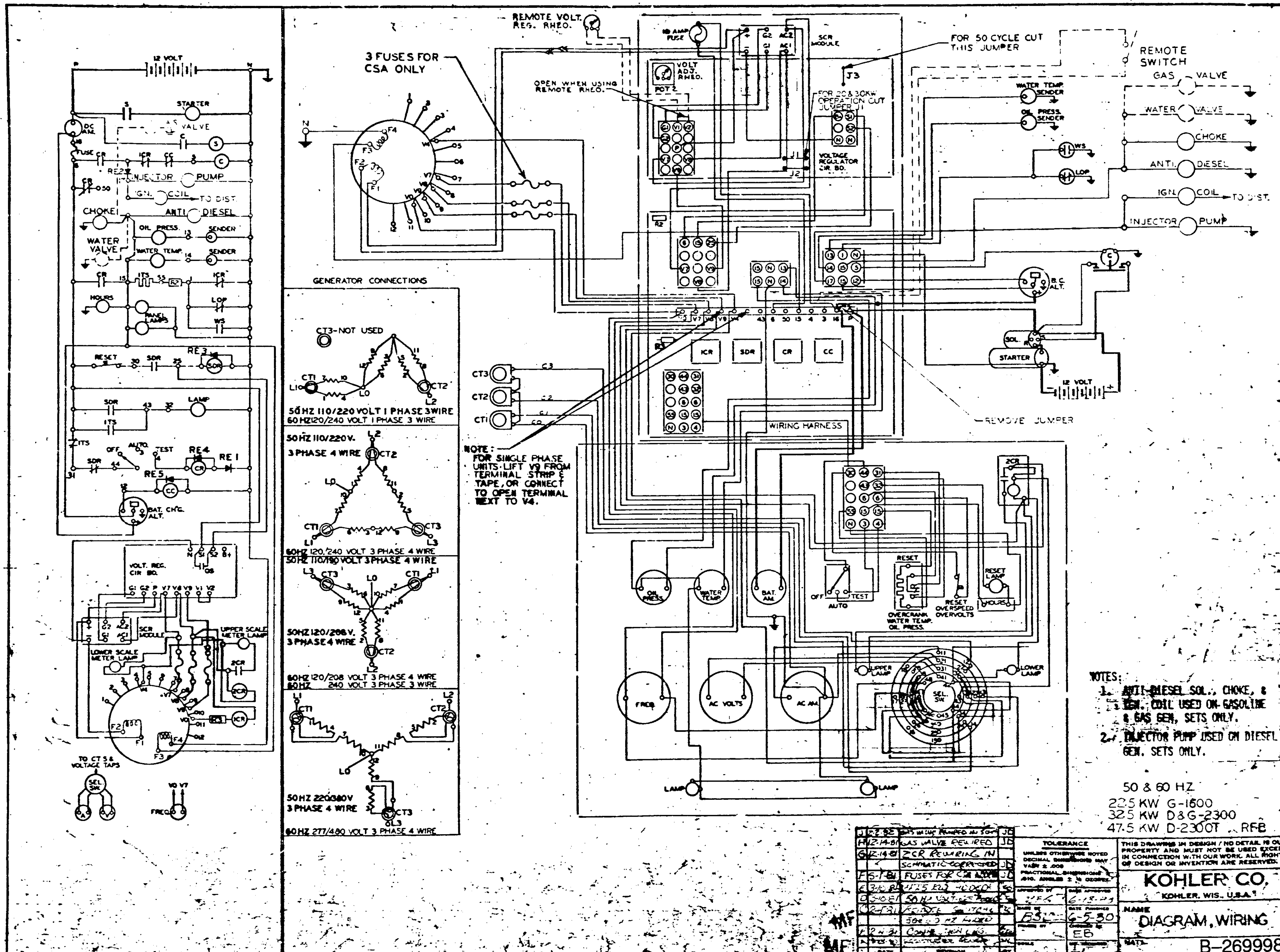
KOHLER CO.
KOHLER, WIS. U.S.A.

NAME: DIAGRAM, WIRING

PART NO. 259860

50 & 60 HZ

10 & 15 MWM & 15 KW PERKINS



12 VOLT
STARTER
GAS VALVE
INJECTOR PUMP
IGN. COIL TO DIST.
CHOKE
ANTI DIESEL
OIL PRESS. SENDER
WATER VALVE
WATER TEMP. SENDER
HOURS
PANEL LAMPS
RESET
LAMP
BAT. CHG. ALT.
VOLT. REG. CIR. BD.
SCR MODULE
UPPER SCALE METER LAMP
LOWER SCALE METER LAMP
TO CT'S & VOLTAGE TAPS
SEL. SW.
FREQ.
REMOTE VOLT. REG. RHEO.
3 FUSES FOR CSA ONLY
OPEN WHEN USING REMOTE RHEO.
VOLT ADJ. RHEO.
FOR 50 CYCLE CUT THIS JUMPER
FOR 20 & 30 KW OPERATION CUT JUMPER J1
VOLTAGE REGULATOR CIR. BD.
REMOTE SWITCH
GAS VALVE
WATER VALVE
CHOKE
ANTI DIESEL
IGN. COIL TO DIST.
INJECTOR PUMP
B.C. ALT.
STARTER
12 VOLT
REMOVE JUMPER
WIRING HARNESS
GENERATOR CONNECTIONS
CT3-NOT USED
50HZ 110/220 VOLT 1 PHASE 3 WIRE
60 HZ 120/240 VOLT 1 PHASE 3 WIRE
50HZ 110/220V. 3 PHASE 4 WIRE
60HZ 120/240 VOLT 3 PHASE 4 WIRE
50HZ 110/190 VOLT 3 PHASE 4 WIRE
50HZ 120/208V. 3 PHASE 4 WIRE
60HZ 120/208 VOLT 3 PHASE 4 WIRE
60HZ 240 VOLT 3 PHASE 3 WIRE
50HZ 220/380V 3 PHASE 4 WIRE
60HZ 277/480 VOLT 3 PHASE 4 WIRE
NOTE: FOR SINGLE PHASE UNITS-LIFT V9 FROM TERMINAL STRIP & TAPE, OR CONNECT TO OPEN TERMINAL NEXT TO V4.
OIL PRESS.
WATER TEMP.
BAT. AM.
OFF AUTO TEST
OVERCRANK WATER TEMP. OIL PRESS.
RESET OVERSPEED OVERVOLTS
RESET LAMP
HOURS
FREQ.
AC VOLTS
AC AM.
UPPER LAMP
LOWER LAMP
LAMP
NOTES:
1. ANTI-DIESEL SOL., CHOKE, & IGN. COIL USED ON GASOLINE & GAS GEN. SETS ONLY.
2. INJECTOR PUMP USED ON DIESEL GEN. SETS ONLY.
50 & 60 HZ
22.5 KW G-1600
32.5 KW D&G-2300
47.5 KW D-2300T
RFB
TOLERANCE
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KOHLER CO.
KOHLER, WIS. U.S.A.
DIAGRAM, WIRING
B-269998

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POWER SYSTEMS

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Phone 414-565-3381
Fax 414-459-1646 (U.S.A. Sales), Fax 414-459-1614 (International)
For the nearest sales and service outlet in U.S.A. and Canada
Phone 1-800-544-2444

TP-5074 12/88a

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