**Caution: This document contains mixed page sizes (8.5 x 11 or 11 x 17), which may affect printing. Please adjust your printer settings according to the size of each page you wish to print.**

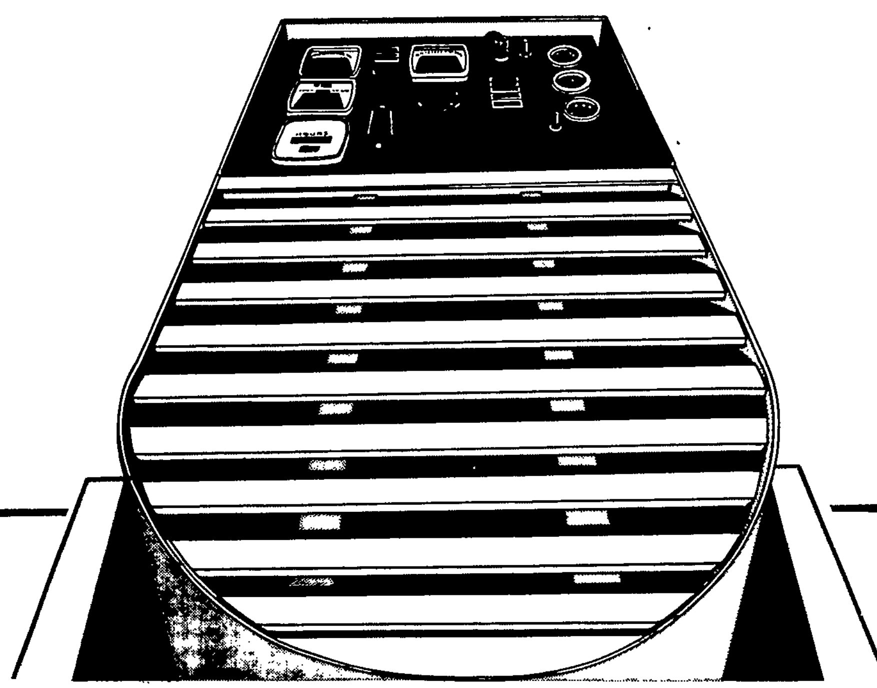
Onan

# Service Manual

## 200 to 350 kW

# YB

# Generators And Controls



Troubleshooting and Test Procedures For

- Generators
- Regulator
- Controls

900-0181
11-81
Printed in U.S.A.

# Safety Precautions

The following symbols in this manual highlight conditions potentially dangerous to the operator, or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

**DANGER** ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

**WARNING** ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

**CAUTION** ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

## GUARD AGAINST ELECTRIC SHOCK

Disconnect electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

Disconnect batteries to prevent accidental engine start. Jewelry is a good conductor of electricity and should be removed before working on electrical equipment.

Use extreme caution when working on electrical components. High voltages cause injury or death.

Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

## PROTECT AGAINST MOVING PARTS

Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be worn because of the danger of becoming caught in moving parts.

Make sure all nuts and bolts are secure. Keep power shields and guards in position.

If adjustments are made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

Do not work on this equipment when mentally or physically fatigued.

# Contents

# Introduction

## FOREWORD

This manual provides troubleshooting and repair information for ONAN series YB generators. It is intended to provide the maintenance technician, serviceman or Onan distributor with a logical procedure to enable him to systematically locate and repair malfunctions in the generator and control systems. This information is not applicable to the engine; refer to the engine manufacturer's manual.

Repair information on printed circuit modules is not extensive because the plug-in modules lend themselves more to replacement than repair. ONAN does not recommend repair of the printed circuit module except at the factory and has initiated a return/exchange service obtainable through distributors. For more information, contact your distributor or the ONAN service department.

Application of meters or high heat soldering irons to printed circuit boards by other than qualified personnel can result in unnecessary and expensive damage.

**CAUTION** ***High voltage testing or high potential (or Megger) testing of generator windings can cause damage to solid state components. Isolate these components before testing.***

This manual is divided into two sections as follows:

1. **GENERATOR** - Consists of general specifications on the YB generator, troubleshooting guides and procedures for testing and repairing the systems.
2. **CONTROLS** - Troubleshooting guides, procedures for testing and repairing the system are contained in this section. A description of the components and an analysis of the module circuitry are included.

## TEST EQUIPMENT

Most of the tests outlined in this manual can be performed with—

Simpson VOM. Model 260, 262 or equivalent.
Kelvin or Wheatstone bridge ohmmeter.

**CAUTION** ***An equivalent VOM to a Simpson 260 or 262 should have a maximum battery voltage of 6VDC (preferably with size AA batteries), on ranges other than R x 1. Some VOM's have outputs of 9VDC or 22.5VDC, which are sufficiently high to damage solid state devices.***

## WARNING

***ONAN RECOMMENDS THAT ALL SERVICE INCLUDING INSTALLATION OF REPLACEMENT PARTS ONLY BE DONE BY PERSONS QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE. FROM THE STANDPOINT OF POSSIBLE INJURY AND/OR EQUIPMENT DAMAGE IT IS IMPERATIVE THAT THE SERVICE PERSON BE QUALIFIED.***

# ABBREVIATIONS

To avoid repetitious use of terms or designations, abbreviations have been used as follows:

| | | | |
|---|---|---|---|
| R-S-R | Run-Stop-Remote | O/S | Overspeed |
| NC | Normally closed | O/C | Overcrank |
| NO | Normally open | LET | Low Engine Temp |
| VDC | Volts Direct Current | CR | Crystal Rectifier (diodes) |
| VAC | Volts Alternating Current | VR | Voltage Regulator |
| LOP | Low Oil Pressure | CB | Circuit Breaker |
| HET | High Engine Temperature | L | Reactor |
| K | Relay | T | Transformer |
| Q | Transistor | TD | Time Delay |
| R | Resistance/Rheostat | LED | Light Emitting Diode |
| C | Capacitor | SCR | Silicon Controlled Rectifier |

## TABLE 1. YB VOLTAGE/CURRENT OPTIONS

| CODE 17 | FREQ | MAXIMUM CURRENT (AMPERES) 200 kW | 230 kW | 250 kW | 300 kW | 350 kW | PARALLEL WYE | SERIES WYE | SERIES DELTA | REF** XFMR TAP |
|---|---|---|---|---|---|---|---|---|---|---|
| 120/208 | 60 Hz | 694 | 798 | 867 | 1041 | 1214 | x | | | H3 |
| 127/220 | 60 Hz | 656 | 755 | 820 | 984 | 1148 | x | | | H4 |
| 139/240 | 60 Hz | 601 | 692 | 752 | 902 | 1052 | x | | | H5 |
| 240/416 | 60 Hz | 347 | 399 | 434 | 520 | 607 | | x | | H3 |
| 254/440 | 60 Hz | 328 | 377 | 410 | 492 | 574 | | x | | H4 |
| 277/480 | 60 Hz | 301 | 346 | 376 | 451 | 526 | | x | | H5 |
| **CODE 5D*** | | | | | | | | | | |
| 120/240 | 60 Hz | 601 | 692 | 752 | 902 | 1052 | | | x | H5 |
| **CODE 6D*** | | | | | | | | | | |
| 240/480 | 60 Hz | 301 | 346 | 376 | 451 | 526 | | | x | H5 |
| **CODE 7*** | | | | | | | | | | |
| 220/380 | 60 Hz | 380 | 437 | 475 | 570 | 665 | | x | | H3 |
| **CODE 9X*** | | | | | | | | | | |
| 347/600 | 60 Hz | 241 | 277 | 301 | 361 | 421 | | x | | H5 |
| **CODE 517** | | **MAXIMUM CURRENT (AMPERES) 165 kW** | **190 kW** | **208 kW** | **250 kW** | **290 kW** | | | | |
| 110/190 | 50 Hz | 626 | 723 | 790 | 950 | 1102 | x | | | H3 |
| 115/200 | 50 Hz | 595 | 687 | 751 | 902 | 1046 | x | | | H4 |
| 120/208 | 50 Hz | 572 | 661 | 722 | 867 | 1006 | x | | | H4 |
| 127/220 | 50 Hz | 541 | 625 | 682 | 820 | 951 | x | | | H5 |
| 220/380 | 50 Hz | 313 | 362 | 395 | 475 | 551 | | x | | H3 |
| 230/400 | 50 Hz | 297 | 344 | 375 | 451 | 523 | | x | | H4 |
| 240/416 | 50 Hz | 286 | 330 | 361 | 434 | 503 | | x | | H4 |
| 254/440 | 50 Hz | 270 | 312 | 341 | 410 | 476 | | x | | H5 |

* - Not reconnectible.

** - Adjust voltage regulator tap on TB21 terminal in control cabinet.

## GENERATOR

The Onan series YB generator is a broad range, brushless, 3 phase unit available in the sizes specified in Table 1. The Code 17 and 517 generators are reconnectible to provide the listed voltage options. Output rating is 0.8 PF.

The broad range characteristic of the generator is that it can be operated continuously in a range of 120-to 139-volts per element and still maintain the same kilowatt output.

The wires from the generator are connected to a bus-bar system (Figure 1). By using reconnection bars, the Table 1 Code 17 or 517 voltage options may be obtained. To complete the reconnection, a tap on a voltage reference transformer must be chosen for the selected voltage (see Figure 2 and Table 1). Phase rotation is counterclockwise (ACB).

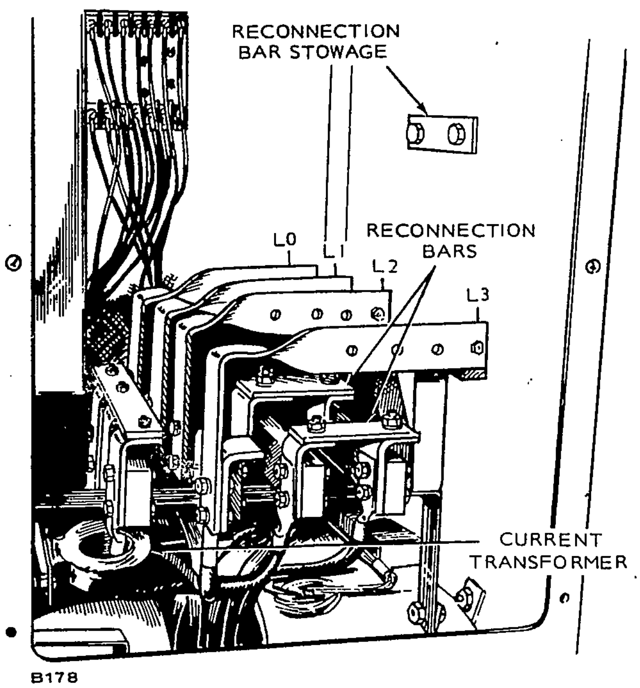



**FIGURE 1. RECONNECTION SYSTEM**

## EXCITATION AND VOLTAGE REGULATION

Excitation and voltage regulation are achieved as follows:

1. Single phase output generated in the main stator winding is fed to input of the voltage regulator (VR21).

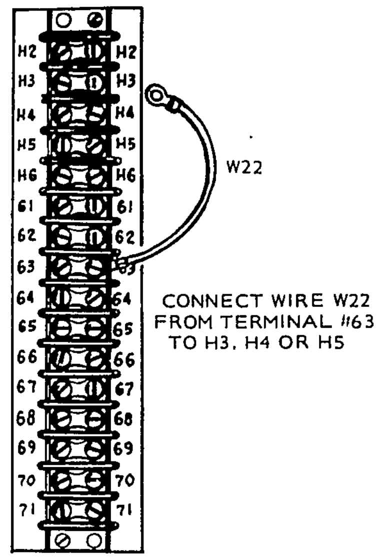



**FIGURE 2. REFERENCE VOLTAGE**

2. This input is compared with and adjusted to a reference voltage in the regulator, then rectified to DC.
3. This DC voltage is applied to the stationary field of the exciter which energizes the exciter armature and produces three phase AC which is again rectified to DC.
4. The DC voltage is then applied to the main alternator as field excitation current. Refer to Figure 3.

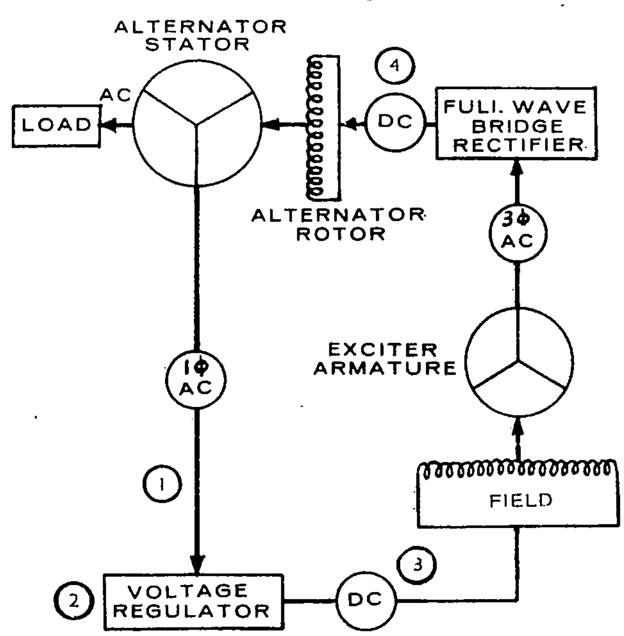



**FIGURE 3. EXCITATION SCHEMATIC**

## COMPONENT LOCATION

Removal of the side panels behind the control box will allow access to the bus-bars and current transformers (Figure 1). Voltage regulator (VR21), reference transformer (T21), SCR (CR21) and reactor (L21) are located inside the control box. Two fasteners (1/4 turn) hold access doors closed. See Figure 4.

**WARNING** ***Proceed with care. High voltages may be present within the load housing and control cabinet. Contact may cause shock and serious personal injury or death.***

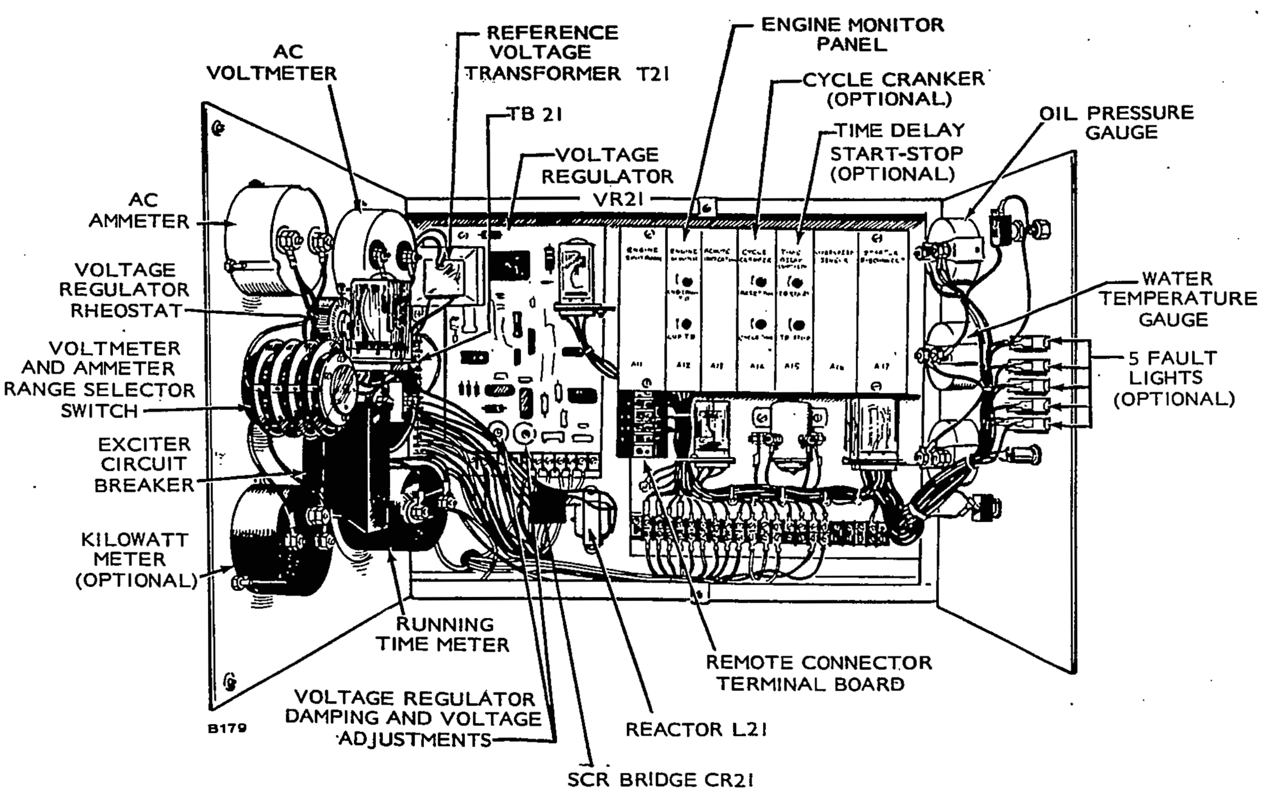



**FIGURE 4. CONTROL PANEL INTERIOR**

# Generator Troubleshooting

## PREPARATION

A few simple checks and a proper troubleshooting procedure can locate the probable source of trouble and cut down service time.

**WARNING** ***Disconnect battery cable before performing any checks on generator. Serious injury or death could result from inadvertent starting.***

- Check all modifications, repairs, replacements performed since last satisfactory operation of set to ensure that connection of generator leads are correct. A loose wire connection, overlooked when installing a replacement part could cause problems. An incorrect connection, an opened circuit breaker, or a loose connection on printed circuit board are all potential malfunction areas to be eliminated by a visual check.
- Unless absolutely sure that panel instruments are accurate, use portable test meters for troubleshooting.
- Visually inspect components on VR21. Look for dirt, dust, or moisture and cracks in the printed solder conductors. Burned resistors, arcing tracks are all identifiable. Do not mark on printed circuit boards with a pencil. Graphite lines are conductive and can cause leakage or short circuits between components.

The information in this section is divided into Flow Charts A, B, C, D, and E as follows:

A. NO AC OUTPUT VOLTAGE AT RATED ENGINE RPM.
B. UNSTABLE OUTPUT VOLTAGE, ENGINE SPEED STABLE 1800 RPM.
C. OUTPUT VOLTAGE TOO HIGH OR LOW.
D. EXCITER FIELD BREAKER TRIPS.
E. UNBALANCED GENERATOR OUTPUT VOLTAGE.

To troubleshoot a problem, start at upper-left corner of the chart related to problem, and answer all questions either YES or NO. Follow the chart until the problem is found, performing referenced Adjustment and Test Procedures following the Flow Charts.

Referenced components in the Flow Charts and Adjustment and Test procedures can be found on the electrical schematic Figure 5, and on assembly drawings and wiring diagrams.

**CAUTION** ***Ohmmeter checks must be made with the unit stopped to prevent meter damage.***

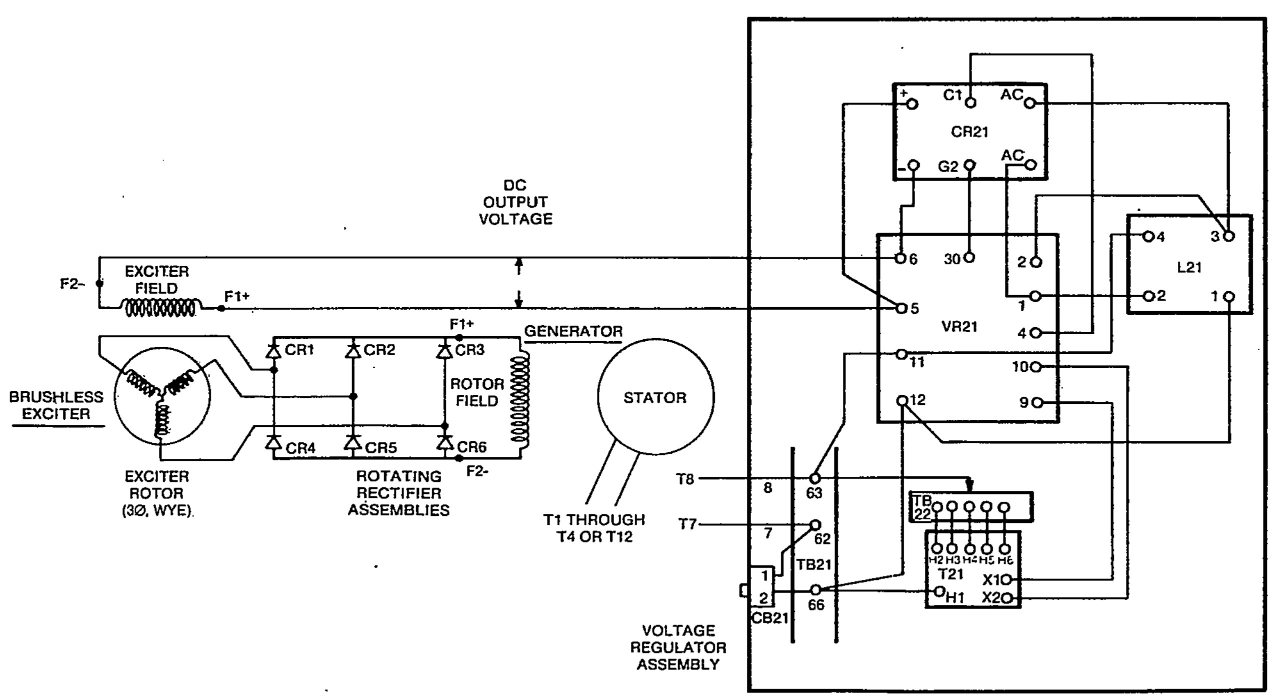
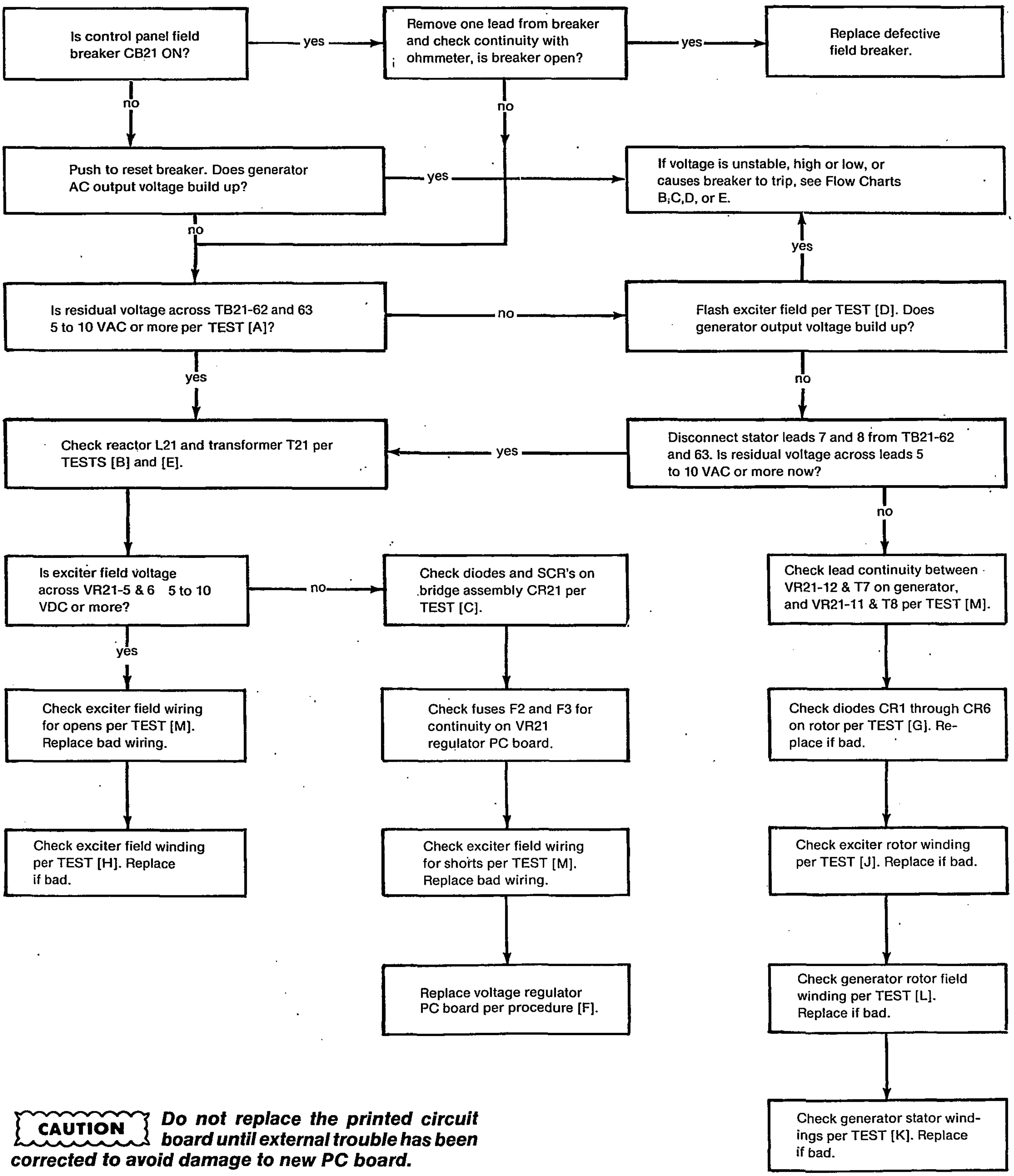


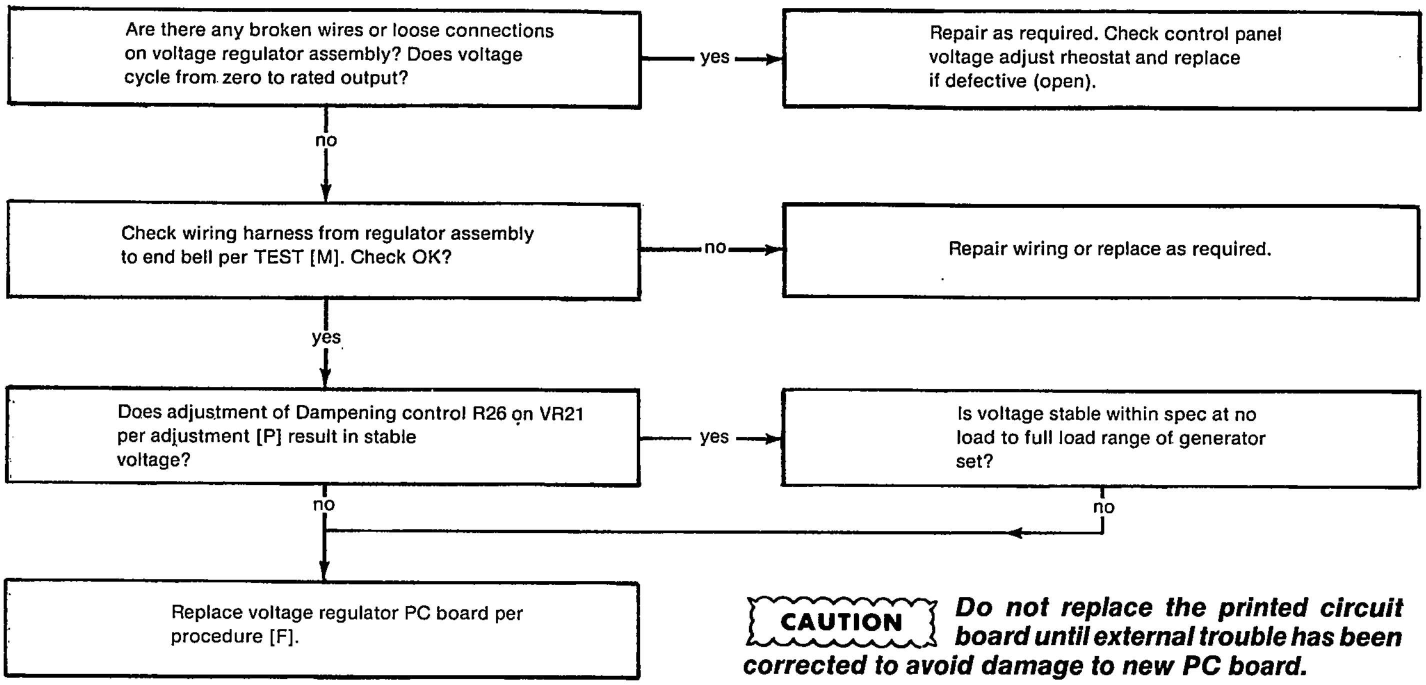

**FIGURE 5. ELECTRICAL SCHEMATIC, YB GENERATOR CONTROL SYSTEM**

## FLOW CHART A. NO AC OUTPUT VOLTAGE AT RATED ENGINE RPM



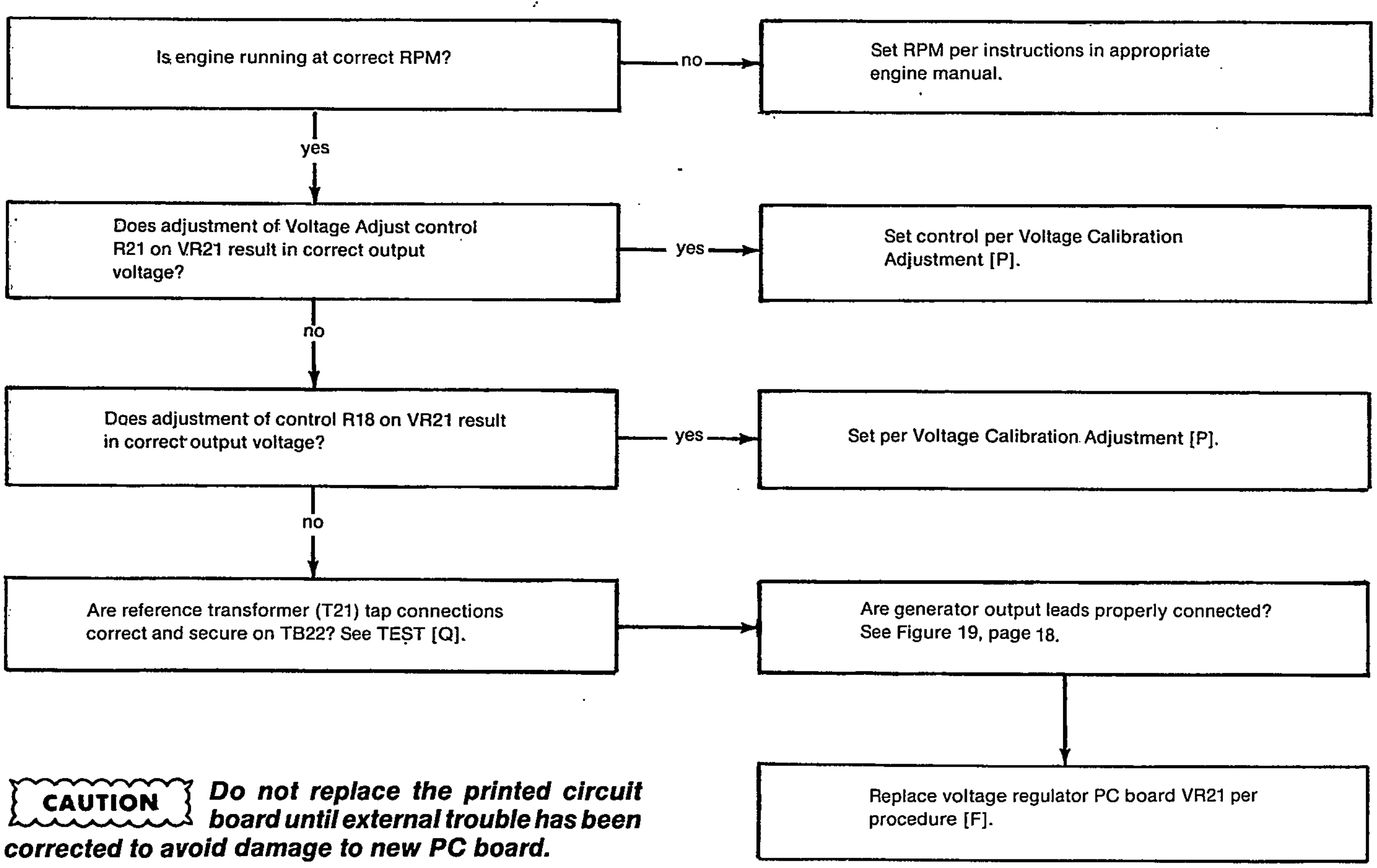

**CAUTION** ***Do not replace the printed circuit board until external trouble has been corrected to avoid damage to new PC board.***

## FLOW CHART B. UNSTABLE VOLTAGE, ENGINE SPEED STABLE 1800 RPM




**CAUTION** ***Do not replace the printed circuit board until external trouble has been corrected to avoid damage to new PC board.***

## FLOW CHART C. OUTPUT VOLTAGE TOO HIGH OR LOW




**CAUTION** ***Do not replace the printed circuit board until external trouble has been corrected to avoid damage to new PC board.***

# FLOW CHART D. EXCITER FIELD BREAKER TRIPS

Does AC output voltage build up to 150% or more of rated voltage before breaker trips?

**yes →** Check for any loose or broken wires or connections on VR21 assembly.

↓

Check diodes and SCR's in bridge assembly CR21 per TEST [C].

↓

Check reference transformer T21 and connections per TESTS [E] and [Q]. Replace if bad.

↓

Check generator stator leads for proper connection. See Figure 19, page 18.

↓

Check generator stator windings per TEST [K]. Replace if bad.

↓

Replace voltage regulator PC board VR21 per procedure [F].

**no ↓** Check diodes CR1,2,3,4,5 and 6 in rotor assembly per TEST [G]. Replace if bad.

↓

Check exciter stator winding per TEST [H]. Replace if bad.

↓

Check exciter rotor winding per TEST [J]. Replace if bad.

↓

Check generator rotor field winding per TEST [L]. Replace if bad.

→ Check generator stator windings per TEST [K]. Replace if bad.

**CAUTION** ***Do not replace the printed circuit board until external trouble has been corrected to avoid damage to new PC board.***

# FLOW CHART E. UNBALANCED GENERATOR OUTPUT VOLTAGE

Remove load at generator terminals. Is output still unbalanced? — no → Check for correct grounding of generator and load.

yes ↓

Are generator leads connected and grounded properly? See Figure 19, page 18. — no → Correct as necessary.

yes ↓

Is generator stator winding continuous per TEST [K]. — no → Replace stator assembly.

yes ↓

Check load for ground faults and correct as necessary.

## ADJUSTMENTS AND TESTS

All of the following Adjustments and Tests can be performed without disassembly of the generator. They should be used for testing generator and regulator components in conjunction with the trouble-shooting flow charts. All ohmmeter tests must be made with the unit stopped to prevent meter damage.

## [A]

### Testing AC Residual Voltage

Generator residual AC voltage should be checked first if there is no AC power output. A good place to check is at TB21 across terminals 62 and 63 (see Figure 5). Residual voltage should be 5-10 VAC at normal operating rpm. If none, flash field per Test [D].

If residual voltage is present at TB21, then check continuity of circuit breaker CB21. If CB21 is OK, proceed to VR21 PC board and check for residual voltage between connector numbers 11 & 12, 1 & 2, and 9 & 10. If none, check continuity between these points with the gen set shut down. If voltage is low, test L21 reactor Test [B] and T21 transformer Test [E].

## [B]

### Testing L21 Reactor

The L21 commutating reactor (Figure 6) mounts inside the control box.

The coils 1-2 and 3-4 are wound on the same core. Resistance between 1-2 and 3-4 should be .031 to .037 and .038 to .046 ohms respectively at 77° F (25°). Resistance between coils and from any terminal to frame of the reactor should be infinity.

## [C]

### Testing Rectifier Bridge Assembly (CR21)

The rectifier bridge located within the control cabinet contains 3 diodes (CR1, CR2 and CR3) and two silicon controlled rectifiers (SCR1 and SCR2). The components are encapsulated within a hermetically sealed block. Therefore, failure of any diode or SCR means the entire unit has to be replaced. See Figure 7.

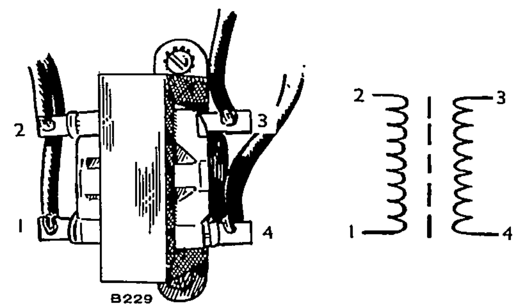
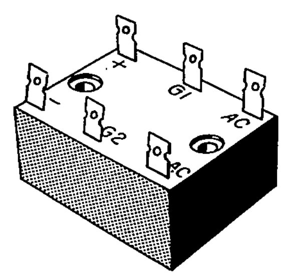



FIGURE 6. L21 REACTOR




AC TERMINALS ARE GIVEN NUMERIC DESIGNATIONS FOR TEXT REFERENCE ONLY. DOES NOT APPEAR ON UNIT.

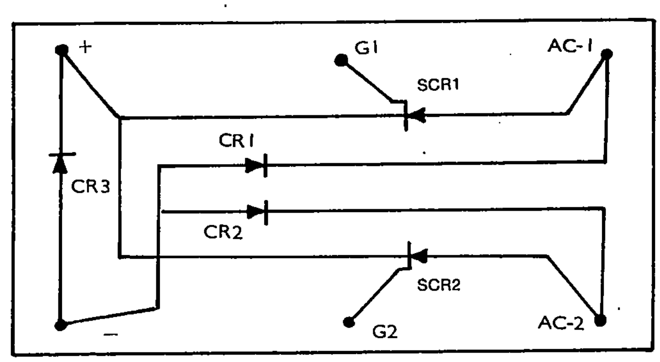
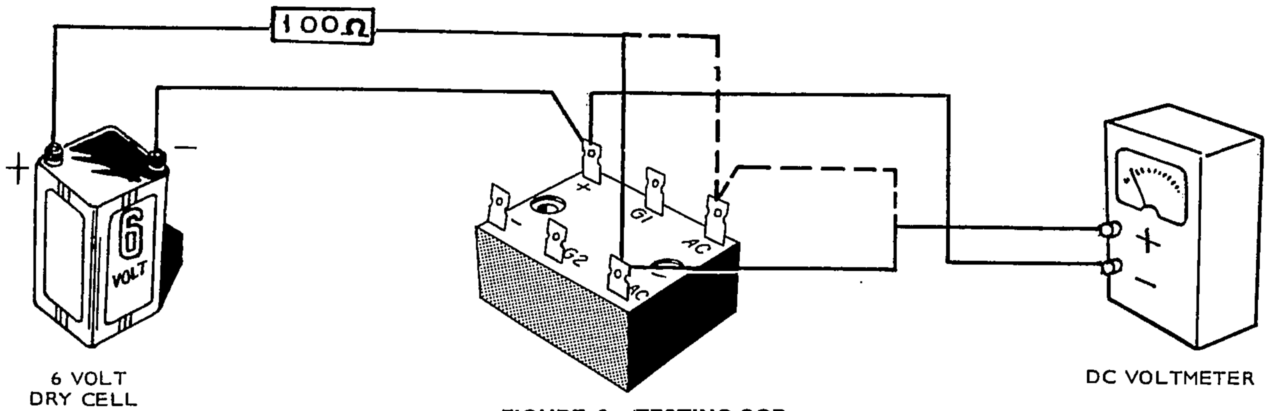



FIGURE 7. SCR BRIDGE ASSEMBLY

Disconnect wires from rectifier unit prior to testing. Test unit in order shown in Table 2. Refer to Figure 8 for SCR1 and SCR2 test circuit. When test is complete and satisfactory, reconnect unit observing correct wiring hook-up.



6 VOLT
DRY CELL
BATTERY

DC VOLTMETER

**FIGURE 8. TESTING SCR**

### TABLE 2. TESTING RECTIFIER BRIDGE ASSEMBLY CR21

| TEST | OHMMETER LEAD + | OHMMETER LEAD - | RECTIFIER TERMINALS | TESTING CR | TESTING SCR | REMARKS | | METER SCALE |
|---|---|---|---|---|---|---|---|---|
| 1 | X | <br>X | +<br>- | CR3 | | Infinity | | RX10K |
| 2 | X | <br>X | -<br>+ | CR3 | | 6- to 50-Ohms | | R X 1 |
| 3 | X | <br>X | +<br>AC1 | | SCR1 | Infinity | | RX10K |
| 4 | X | <br>X | AC1<br>- | | | Infinity | | RX10K |
| 5 | X | <br>X | -<br>AC1 | CR1 | | 6- to 50-Ohms | | RX1 |
| 6 | X | <br>X | +<br>AC2 | | SCR2 | Infinity | | RX10K |
| 7 | X | <br>X | AC2<br>- | <br>CR2 | | Infinity | | RX10K |
| 8 | X | <br>X | -<br>AC2 | CR2 | | 6- to 50-Ohms | | R X 1 |
| | 6 V Battery with Resistor<br>+ | <br>- | | | | DC Voltmeter lead<br>+ | <br>- | DC Voltmeter Reading<br>less than |
| 9* | AC1 | + | | | SCR1 | AC1 | + | 3 Volts |
| 10** | AC2 | + | | | SCR2 | AC2 | + | 3 Volts |

* Apply temporary jumper from AC1 to G1 to test SCR1. Remove jumper and read voltmeter.

** Apply temporary jumper from AC2 to G2 to test SCR2. Remove jumper and read voltmeter.

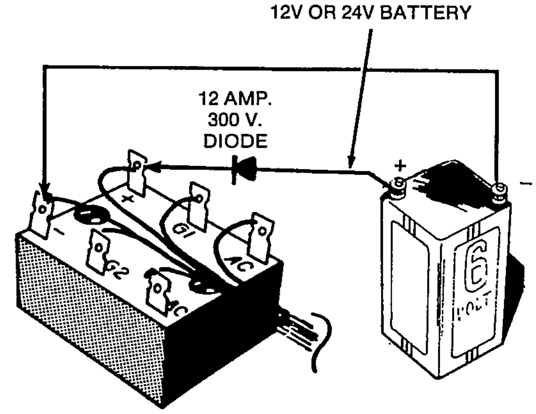
## [D]

### Flashing The Field

If output voltage does not build up it may be necessary to restore residual magnetism by flashing the field. Assemble a 6-volt battery and diode as shown in Figure 9.

If a 6-volt lantern battery is not available, a 12-volt or 24-volt generator set battery can be used. However, a 20-ohm or a 40-ohm, 2 watt resistor must be used in series respectively with the 12 amp 300 V diode. Start the generator set and operate at normal rpm. Touch positive lead to + terminal on rectifier bridge, and negative lead to the - terminal. Hold leads on terminals just long enough for voltage to build up.

**CAUTION** ***Do not keep excitation circuitry connected longer than 5 seconds, or damage may occur to the exciter regulator.***



RECTIFIER BRIDGE
ASSEMBLY

6 VOLT
DRY CELL
BATTERY

**FIGURE 9. FIELD FLASHING CIRCUIT**

## [E]

### Testing Reference Transformer T21

Transformer T21 has eight leads; six are primary leads marked H1 through H6 and two are secondary leads marked X1 and X2.

The winding schematic (Figure 10) shows the resistance values for the individual coils. Resistance between any primary and secondary leads and from any lead to transformer frame should be infinity.

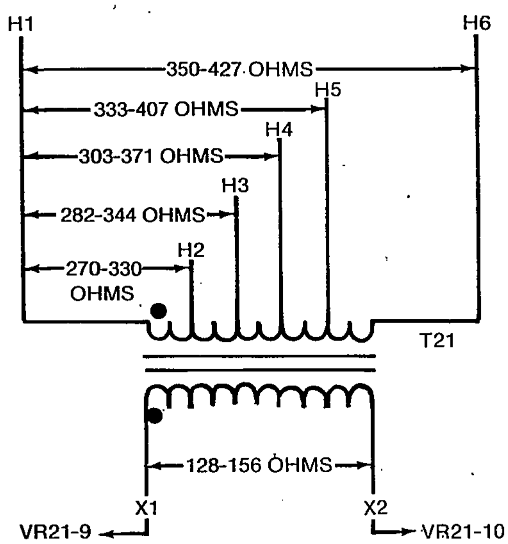



**FIGURE 10. T21 WINDING SCHEMATIC**

## [F]

### VR21 Replacement

Use the following procedure for replacing the voltage regulator PC board or VR chassis.

1. Stop engine.
2. Disconnect and if necessary, label wires; VR21-1 through VR21-12. Refer to AC control wiring diagram.
3. Remove four screws at corners.
4. Remove old PC board.
5. Install new PC board and secure with four screws.
6. Reconnect wires removed in step 2 to proper terminals.
7. Connect jumper W12 to proper terminals for your particular voltage code and voltage connection. See Test Procedure [Q].
8. Perform voltage calibration and stability adjustment procedures to obtain the correct generator output voltage and stability with new PC board in set.

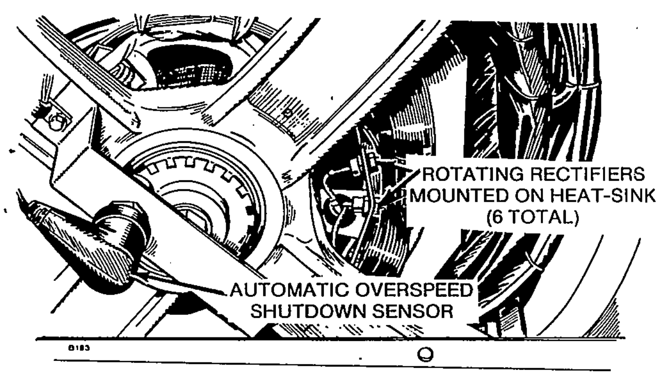
## [G]

### Testing Rotating Rectifiers

Six diodes labeled CR1 thru CR6 are mounted on the rotating exciter assembly as shown in Figure 11. Test diodes as follows:

1. Remove one diode at a time from heat sink. Test that diode and reinstall on heat sink before proceeding to the next one.
2. Check the resistance of the diode with an ohmmeter. Connect one lead to the top of the diode and the other lead to the diode stud. Observe reading.
3. Now reverse leads and again observe reading. A good diode should have a higher reading in one direction than the other. If both readings are high, or if both readings are low, diode is defective and must be replaced with new, identical part.

**CAUTION** ***Excessive dust or dirt on diodes and other components will cause overheating and eventual failure. Keep these assemblies clean!***




**Use 24-lbs-in. (2.7 N•m) torque when replacing nuts of F1+ and F2-, CR1, CR2, CR3, CR4, CR5, and CR6.**

**FIGURE 11. DIODE ASSEMBLY**

Replace rectifiers using the following procedure:

1. Unsolder leadwires from terminals.
2. Use proper size wrenches to hold the body while removing the nut.
3. Push the rectifier free of mounting hole in the heat sink.
4. Insert new rectifier into mounting hole. Using nut and washer provided, secure rectifier to heat sink.
5. Torque diodes on rotating exciter assembly to 24-lb. in. (2.7 N•m).
6. Solder leadwires to new rectifiers.

**CAUTION** ***Use a 40 watt soldering iron. Hold a needlenose pliers between rectifier and soldering point to prevent destructive heating. Excessive heat on these components will destroy them.***

## [H]

### Testing Exciter Stator

**Testing for grounds:** Using an ohmmeter (R x 100 scale), measure the insulation resistance between either lead F1 or F2 and the laminations. A reading of less than infinity indicates a grounded coil. See Figure 12.

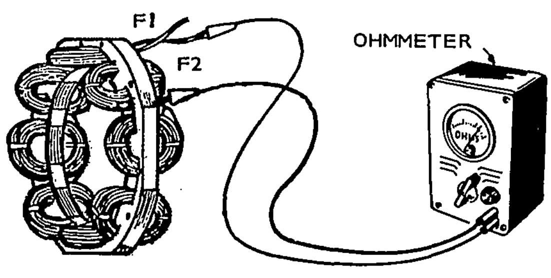



FIGURE 12. TESTING FOR GROUNDS

**Testing winding resistance:** Measure coil resistance between leads F1 and F2 with an ohmmeter (scale R x 1). Resistance should be 15.55 to 17.79 ohms at 68° F (20° C). See Figure 13.

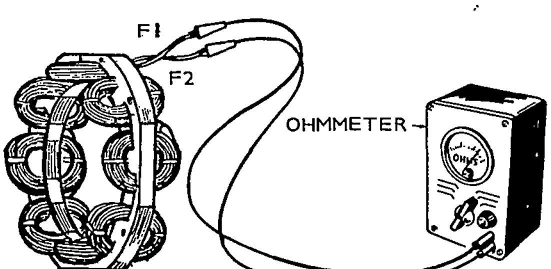



FIGURE 13. MEASURING FIELD RESISTANCE

## [J]

### Testing Exciter Rotor

**Testing for grounds:** Remove diodes CR1, CR2, CR3, CR4, CR5, and CR6 from diode heat sink assemblies. Using an ohmmeter (R x 100 scale) measure insulation resistance between any of the leads and the laminations (exclude the diodes from the test circuit). A reading of less than infinity indicates a ground.

**Testing winding resistance:** Using a Wheatstone or Kelvin bridge meter, measure resistance between leads pairs T1-T2, T2-T3 and T1-T3. Resistance should be 0.496-0.607 ohms. at 68° F (20° C). See Figure 14.

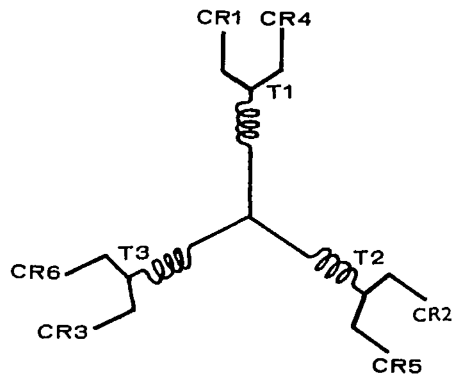



FIGURE 14. TESTING EXCITER ARMATURE

## [K]

### Testing Generator Stator

**Testing for grounds:** Before testing stator, disconnect control wires 4,7,8,9 and 10 from TB21. Isolate from ground and each other. Connect all stator output leads (T1-T12) together. Use an ohmmeter set on the R x 100 scale to measure the insulation resistance between the windings and the stator frame. A reading of less than infinity indicates a grounded coil.

**Testing for shorts:** Connect an ohmmeter (R x 100 scale) between each individual winding and the other windings connected together. Repeat until all six coils have been tested. A reading of less than infinity indicates a short.

Measure resistance of windings using a Wheatstone or Kelvin bridge meter. See Figure 15. If any windings are shorted, open, or grounded, replace the stator assembly. Before replacing the assembly, check the leads for broken wires or damaged insulation.

**Stator output leads T4, T7, T8, T9 and T10 are interconnected (within the stator) to five stranded (#10 aircraft) control wires. These wires are labeled 4,7,8,9 and 10 respectively and terminate at TB21 (terminals 61-65).**

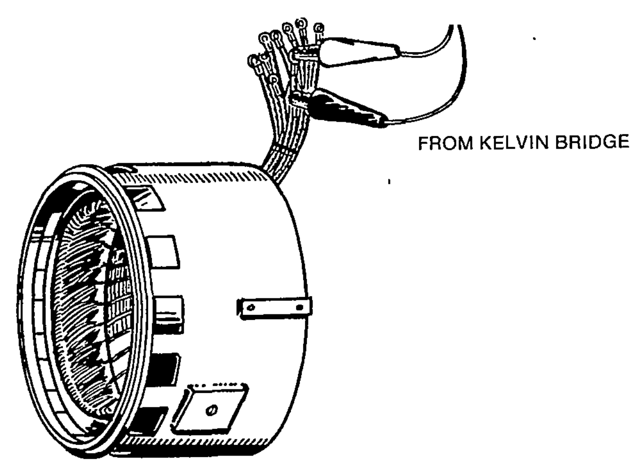



FIGURE 15. TESTING STATOR WINDINGS

**TABLE 3. RESISTANCE VALUES FOR STATORS**

All resistances should be within the value shown at 68° F (20° C). Use a Wheatstone or Kelvin bridge for this test. Measure between the following leads:

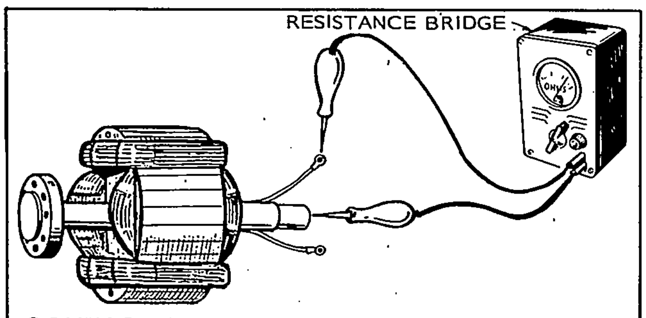
| | | |
|---|---|---|
| T1-T4 | T7-T10 | T3-T6 |
| T9-T12 | T2-T5 | T8-T11 |

| KW RATING | | RESISTANCE |
|---|---|---|
| 50 Hz | 60 Hz | Ohms |
| 165 | 200 | .0047 to .0057 |
| 208 | 250 | .0032 to .004 |
| 250 | 300 | .0022 to .0027 |
| 290 | 350 | .0018 to .0022 |

# [L]

## Testing Generator Rotor

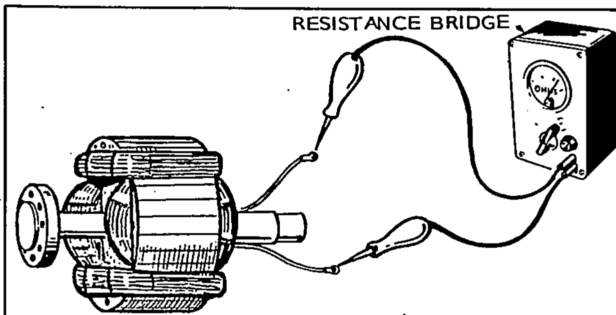
**Testing for grounds:** Remove F+ and F- rotor leads from diode heat sink assemblies. Connect an ohmmeter (R x 100 Scale) between either rotor lead and the rotor shaft. A reading of less than infinity indicates a grounded coil. See Figure 16.




CONTACT ONE PROD TO EACH OF THE FIELD LEADS AND THE OTHER PROD TO THE ROTOR SHAFT.
IF ROTOR IS GOOD THERE SHOULD BE NO READING ON OHMMETER

**FIGURE 16. TESTING ROTOR FOR GROUNDS**

**Testing winding resistances:** Use a Wheatstone or Kelvin bridge for this test. Remove F+ and F- rotor leads from diode heat sink assembly. Connect meter leads between F+ and F-. Resistances should be within the values specified in Table 4 at 68° F (20° C). See Figure 17.




CONTACT ONE PROD TO ONE FIELD LEAD AND THE SECOND PROD TO THE OTHER FIELD LEAD. RESISTANCE VALUES ARE GIVEN IN TABLE 4

**FIGURE 17. MEASURING ROTOR WINDING RESISTANCE**

**TABLE 4. ROTOR RESISTANCES**

| kW RATING AND SERIES | | RESISTANCE |
|---|---|---|
| 50 Hz | 60 Hz | OHMS |
| 165.0 DYH | 200.0DYH | 1.61 - 1.97 |
| 165.0 DFP | 200.0 DFP | 1.61 - 1.97 |
| 192.0 DFP | 230.0 DFP | 1.80 to 2.20 |
| 208.0 DYB | 250.0 DYB | 1.91 to 2.33 |
| 208.0 DFM | 250.0 DYB | 1.91 to 2.33 |
| 208.0 FT | 250.0 FT | 1.91 to 2.33 |
| 250.0 DFS | 300.0 DFS | 2.17 to 2.35 |
| 250.0 DFT | 300.0 DFT | 2.17 to 2.35 |
| 250.0 DHA | 300.0 DHA | 2.17 to 2.35 |
| 290.0 DFN | 350.0 DFN | 2.38 to 2.90 |
| 290.0 DFU | 350.0 DFU | 2.38 to 2.90 |
| 290.0 DHB | 350.0 DHB | 2.38 to 2.90 |
| 290.0 WF | 350.0 WF | 2.38 to 2.90 |

## [M]

### Wiring Harness Check

Carefully check wiring harnesses as follows:

1. Inspect all wires for breaks, loose connections, and reversed connections. Refer to applicable wiring diagram.
2. Remove wires from terminals at each end and using an ohmmeter, check each wire end to end for continuity or opens.
3. Using an ohmmeter, check each wire against each of the other wires for possible shorts or insulation breaks under areas covered by wrapping material.
4. Reconnect or replace wires according to applicable wiring diagram.

## [N]

### Sensitivity Reference Circuit

Three types of sensitivity references are possible with voltage regulator VR21.

1. *Frequency sensitive*—voltage output reduces in direct proportion to the engine speed.
2. *Non-frequency sensitive*—voltage output does not decrease when engine speed decreases.

   A temporary overload with non-frequency sensitive reference could cause the engine to reduce speed, and then require a 50- to 60-percent load reduction before it could return to rated speed.
3. *Semi-frequency sensitive*—voltage output decreases as engine speed decreases, but not as severely as in the "frequency sensitive" mode. Unless otherwise requested by the purchaser, Onan sets are connected at the factory for semi-frequency sensitive voltage regulation because a decrease in voltage output reduces the effective load on the engine, permitting the set to return to its rated voltage and frequency when the overload is removed.

**Changing Sensitivity Reference:** The sensitivity reference can be changed if necessary, by unsoldering W1 on VR21 at "S" (semi-frequency sensitive) and resoldering it to hole "F" (for frequency sensitive) or to hole "N" (for non-frequency sensitive) voltage regulation. See Figure 18.

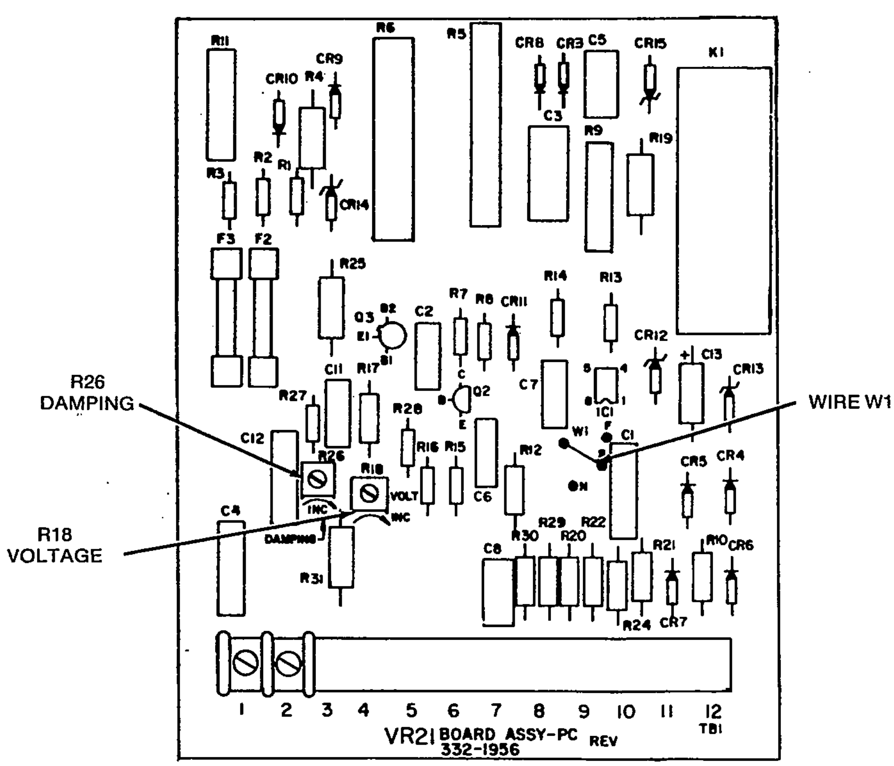



FIGURE 18. VR21 PRINTED CIRCUIT BOARD

# [P]

### Voltage Regulator Adjustment

If VR21 voltage regulator printed circuit board has been replaced, it may be necessary to center the voltage adjust rheostat (R21) on meter panel.

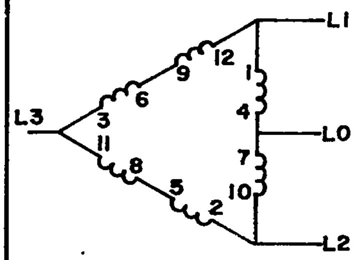
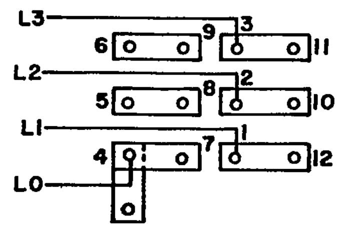
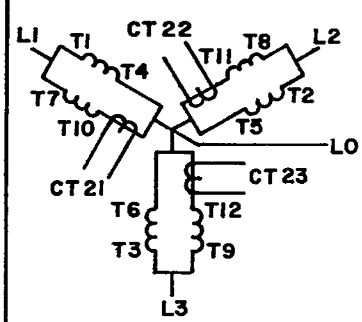
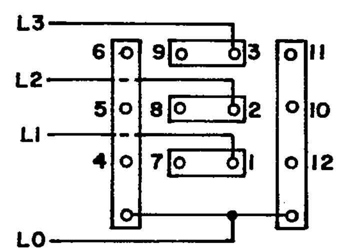
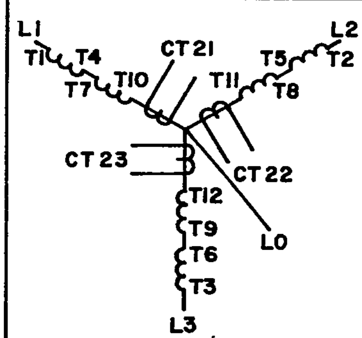
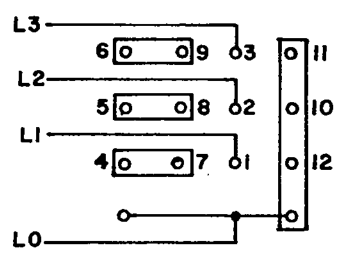
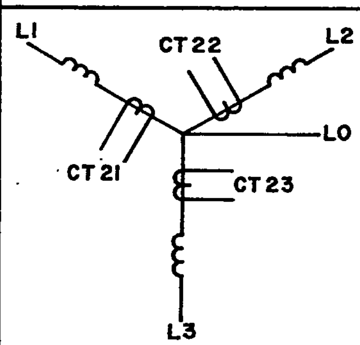
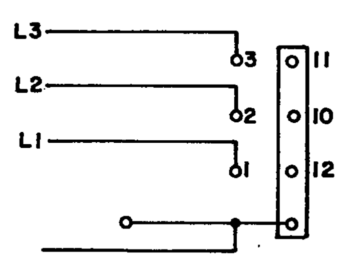
1. Center the voltage adjust knob so pointer is in a vertical position.
2. Open meter panel doors and start unit.
3. Using a screwdriver, turn R18 potentiometer on printed circuit board VR21 in direction shown to increase or decrease the voltage (See Figure 18). Observe voltmeter on meter panel while making adjustment. Set voltage with no load connected to generator.
   (Example: For a 120/240 volt connection, set no load voltage at approximately 246 volts).

If voltage is unstable or tends to hunt, turn R26 potentiometer on VR21 in the direction shown on printed circuit board to increase damping (Figure 18).

# [Q]

### Reconnection

Figure 19 shows reconnection possibilities for the YB series generators. When reconnecting bus-bars for a different voltage, be sure to reconnect lead from terminal 63 (inside control box) to either H3, H4 or H5. See Figure 2 and 19.

| NAMEPLATE VOLTAGE CODE | VOLTAGE | PHASE | FREQUENCY | CONNECT LEADS FROM TERMINAL 63 TO: | GENERATOR CONNECTION | GENERATOR CONNECTION SCHEMATIC DIAGRAM | GENERATOR CONNECTION WIRING DIAGRAM |
|---|---|---|---|---|---|---|---|
| 5D | 120/240 | 3 | 60 | H5 | SERIES DELTA |  |  |
| 6D | 240/480 | 3 | 60 | H5 | | | |
| 17 | 120/208 | 3 | 60 | H3 | PARALLEL WYE |  |  |
| | 127/220 | 3 | 60 | H4 | | | |
| | 139/240 | 3 | 60 | H5 | | | |
| 517 | 110/190 | 3 | 50 | H3 | | | |
| | 115/200 | 3 | 50 | H4 | | | |
| | 120/208 | 3 | 50 | H4 | | | |
| | 127/220 | 3 | 50 | H5 | | | |
| 7 | 220/380 | 3 | 60 | H3 | SERIES WYE |  |  |
| 17 | 240/416 | 3 | 60 | H3 | | | |
| | 254/440 | 3 | 60 | H4 | | | |
| | 277/480 | 3 | 60 | H5 | | | |
| 517 | 220/380 | 3 | 50 | H3 | | | |
| | 230/400 | 3 | 50 | H4 | | | |
| | 240/416 | 3 | 50 | H4 | | | |
| | 254/440 | 3 | 50 | H5 | | | |
| 9X | 347/600 | 3 | 60 | H5 | SERIES WYE |  |  |

NOTE: SINGLE PHASE NOT AVAILABLE YB SERIES GENERATORS 98-2579(C)

FIGURE 19. OPTIONAL VOLTAGE CONNECTIONS

## GENERATOR DISASSEMBLY

If generator testing determines that generator needs repair, remove and disassemble as follows:

1. Disconnect and remove load wires in outlet box.
2. Disconnect leadwires from control box. Check wire markings for legibility to ease assembly. Arrange leads so they can be easily withdrawn from the control box.
3. Remove generator air inlet grille and end bell cover. Disconnect and remove control box housing. Remove capscrew, washer and speed sensor wheel from rotor shaft.
4. Block the rear of the engine in place by supporting the flywheel housing. Remove capscrews securing the generator mounting bracket to the skid base. Remove the generator air outlet screen.

   Step 5 applies to models using disc with holes (Figure 20).
5. Attach an overhead hoist to the stator assembly lifting bar. Remove the capscrews securing the stator assembly to the engine flywheel housing and slide the stator back about three inches. Remove the capscrews attaching the flexible drive coupling to the engine flywheel and remove the stator assembly and rotor assembly (rotor inside the stator) from the engine.

   **CAUTION** **Do not let rotor hang unsupported by the flexible drive coupling. Rotor weight will damage the flexible drive coupling.**

   Proceed to step 8.
6. Attach an overhead hoist to the stator assembly lifting bar. Remove the capscrews securing the stator assembly to the engine flywheel housing and slide the stator assembly off the rotor assembly.
7. Attach hoist and sling to the rotor assembly and apply a slight lift to support the rotor. Remove capscrews securing the flexible drive coupling to the engine flywheel and remove the rotor from the engine.
8. Remove end bell from stator assembly; remove exciter field from end bell assembly if necessary.
9. Remove bearing and spacer from shaft.
10. Disconnect rotor field leads from rectifier assemblies F1 and F2 on exciter armature. Remove exciter armature.

## GENERATOR ASSEMBLY

Generator assembly is the reverse of disassembly procedure:

1. Always replace bearing with a new one; apply a layer of Molykote grease Onan #524-0118 on end-bell bearing bore before inserting bearing.
2. Torque bearing capscrew to 60-70 lb. ft. (81.3 to 94.9 N.m).

   Step 3 applies to models DYH and DYB only.
3. Assemble rotor and stator to engine. Be sure to install the eight flat washers between the disc and blower (Figure 20). Use spray adhesive or heavy grease to hold washers in place during assembly.
4. Torque drive disc to rotor capscrews to 200-240 lb. ft. (271 to 325 N.m).
5. Torque drive disc to flywheel capscrews to 110 to 120 lb. ft. (149 to 162 N.m).
6. Torque end bell mounting stud nuts to 55 to 65 lb. ft. (75 to 88.0 N.m).
7. Torque stator mounting capscrews to 45 to 55 lb. ft. (61 to 75 N.m).
8. Adjust magnetic sensor air gap at .050- to .060-inch (1.27 to 1.52 mm).
9. Refer to parts catalog for replaceable parts and assemblies. Refer to applicable wiring diagram for reassembly.

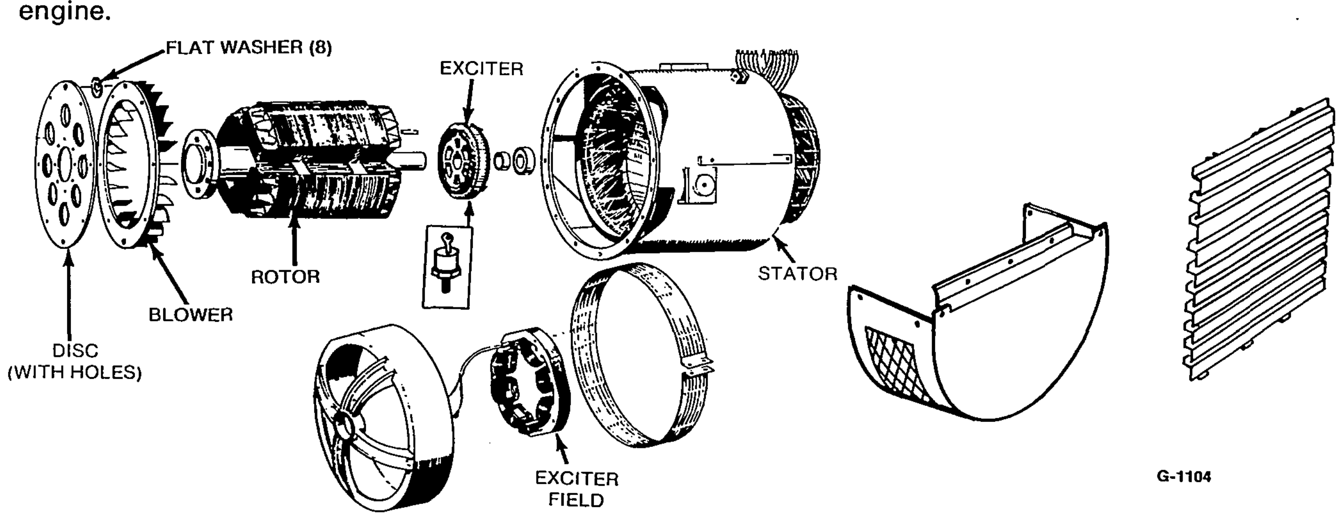



FIGURE 20. GENERATOR DISASSEMBLY

# Control System

## GENERAL

The shock-mounted control box has two doors that open from the middle. For identification purposes, left and right is determined by facing the control panel.

The left hand door is designated the AC panel and contains the following standard equipment. See Figure 21.

**Dual Range AC Voltmeter:** Scales 50 to 300 volts and 100 to 600 volts AC.

**Dual range AC Ammeter:** Range of meter depends upon size of generator.

**Voltmeter ammeter phase selector switch:** Selects the phases of the generator output to be measured by the AC voltmeter and AC ammeter, ie., line-to-line, line-to-neutral, single phase or three phase.

**Range Indicator Lights:** Identifies high or low scale to be read on the AC ammeter or AC voltmeter.

**Frequency Meter:** Pointer type meter indicates generator output frequency in Hertz.

**Running Time Meter:** Registers total number of hours, to one-tenth hour that unit has run. Recorded time is accumulative; the meter cannot be reset to zero time.

**Voltage Regulator:** Rheostat (R21) provides an adjustment of plus or minus 5 percent of generator output voltage.

**Exciter Circuit Breaker (CB21):** Provides generator exciter and regulator protection from overheating in the event of certain failure modes of the generator exciter and voltage regulator.

### Optional AC Panel Equipment:

**Kilowatt Meter:** Connected to a transducer mounted on the back of the control cabinet, this instrument indicates generator output in kilowatts. The transducer is connected across the phases of the generator, and to the current transformers.

**Governor Control:** This single-pole double-throw, center-off, momentary contact switch is wired into a split-field series motor situated on top of the engine governor. Used only with a Woodward PSG Governor, the switch operates the motor which adjusts the governor and therefore the engine speed.

### Standard DC Panel Equipment:

**Oil Pressure Gauge:** Connected to a resistance type sender on the engine, this instrument indicates engine circulating oil pressure.

**Water Temperature Gauge:** Connected to a resistance type sender on the engine, this instrument indicates engine coolant temperature.

**Ammeter:** Indicates the output current of the battery charging alternator.

**Run-Stop-Remote Switch:** Starts and stops the unit locally or from a remote location.

**Reset Switch:** Manual reset for engine monitor after shut-down. Run-Stop-Remote switch in "STOP" position.

**Lamp Test:** Depress to test warning lamp bulbs. Operate only while engine is running.

**Warning Light:** Indicates "Fault in engine operation".

### Optional DC Panel Equipment:

**Penn State Run-Stop/Reset-Remote Switch:** Momentary contact in the depress during reset position. To reset engine monitor, hold switch in the DDR position, actuate reset switch, release and select run to start engine.

**Warning Lights:** Eliminates the one "Fault" light and substitutes five indicator lights to give warning of:

1. Overcrank
2. Overspeed
3. Low Oil Pressure
4. High Engine Temperature
5. Low Engine Temperature

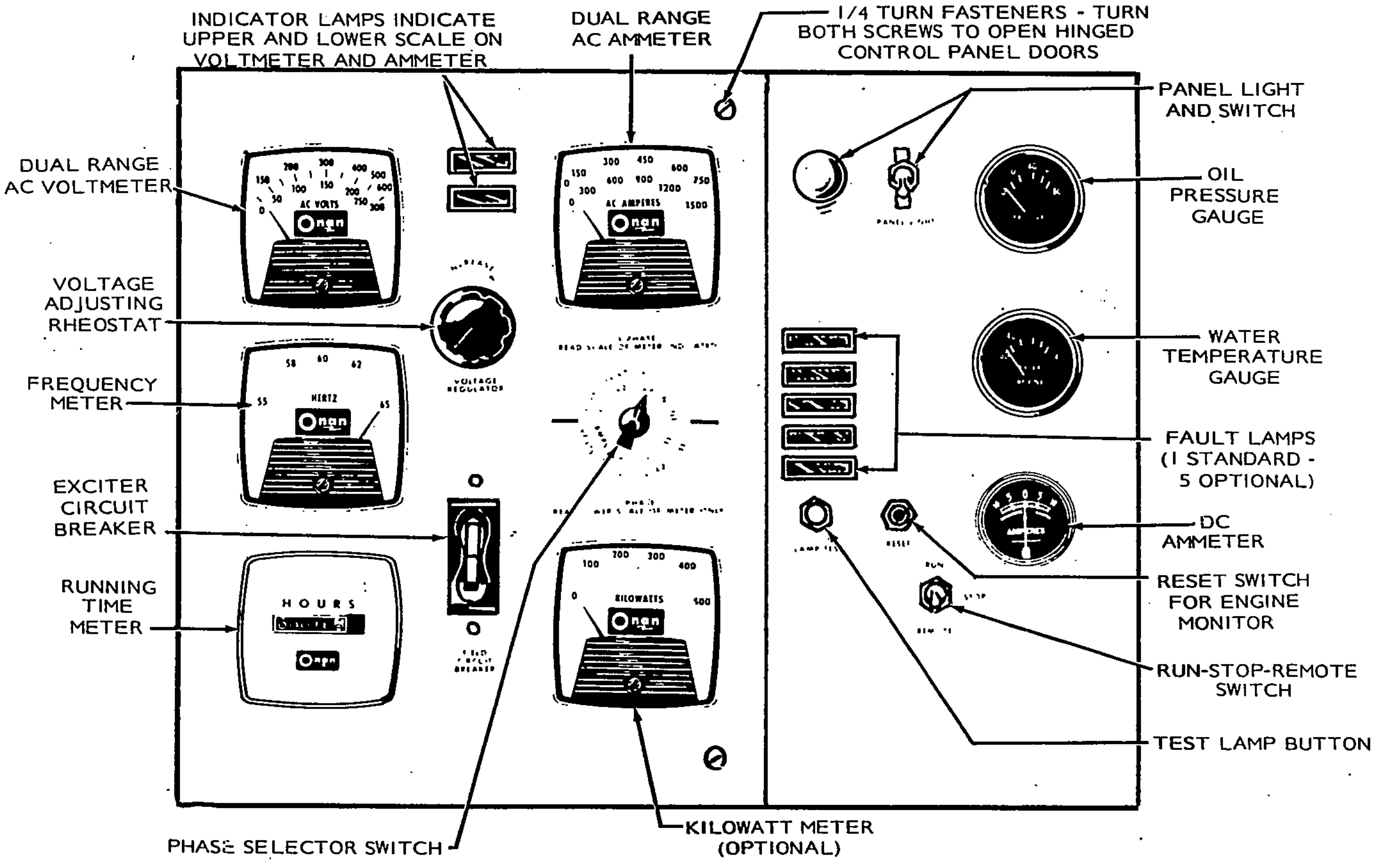



**FIGURE 21. CONTROL PANEL**

## CONTROL OPERATION

In emergencies, service personnel may be required to service a failed generator set in minimum time. This is especially true if generator is the backup power source for life support equipment in hospitals.

The information in this section will instruct personnel on operation of relays and printed circuit modules. Used with the Wiring Diagrams, it will provide greater understanding of control system function.

### Engine Control Relays

The following are brief descriptions of operation and functions of the control relays. The term B+ is used to designate battery voltage (+24 VDC).

**Start Disconnect Relay K11:** Placing R-S-R (Run-Stop-Remote) switch in Run position applies B+ to coil terminal B of relay K11. Coil terminal A is connected to terminal 1 of Start Disconnect module A17. Coil ground is completed by transistor Q2 on A17. When K11 energizes, the following occurs:

1. Contacts 7 and 4 close and apply B+ through K14, (7-1) to Cranker module A14. Relay K13 energizes and applies B+ to the starter solenoid.
2. Contacts 3 and 9 open to start the Overcrank timing sequence.
3. Contacts 8 and 2 open and allow engine starting without low oil pressure shutdown.

Relay K11 remains energized until engine begins to run and an input of 150 to 190 hertz from the magnetic speed sensor is applied to A17 terminals 21 and 22. This causes transistor A17-Q2 to stop conducting and opens the ground circuit to K11 coil causing the following:

1. Contacts 7 and 4 open to disconnect the B+ from the cranking starter circuit.
2. Contacts 3 and 9 close to terminate overcrank timer.
3. Contacts 8 and 2 close to enable Low Oil Pressure shut down circuit.

**Ignition Relay, K12:** Energized by B+, through module A11 when R-S-R switch is placed in run position. Relay A11-K1 N.C. contacts complete the circuit through module A11-20 terminal to relay K12 coil. This relay remains energized for duration of engine run.

When K12 energizes the following occurs:

1. Contacts 8 and 5 close and apply B+ to voltage regulator of battery charging alternator to provide excitation.
2. Contacts 4 and 7 close and apply B+ to:
   a. Oil pressure gauge.
   b. Water temperature gauge.
   c. Water solenoid valve.
   d. Fuel pump.
   e. Energize K15, stop relay (not diesel).
   f. K11-7, input to module A14.
   g. K15(-6) to energize fuel solenoid valve (not diesel).
3. Contacts 3 and 9 open to initiate Cycle Cranker sequence.

Deactivation of relay K12 will shut down the engine.

**Start Solenoid, K13:** Relay K13 has only one set of contacts. It is energized by closure of K11 (7-4) through K14 (7-1) and Cranker module A14. When relay is energized, it applies B+ through circuit breaker CB1 (one engine) to starter shift solenoid K. When engine starts, relay contacts K11 (7-4), followed by K14 (7-1) open to de-energize K13.

**Starter Protection Relay, K14:** Relay K14 is energized by generator output (190 to 240 VAC) and de-energizes when voltage falls to 135 VAC. When energized the following occurs:

1. Contacts of K14 (9-6) close to apply B+ to TB13-58 and to remote station "Generator on" lamp.
2. Contacts K14 (7-1) open to de-energize K13 and act as a backup for relay K11 (7-4).

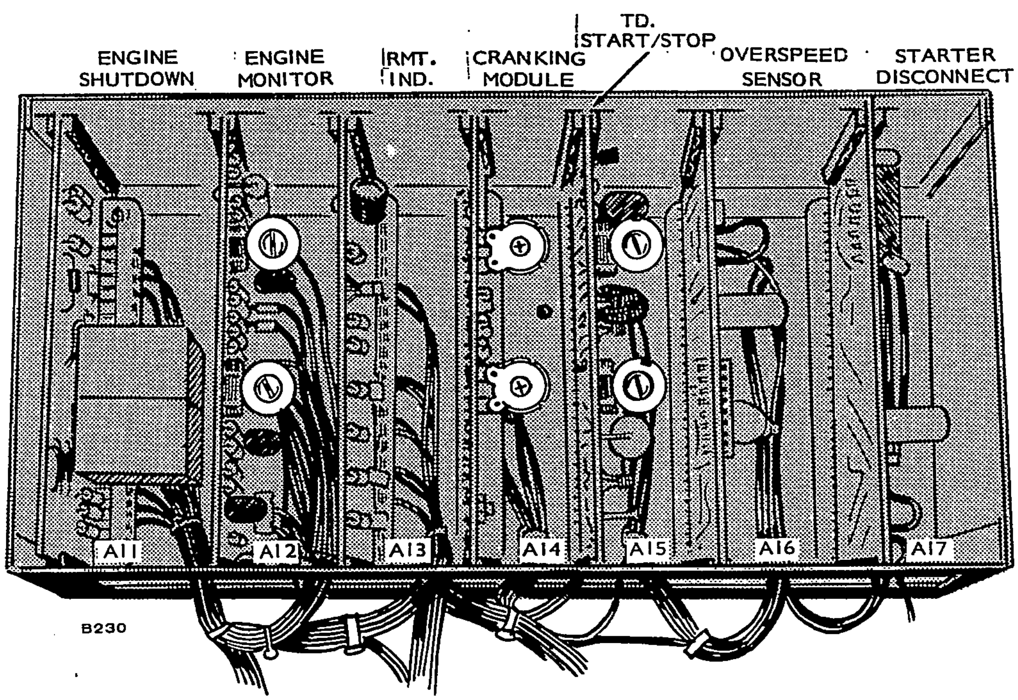



FIGURE 22. ENGINE CONTROL MODULE LOCATION

**Stop Relay, K15 (Natural Gas:** Relay K15 is energized by closure of K12 (4-7) contacts. Contact switching is as follows:

1. Contacts 7-1 and 8-2 open to disconnect ground from magneto (or magnetron) primary coils.
2. Contacts 3-9 open to disconnect K1 fuel solenoid from AUX output of battery charging alternator.
3. Contacts 6-9 close and apply B+ to K1 fuel solenoid.

**Overspeed Relay K15 (DHA and DHB Only):** Relay K15 is normally de-energized and used as a back-up to the standard Overspeed installation. If engine overspeed occurs transistor A16-Q2 conducts and a ground is supplied to terminal 13 of A11 Engine Shutdown module. This causes A11-Q1 to conduct and apply B+ to energize K15 relay.

Closure of K15 contacts 6 and 9 applies B+ to K4 Air Inlet solenoid which actuates air shutters to starve the engine and induce shutdown.

**Should this back-up system be actuated, manually reset air shutter doors. The engine will not start until shutters are open.**

## Engine Control Models

The following are brief descriptions of operating functions of the engine control modules shown in Figure 22. The term B+ is used to designate battery voltage (+24 VDC).

**Engine Control Module, A11:** The R-S-R switch in Run position applies B+ to energize K12 ignition relay via A11 pins 5 and 20. The B+ at pin 14 goes through lamp test switch S13, then re-enters at pin 18 and applied to coils of A11-K1 and -K2. A ground at A11-7 energizes A11-K1 to perform the following functions:

1. The N.C. contacts open to remove B+ from K12 coil which shuts down the engine.
2. The N.O. contacts close to apply B+ (from the alarm reset switch) to the alarm terminal on TB12.

A ground at A11-3 energizes A11-K2 which will function as follows:

1. N.O. contacts close to energize alarm and apply B+ through A11-19 to A12-1 to keep fault lamp on.
2. N.O. contacts close; if a ground is present on A11-1, relay All-K1 will energize and shut down engine .The ground on A11-1 will act as a hold-in circuit for A11-K1 coil.

DHA and DHB only: During overspeed shutdown, a ground is applied to terminal 13. The current flow across resistor A11-R1 will turn on A11-Q1 transistor which applies B+ to terminal 9 to energize relay K15.

Engine shutdown caused by malfunction will leave A11-K1 relay latched. Reset relay as follows:

Standard Installation: Place R-S-R switch in Stop position and press Reset button. Return R-S-R switch to operational position (Run or Remote).

Penn State Installation: Place and hold R-S-R switch in Depress During Reset position. Press Reset button. Release switch and return to the required operational position.

**Engine Monitor Module, A12:** The R-S-R switch in Run position applies B+ to A11 (pins 5 and 20), to terminal A12-20, to DS12 Overcrank, DS13 Overspeed and DS14 Low Oil Pressure lamps. Grounds for the fault lamps are provided within the Engine Monitor module.

Start Disconnect relay K11, N.C. contacts 9-3 (open when K11 energized) are between A12-22 and ground. If after 75-seconds of cranking engine does not start, a potential built up in capacitor A12-C7 will discharge and cause unijunction A12-Q7 to fire. Unijunction A12-Q5 fires and turns on A 12-CR9 to apply a ground to A11-K1 relay, which energizes and stops any further starting action. A12-CR9 also provides a ground for the Overcrank lamp to indicate a fault.

Engine start within 75-seconds will cause a signal from the overspeed sensor through module A16 to turn off transistor A17-Q2 and de-energize relay K11. N.C. contacts 9-3 close and short out capacitor A12-C7 to prevent engine shutdown through Overcrank function.

With the engine running and relay K11 de-energized, low engine oil pressure will cause LOP switch to close applying a ground to pin 4. Transistor A12-Q6 will turn off, A12-CR6 will turn on and apply a ground for Low Oil Pressure light to indicate a fault. A11-K1 will cause K12 relay to shut down the engine and energize the alarm system.

If engine overspeeds (rpm in excess of 2010), the output of A16-IC2 turns on A16-Q2 which conducts and applies ground to A12-2. This turns on A12-Q1; A12-CR3 will conduct and make ground for the Overspeed light to indicate a fault. A11-K1 will energize to shut off K12 relay to stop the engine. The alarm will operate.

**Remote Indicator Module, A13:** This module is used on five Fault light systems only, to light fault indicators at remote stations.

If a low oil pressure shutdown occurs a ground will be applied to A12-5 and A13-1. This turns on A13-Q1 and applies B+ to A11-2 to light the Low Oil Pressure fault indicator at the remote station. Two extra fault lights are connected into the A13 module: DS15 High Engine Temperature and DS16 Low Engine Temperature. Closure of High Engine Temperature Sensing switch applies a ground to A13-20. This starts A13-Q6 conducting which turns on CR7 to ground pin 14, and light the High Engine Temperature lamp and apply a ground to A11-K2 for the alarm system. A13-Q5 will conduct and apply B+ to A13-12 for the remote station light.

Closure of the Low Engine Temperature Sensing switch applies a ground to A13-8. Transistor A13-Q4 will turn on the sets panel and remote Low Engine Temperature lights to indicate a fault. There is no alarm or engine shutdown with this fault.

**Cycle Cranker Module, A14:** Available as an option, the Cycle Cranker allows three crank cycles and two rest cycles of the engine starter motor within the 75-second cranking period established by module A12.

Cycle times are adjustable. Crank cycle time is varied by A14-R4 and rest time by A14-R6. Crank time is 13-to 17-seconds and rest time is 8- to 12-seconds. The rheostats are accessible through holes in the module plate.

When the R-S-R switch is in Run position, K11 is energized. K11 (7-4) contacts close and B+ is applied to terminals 3, 4 and 5 of A14. Transistor A14-Q2 conducts and causes Q3, Q4 and A5 to conduct and apply B+ to K13 starter relay. Capacitor A14-C2 charges and turns off A14-Q2 which allows Q1 to turn on.Q3, Q4 and Q5 turn off and de-energize K13. Capacitor A14-C2 discharges, transistor Q2 turns on and the cranking cycle is repeated until capacitor A12-C7 is charged. At this point A12-CR9 turns on allowing relay A11-K1 to pull-in, to de-activate ignition relay K12 and prevent any further cranking action.

If the engine starts within the cranking cycle time (75-seconds) relay K11 will de-energize, contacts K11 (3-9) will close and capacitor A12-C7 will be discharged setting its voltage to zero.

**Standard Cranker Module, A14A:** This module allows B+ to be applied to K13 Starter relay, and cranking to continue until the engine starts and relay K11 is de-energized as described above. The 75-second cranking period is established by module A12.

**Time Delay Start-Stop, A15:** Used only with a remote control station, this module inserts a timed delay into the Start and Stop functions. Delay times are adjustable: Start, up to 15-seconds and Stop, from 30-seconds to 5 minutes. Adjustments can be made through access holes in the module plate.

When engine start signal is initiated from a remote station, the set control panel R-S-R switch is left in Remote position. Initiation of a start signal will apply B+ to terminals A15-17 and A15-9. Voltage at A15-17 allows capacitor A15-C3 to charge. Voltage at A15-9 prevents capacitor A15-C4 from charging. Charge time of A15-C3 is adjusted by rheostat A15-R14. When charged capacitor A15-C3 will turn on A15-Q1 which will cause A15-CR1 to conduct and apply B+ to the output terminals of the module, then to distribution points in the control panel. Once the gate of A15-CR1 has been triggered, it will continue to conduct.

Initiation of a stop signal is really removal of the start signal, which removed B+ from terminals 17 and 9 to allow capacitor A15-C4 to charge. Charge rate is adjusted by rheostat A15-R16. When A15-C4 has charged, transistor A15-Q8 will turn on and cause the potential across capacitor A15-C6 to go more positive and bias the cathode of A15-CR1 to turn it off. This will shut down the set.

**Time Delay Bypass Module, 15A:** Use of this module allows Start/Stop control from a remote station without the time delay advantage.

**Engines fitted with turbo super chargers should be run for at least five minutes after load removal before shutdown. This allows engine temperature to stabilize and the turbo housing to cool off and prevent warping or cracking of the turbo assembly.**

Control panels with the time delay will allow the set to run for five minutes before automatic shutdown.

**Overspeed Sensor Module, A16:** The Overspeed sensor system has two sections: A 20-tooth disc mounted on the generator shaft and a magnetic pick up, and an Overspeed sensor printed circuit module.

The output of the disc pickup device is fed into the sensor module and is used for two purposes:

1. Engine shutdown when speed reaches 2010 rpm.
2. Disconnects starter when engine speed reaches 450 to 570 rpm and reconnects starter at 10 to 30-rpm if engine fails to start.

The 20 tooth disc rotates at engine speed and is positioned so that the teeth are in the field of the magnetic pick-up. Rotation of the disc induces a voltage in the pickup which is fed to a switching amplifier in A16-IC2, and then into a multivibrator (A16-IC1), where a voltage is produced which is proportional to the input frequency. At transistor A16-Q1 the same amplifier output is applied to A17 Starter Disconnect module.

If engine overspeed occurs, the output of the frequency-to-voltage converter (A16-IC1) switches a zener diode into the base of A16-Q2. Q2 turns on and provides a ground for the Overspeed fault light, alarm and engine shutdown if engine speed reaches 2010 rpm.

**DHA and DHB only:** An additional function when A16-Q2 turns on is application of a ground to terminal 13 of A11 Engine Shutdown module for air shutter operation.

**Start Disconnect Module, A17:** This module is responsible for disconnecting the starter at an engine speed of 450- to 570- rpm to protect the starter and the engine flywheel. A 5V square wave is fed into pins 21 and 22 from the Overspeed Sensor board and then into an integrated circuit A17-IC1. A difference in time constant circuitry divides A17-IC1 into two sections: one for disconnect and one for reconnect. A square wave output from A17-IC1 is fed into A17-IC2 (essentially a flip-flop circuit) where it becomes +5VDC applied to an amplifier in A17-IC3 and amplified to 13V. This voltage is connected through a zener diode to the base of transistor A17-Q2 to turn it on and provide a ground to energize Start/Disconnect relay K11.

Division of A17-IC1 also allows a second square wave output to be applied to another amplifier in A17-IC3. Here it connects to a filter network and into a Nand gate of A17-IC2. At an engine speed of 450- to 570-rpm (150- to 190- Hertz), the voltage output of A17-IC2 is switched to zero which causes A17-Q2 to turn off and disconnect ground from K11. De-energizing of K11 will open Starter solenoid K13 and prevent the starter from operating.

A characteristic of the Starter Disconnect circuit is that A17-IC2 will not reverse output polarity until the input is reduced to less than 10-Hertz. Therefore, the starter motor will not be reconnected until the engine rpm drops below 30.

**Fault Lights:** For a list of the fault light options, refer to Table 6. On a standard single light installation a fault indication will be accompanied by an engine shutdown and an alarm. Pennsylvania State installations will not shut down the engine for low oil pressure or high engine temperature, otherwise the installations are the same.

With four faults lighting one lamp, troubleshooting without an Engine Tester board (Figure 23) is a process of elimination to find which fault caused the indication.

## TABLE 6. FAULT LAMP OPTIONS

| SYSTEM | FAULT | FAULT LAMP | STOP ENGINE | EXTERNAL ALARM |
|---|---|---|---|---|
| PENN-STATE SINGLE LIGHT | Overcrank | x | x | x |
| | Overspeed | x | x | x |
| | Low Oil Pressure | x | | x |
| | High Engine Temperature | x | | x |
| STANDARD SINGLE | Overcrank | x | x | x |
| | Overspeed | x | x | x |
| | Low Oil Pressure | x | x | x |
| | High Engine Temperature | x | x | x |
| 5 LIGHT | Overcrank | x | x | x |
| | Overspeed | x | x | x |
| | Low Oil Pressure | x | x | x |
| | High Engine Temperature | x | x | x |
| | Low Engine Temperature | x | | |
| 5 LIGHT PRE-ALARM | Overcrank | x | x | x |
| | Overspeed | x | x | x |
| | Pre Low Oil Pressure | x | | x |
| | Low Oil Pressure | x | x | x |
| | Pre High Engine Temperature | x | | x |
| | High Engine Temperature | x | x | x |
| | Low Engine Temperature | x | | |

## Engine Malfunctions

The following are common engine malfunctions and a brief description of control operation for alarm or shutdown.

**Overcrank:** If after cranking for 75 seconds the engine will not start, capacitor A12-C7 on the Engine Monitor module will charge to turn on A12-CR9, illuminate the fault light and apply a ground to pin 7 on A-11 Engine Shutdown module. This energizes A11-K1 and allows K12 to de-energize and stop cranking action.

If an engine has been running and shuts down for a malfunction, the starter will be energized (when engine rpm drops below 30) to restart the engine. After 75-seconds of cranking, the above shutdown sequence is initiated and the cranking circuitry is disabled.

**Overspeed:** Engine speed in excess of 2010 rpm will cause transistor A16-Q2 on the Overspeed Sensor module to conduct and apply a ground to pin 2 of A12 Engine Monitor module. A12-Q1 will then turn on and trigger A12-CR3 to illuminate the fault light and initiate shutdown and alarm from A11 shutdown module.

**Low Oil Pressure and High Engine Temperature (1-Fault Light System):** These two switches, although performing dissimilar functions, have the same result. Closure of either switch will apply a ground to pin 4 of the A12 module. Transistor A12-Q6 will turn on causing unijunction A12-Q3 to fire and trigger A12-CR6. The fault light will illuminate. On a standard installation the alarm and engine shutdown will be initiated, but a Penn State installation will set off the alarm only.

**Five Light System:** On a five fault light system, the High Engine Temperature switch connects to module A13-20 and the Low Oil Pressure switch to A12-4.

Closure of High Engine Temperature switch will apply a ground to A13-20. This turns on A13-Q6 which triggers A13-CR7 into conduction. This provides a ground path for High Engine Temperature fault light and to relay A11-K2 for engine shutdown.

Closure of the Low Oil Pressure switch has the same effect as that given for the single light system. An adjustable rheostat (A12-R10) provides a timed-delay period up to 10 seconds to allow the engine to be started and oil pressure to build up. This prevents immediate shutdown due to low oil pressure during starting.

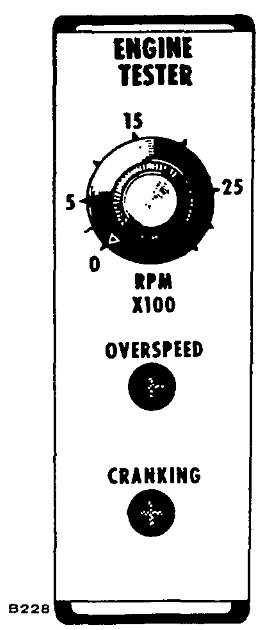



FIGURE 23. ENGINE CONTROL TESTER

## ENGINE CONTROL SYSTEM CHECKOUT PROCEDURE

This checkout procedure of the Engine Control System is for use with the Engine Control Tester Part Number 420-0336 (Figure 23). Designed to enable the serviceman to check out the complete system, the Engine Control Tester module is an indispensable tool for rapid location of faults, or final pre-start system test.

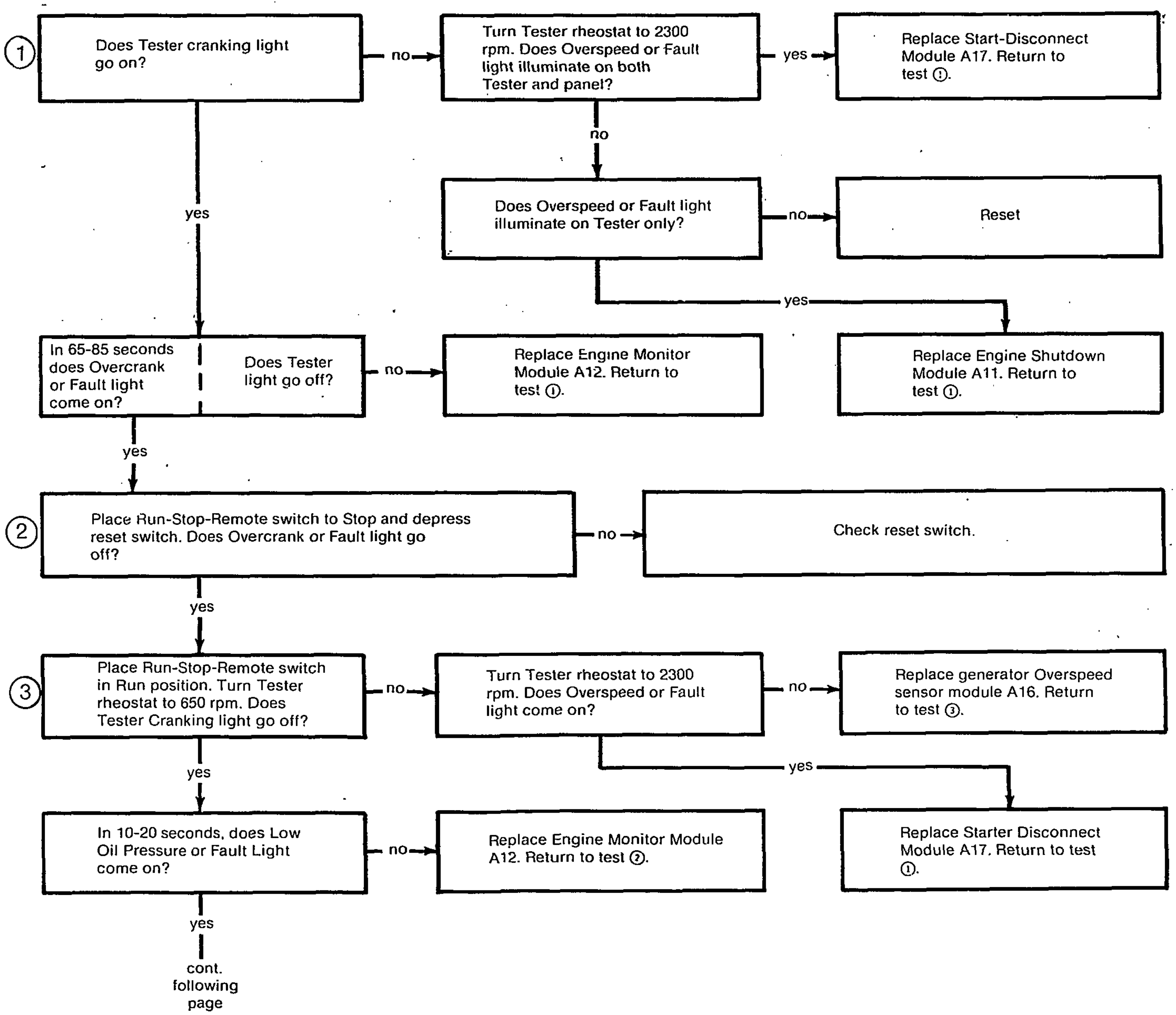
Proceed with the checkout as follows:

1. Remove front cover of engine module rack.
2. Remove Cycle Cranker module A14. See Figure 22.
3. Insert Engine Control Tester module into A14 position.
4. Set rheostat on Tester module fully counterclockwise.

**Engine will not start with controls in this configuration.**

5. Place R-S-R switch in run position, depress lamp test switch to test fault lamp.

### CHECKOUT



yes

4 Reset Turn Tester rheostat to 2300 rpm

Does Tester Overspeed light come on? — no → Replace Overspeed Circuit Module A16. Return to test 4.

Does panel Overspeed or Fault light come on? — no → Replace Engine Monitor Module A12. Return to test 4.

yes

5 Turn Tester rheostat to 400 rpm. Reset. Turn rheostat slowly CCW. Does Overcrank or Fault light come on below 30 rpm? — no → Replace Starter Disconnect Module A17. Return to test 3.

yes

Momentarily ground terminal 31 on TB11. Does High Engine Temp. or Fault light go on? (Tester cranking light should go off if in the shutdown mode, remain on in Pre-Alarm mode). — no → Replace Remote Indicator Module A13. Return to test 5.

yes

6 Place panel Run-Stop-Remote switch in Remote position. Turn Tester rheostat fully CCW. Jumper B+ to Remote on TB12. Does Tester Cranking light come on after 2 to 3 second delay? — no → Replace Time Delay Start/Stop Module A15.

yes

Remove Module A12. Remove B+ to Remote Jumper on TB12. Does Tester Cranking light go off after 30 seconds? Reinstall Module A12. — no → Replace Time Delay Start/Stop Module A15. Return to test 6.

yes

Remove Tester Module, plug in Cycle Cranker Board A14. Place Run-Stop-Remote switch in Run position. Does engine crank? — no → Replace Cycle Cranker Module A14.

## CONTROL TROUBLESHOOTING

Before troubleshooting, visually inspect all wiring and connections. Check relay plug-in receptacles for cold solder connections. Look at the engine control modules for signs of burned or damaged solid state devices, and again check for cold solder connections.

This troubleshooting guide assumes the technicians knowledge of the generator set will allow him to consider the nature of the fault before proceeding.

For example, the set cranks without starting; he would check fuel, fuel lines, ignition, carburetion, etc. If it does not crank, he would check -

- Batteries
  Connected properly?
  Connections clean and secure?
  Fully charged?
- Starter connections secure?
- Remote station Start switch in correct position?

A few minutes spent logically analyzing a malfunction can save time and expense. Consult the engine operator's manual for engine troubleshooting information.

This manual will help troubleshooting electrical control problems. The information in this section is divided into Flow Charts A, B, C and D as follows:

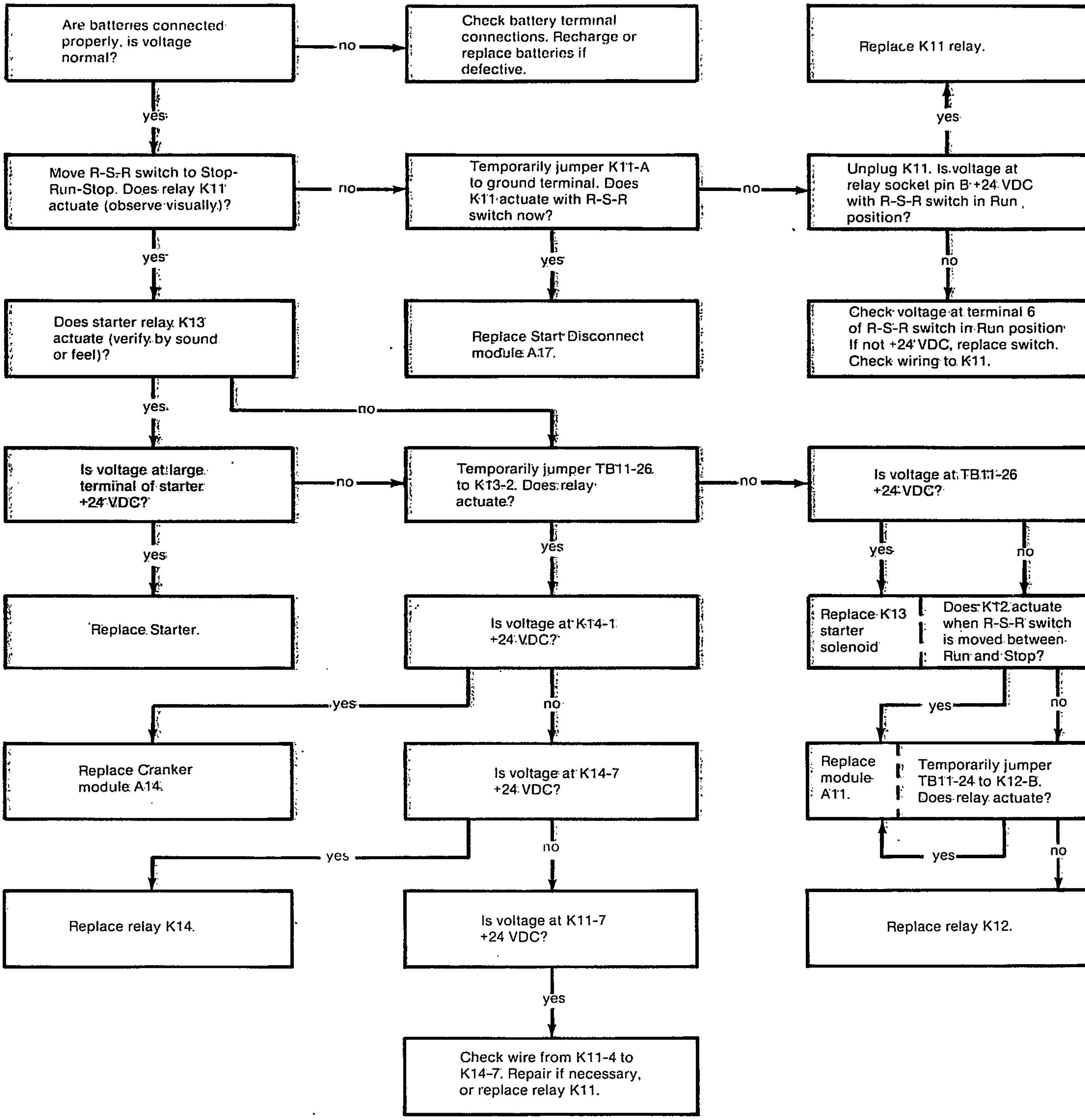
A. Engine Fails to Crank. Switch in "Run" position.
B. Engine Fails To Crank, Switch in "Remote" position.
C. Engine Malfunction Shutdown, Fault Light "On". Five Light System.
D. Engine Malfunction Shutdown. Fault Light "ON". Single Light System.

To troubleshoot a problem, start at upper-left corner of the chart related to the problem, and answer all questions either YES or NO. Follow the chart until the problem is found, making voltage measurements as referenced.

**CAUTION** ***Do not make voltage measurement on any module unless an extender card is used. Make measurement on the extender card. Doing so helps prevent damage to the module from accidental short circuit by the test probe.***

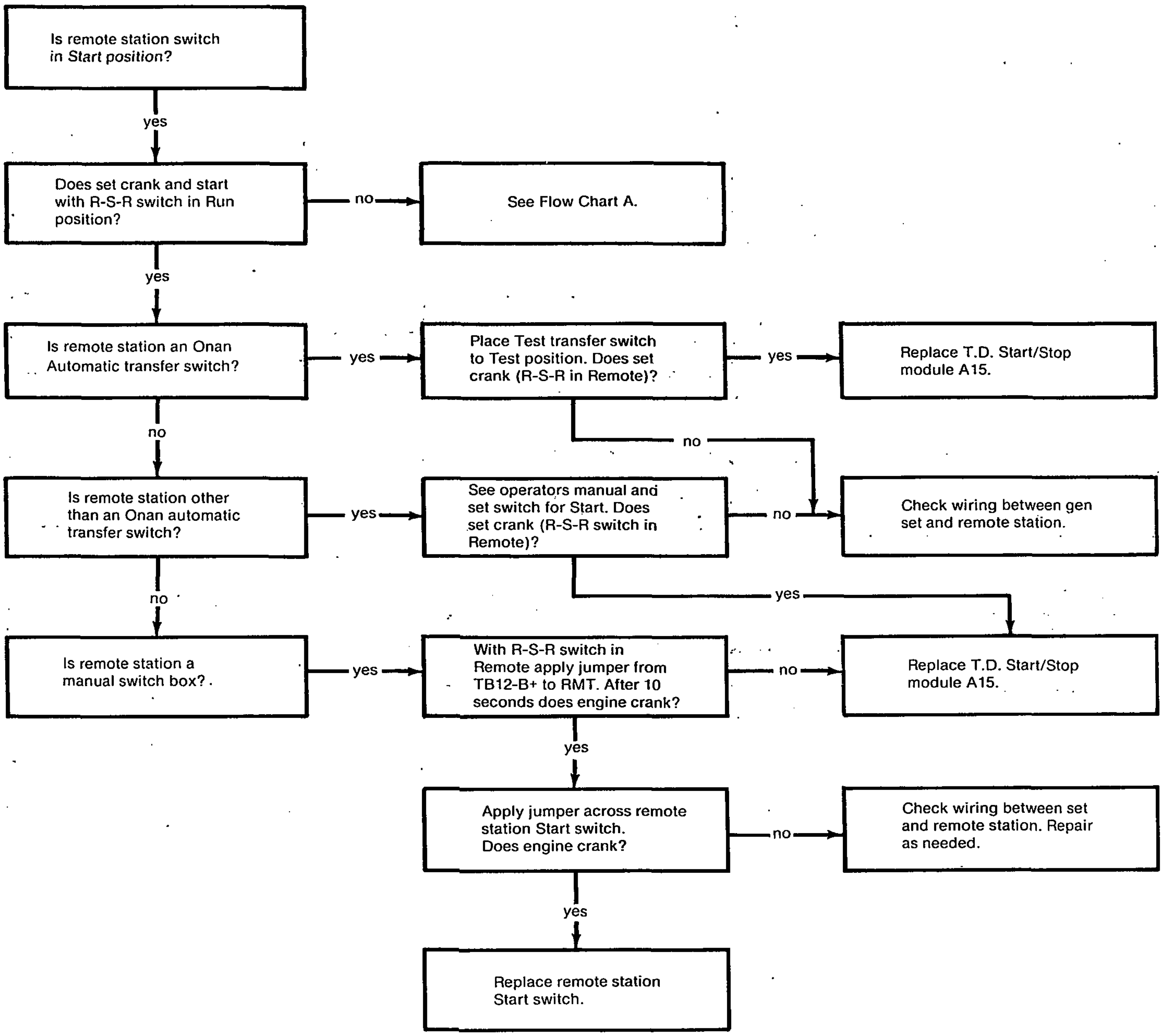
## FLOW CHART A. ENGINE FAILS TO CRANK. SWITCH IN "RUN" POSITION.

**NOTE: Place R-S-R switch in Run position when making voltage measurements.**

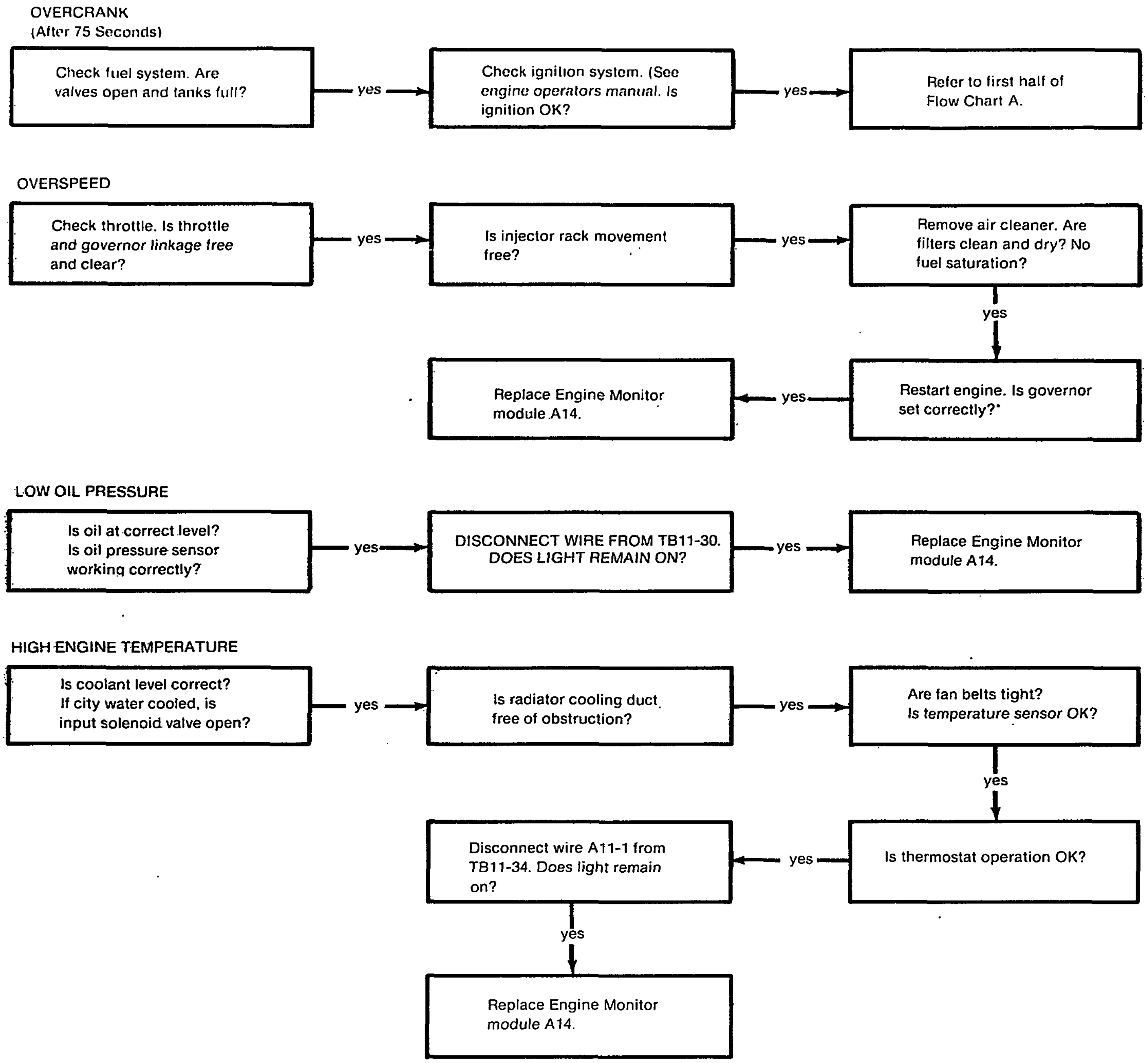


## FLOW CHART B. ENGINE FAILS TO CRANK. SWITCH IN "REMOTE" POSITION.

**NOTE: This chart is concerned with failure to crank in Remote only. Fault light "ON" should be solved after this malfunction is corrected. See section on Fault Lights (Charts C and D).**

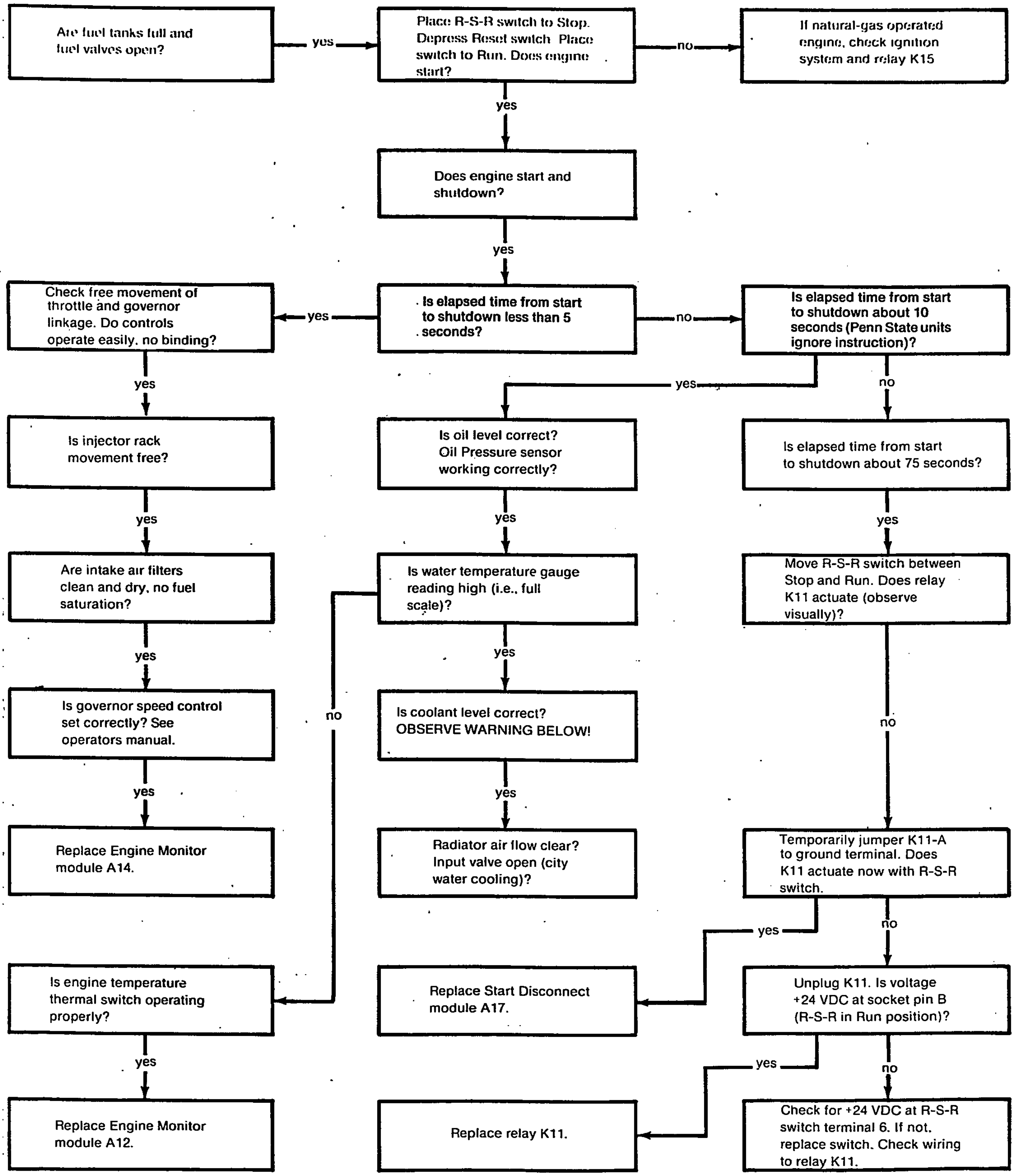


## FLOW CHART C. ENGINE MALFUNCTION SHUTDOWN, FAULT LIGHT "ON". FIVE LIGHT SYSTEM




***Woodward governors have optionally installed externally-controlled motors. Adjust governor with switch on control panel.**

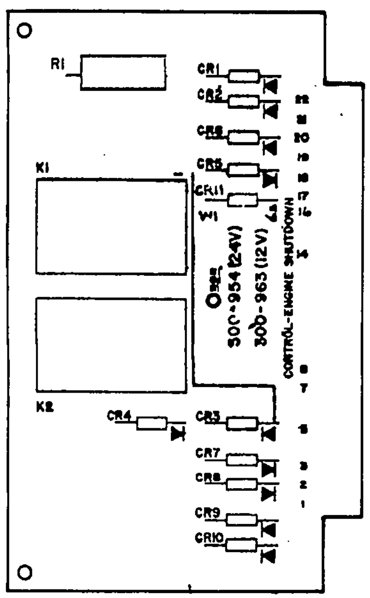
## FLOW CHART D. ENGINE MALFUNCTION SHUTDOWN. FAULT LIGHT ON SINGLE LIGHT SYSTEM



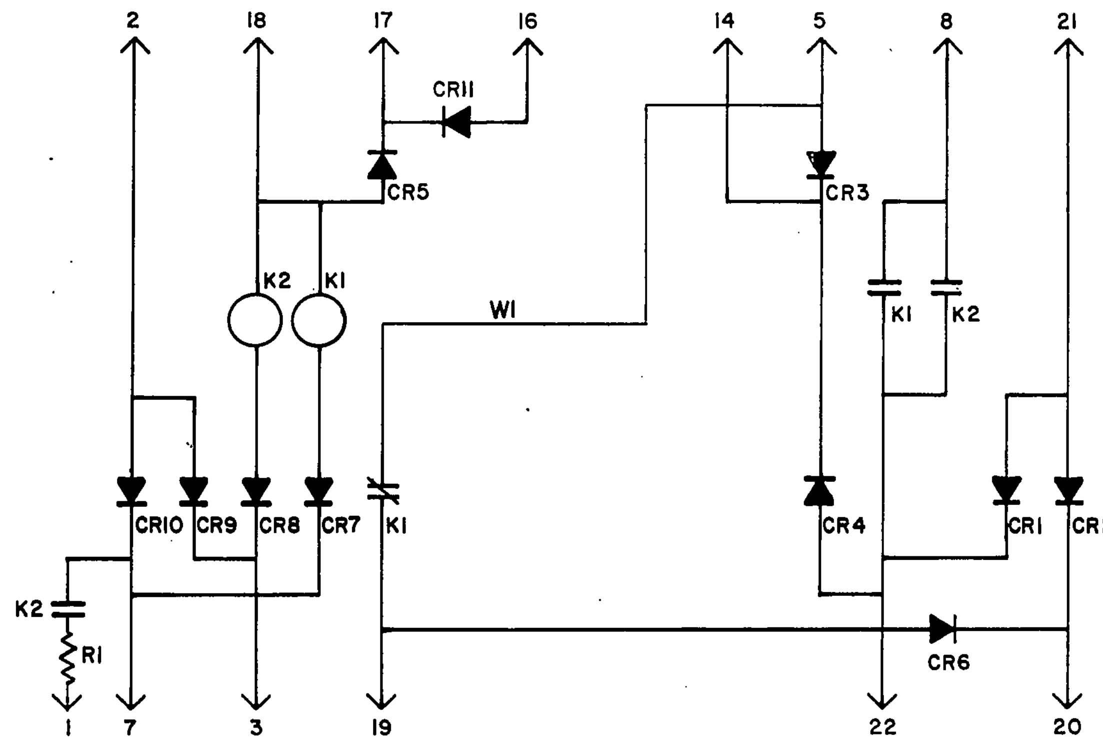

**WARNING** ***Bleed off block coolant pressure before attempting to remove filler cap. Severe liquid burns could result from erupting coolant.***

# Wiring Diagrams

## MECHANICAL ASSY




## SCHEMATIC DIAGRAM




| | | | | | |
|---|---|---|---|---|---|
| | 50 ✓ relay | price | tp | pur | ✓ me |
| | weld | sa | hsg | gd | qc |
| | sec | punch | crank | ck | ✓ po |
| DATE | | | | sc NONE | |

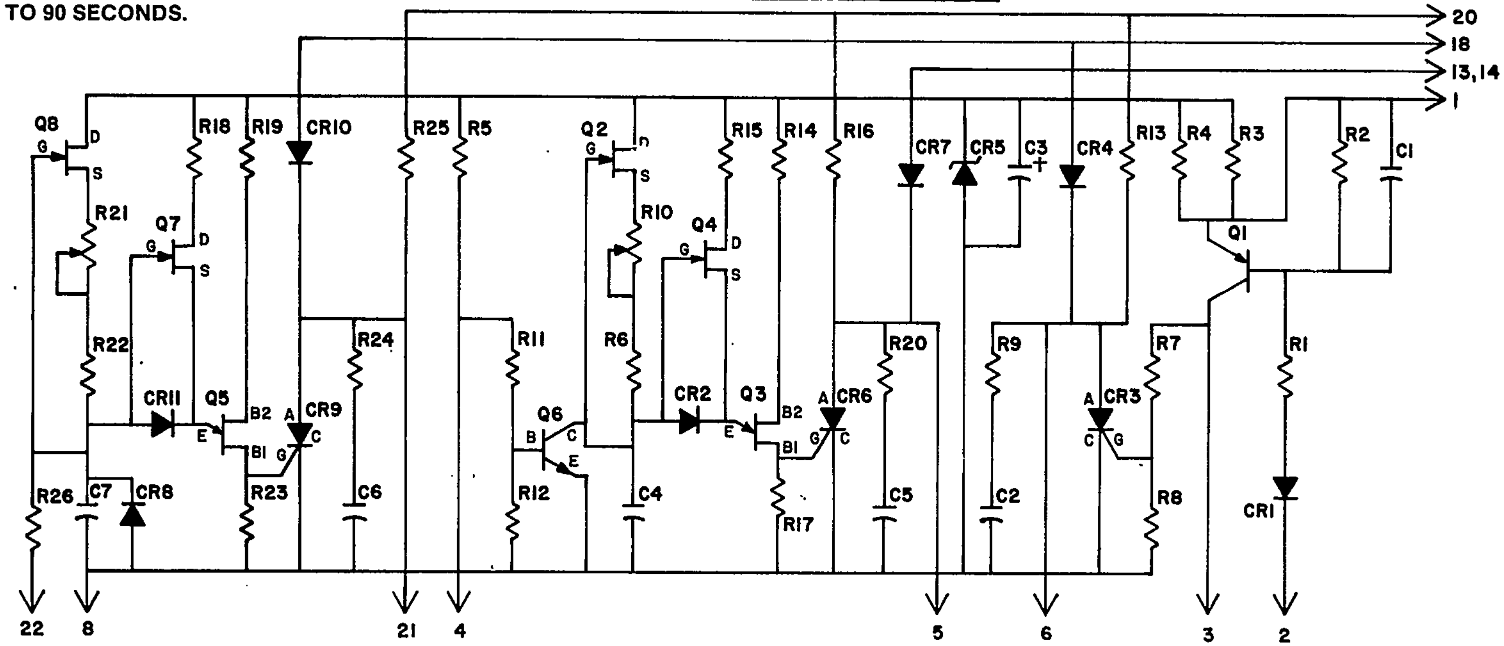
Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

**MODULE-ENG SHUTDOWN**

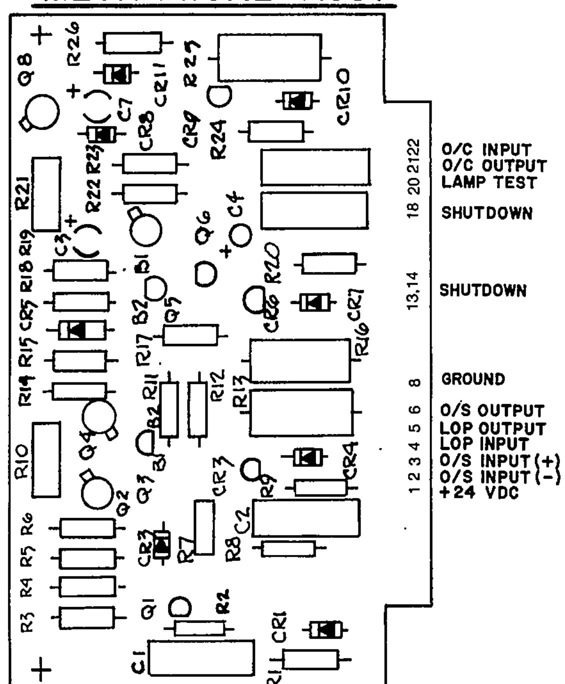
MODEL: YB (24 V) — NO. 300-954 — DWG SIZE C

POTENTIOMETERS R10 AND R21 ARE ADJUSTABLE FROM 0 TO 90 SECONDS.

## SCHEMATIC DIAGRAM



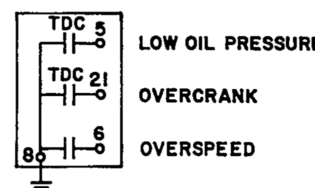

## MECHANICAL ASSY




## SPECIFICATIONS

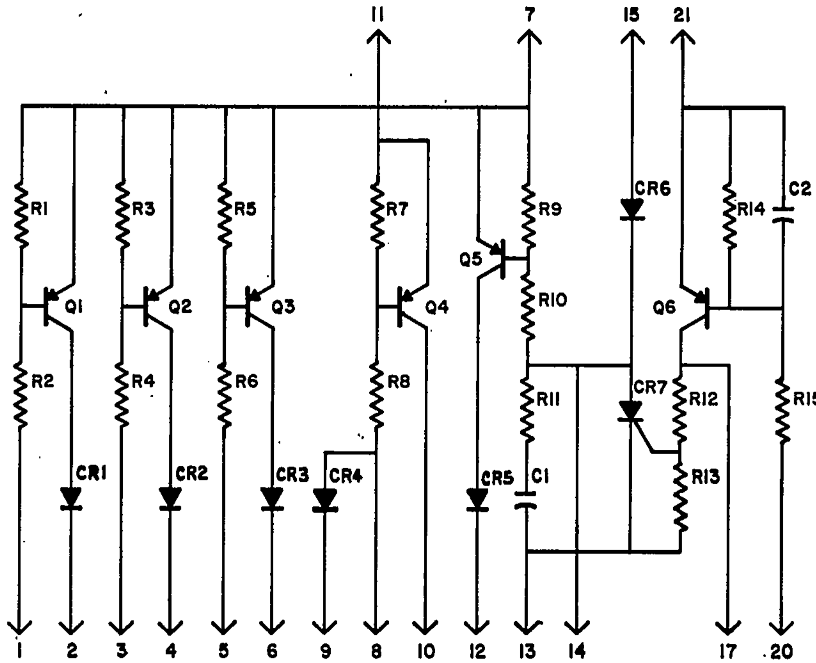
B+ POWER .......................................... 24–6 VDC
LOW OIL PRESSURE
TIME DELAY (TDC) .................................. 12.5+2.5 SEC
OVERCRANK
TIME DELAY (TDC) .................................. 75+ 5 SEC
STORAGE TEMPERATURE .......................... 40° C to 100° C
OPERATING TEMPERATURE ...................... 40° C to 80° C

## DIAGRAM SYMBOL

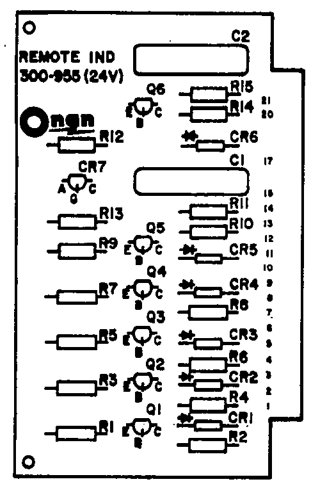



| | |
|---|---|
| A DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota | |
| TITLE | MODULE-ENG MONITOR (24V) |
| MODEL | YB |
| DWG NO. | 300-0953 |
| DWG SIZE | C |

## SCHEMATIC DIAGRAM



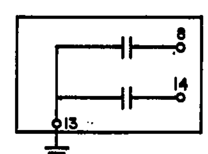

## MECHANICAL ASSY




## SPECIFICATIONS

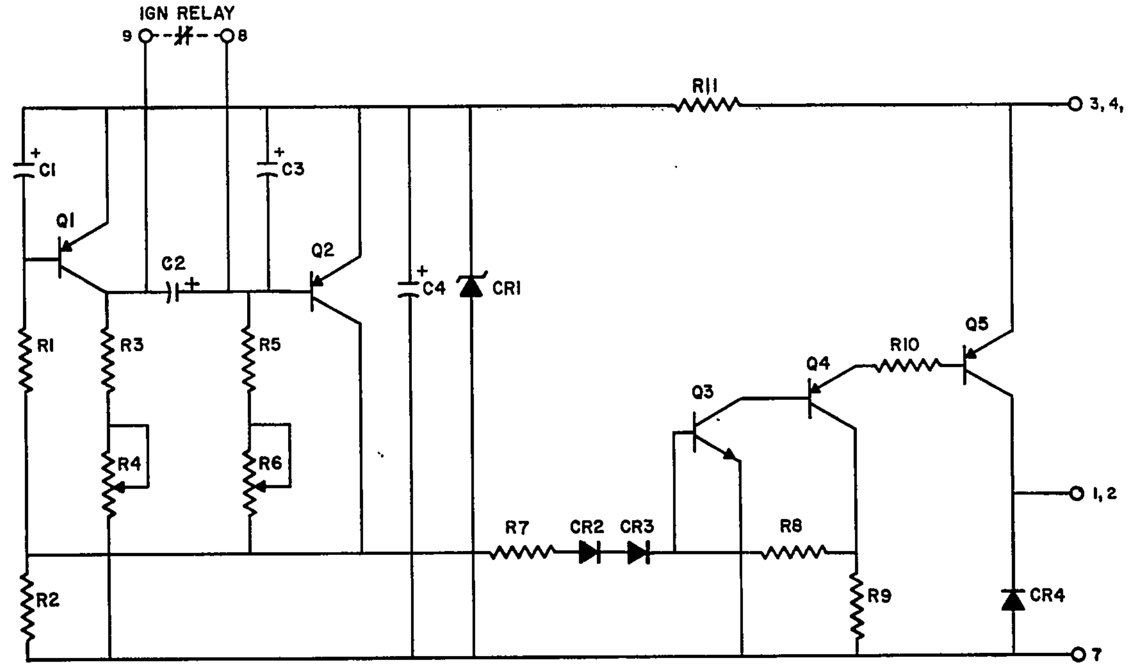
B+ POWER .............................................. 24 ± 6 VDC
STORAGE TEMPERATURE ......................... -40°C TO 100°C
OPERATING TEMPERATURE ........................ -40°C TO 80°C

## DIAGRAM SYMBOL



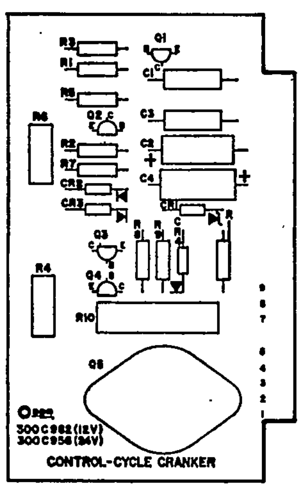

| ITEM | PART NO. | SIZE | QTY | BULK | DESCRIPTION OR MATERIAL |
|---|---|---|---|---|---|
| | | | | | Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota |
| DATE 12-12-72 | SC NONE | | | | MODULE - REMOTE IND(24V) |
| YB | | | | | 300-955 C |

## SCHEMATIC DIAGRAM




FACTORY ADJUST POTENTIOMETER R6 FOR 10±2 SEC REST TIME
FACTORY ADJUST POTENTIOMETER R4 FOR 15±2 SEC CRANK TIME

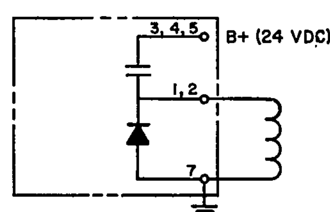
## MECHANICAL ASSY




## SPECIFICATIONS

| | |
|---|---|
| B+ POWER | 24 ± 6 VDC |
| CRANK TIME | 15 ± 2 SEC |
| REST TIME | 10 ± 2 SEC |
| OPERATING TEMPERATURE | -40°C TO 80°C |
| STORAGE TEMPERATURE | -40°C TO 100°C |

## DIAGRAM SYMBOL




Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

MODULE-CYCLE CRANKER (24V)

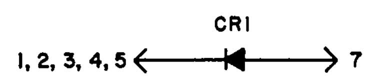
DATE 12-12-72 SC NONE

YB

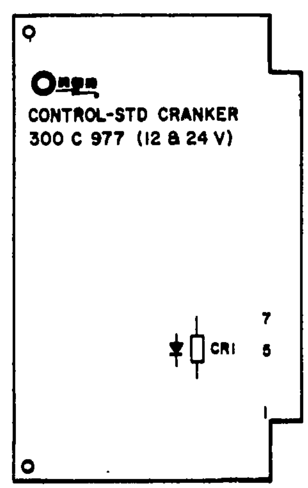
300-956

DWG SIZE C

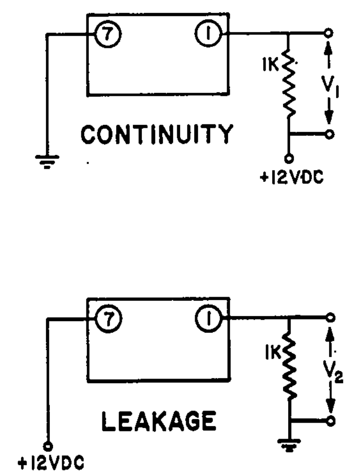
## SCHEMATIC DIAGRAM




## MECHANICAL ASSY




## TEST DIAGRAM




DR Bushard
CKR CDR
DATE 11-29-72
SC NONE

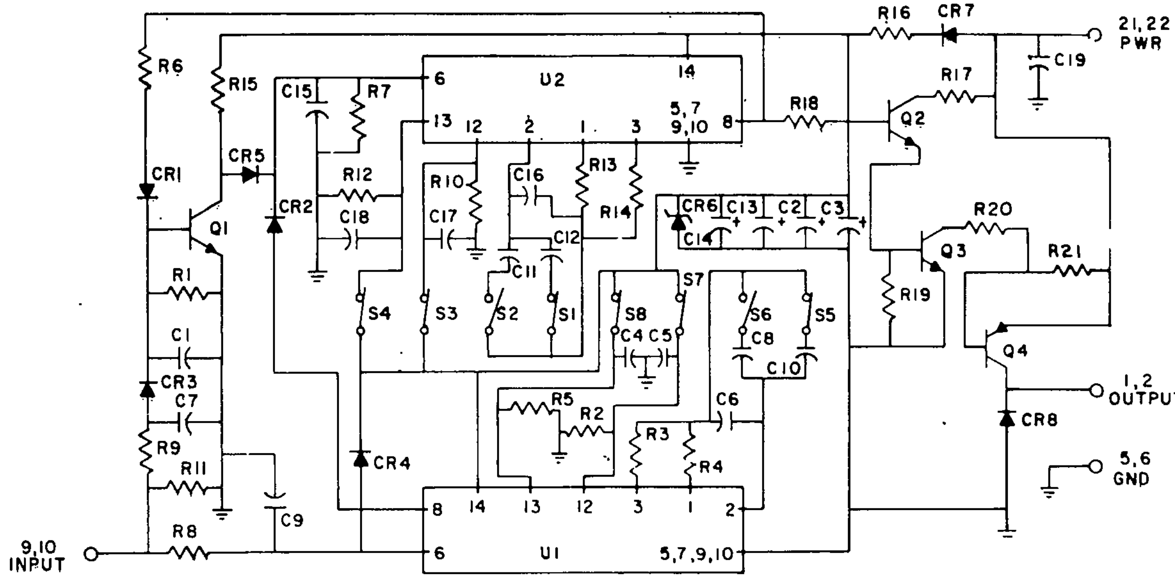
Onan
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

MODULE-STD CRANKER

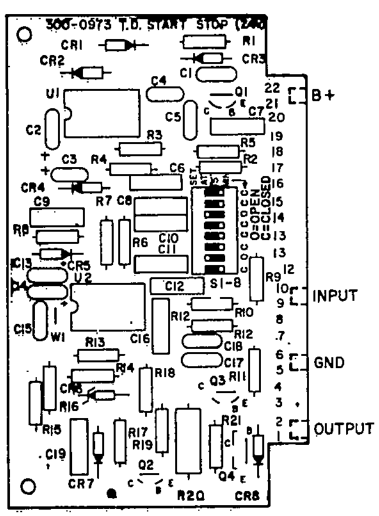
YB

300-977

# SCHEMATIC DIAGRAM




## MECHANICAL ASSY




## SPECIFICATIONS

INPUT .......................................... 24 TO 30 VDC
LOAD CURRENT .......................................... 400 MA

TIMING ACTION
DELAY ON OPERATE PLUS DELAY ON RELEASE

ADJ TIME RANGE:
START .......................................... 0.5 TO 15 SECONDS
STOP .......................................... 0.5 TO 5 MINUTES
TOLERANCE .......................................... ± 20%

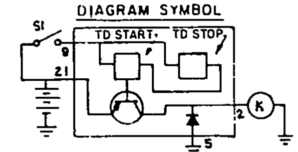
### SWITCH FUNCTIONS

| SW POSITION O = OPEN C = CLOSED | | | | APPROX TIME | |
|---|---|---|---|---|---|
| 1,5 | 2,6 | 3,7 | 4,8 | MIN | SEC |
| O | O | C | O | | .5 |
| O | O | O | C | | 1 |
| C | O | C | O | | 1.4 |
| C | C | C | O | | 2.4 |
| C | O | O | C | | 5.5 |
| O | O | O | O | | 7.9 |
| C | C | O | C | | 9.6 |
| C | O | O | O | | 43 |
| O | O | C | C | 1 | 2 |
| C | C | O | O | 1 | 16 |
| C | O | C | C | 5 | 45 |
| C | C | C | C | 10 | 15 |

TIME TOLERANCE ± 20%

S 1-4 T.D. START
S 5-8 T.D. STOP

DIAGRAM SYMBOL

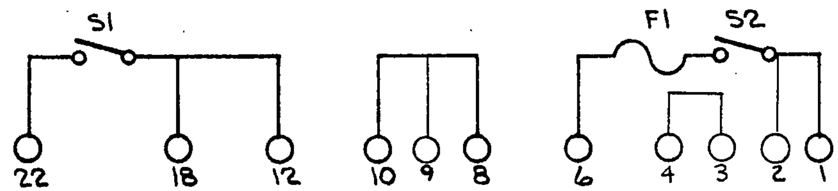


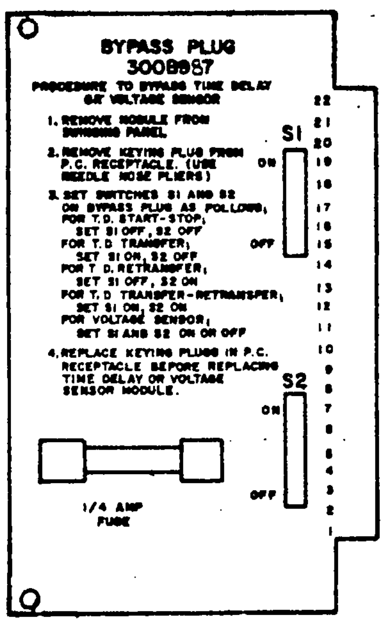

Onan DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

DATE 1-22-79 SC NONE

MODULE-TD START-STOP (24 V)

YB 300-0973 C



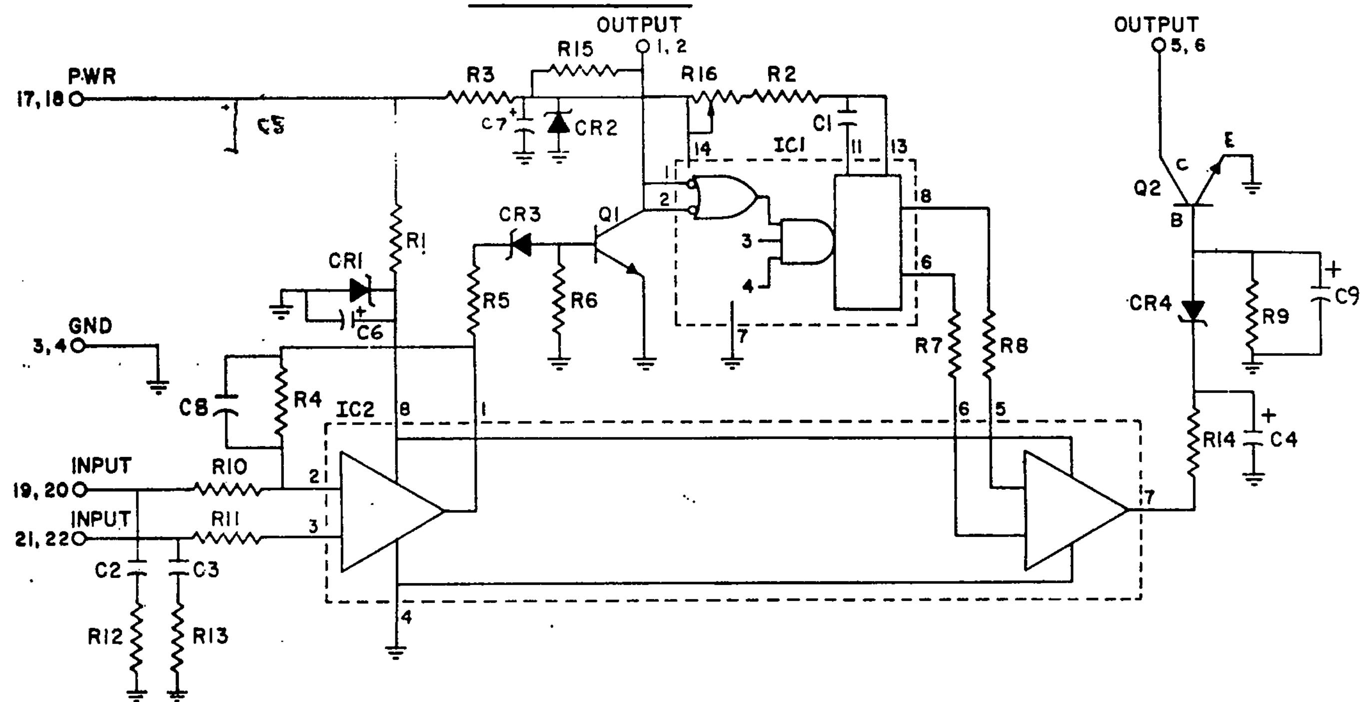

**NOTE** If replacing this Bypass module, verify that —

a. Switch S2 is open.

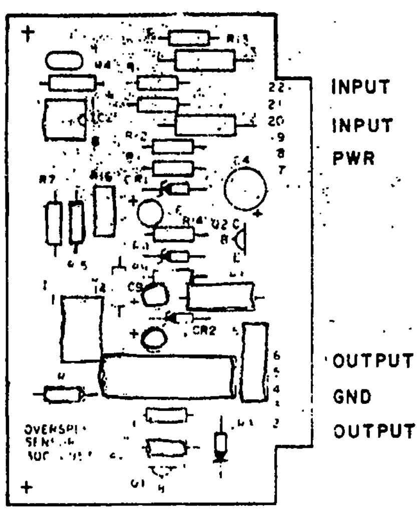
b. Switch S1 is open.

| | | | | | | |
|---|---|---|---|---|---|---|
| fab | price | tp | pur | me | Onan | DIVISION OF ONAN CORPORATION<br>Minneapolis, Minnesota |
| weld | so | htg | gd | gr | | |
| sec | punch | crank | ck | pu | | MODULE-BYPASS PLUG |
| DATE 1-4-73 | | | SC 1:1 | | | |
| MODEL YB | | | | | | DWG NO 300-987 |

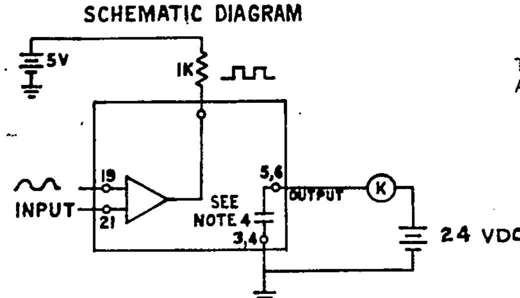
## SCHEMATIC




## MECHANICAL ASSY




SYMBOL FOR
SCHEMATIC DIAGRAM



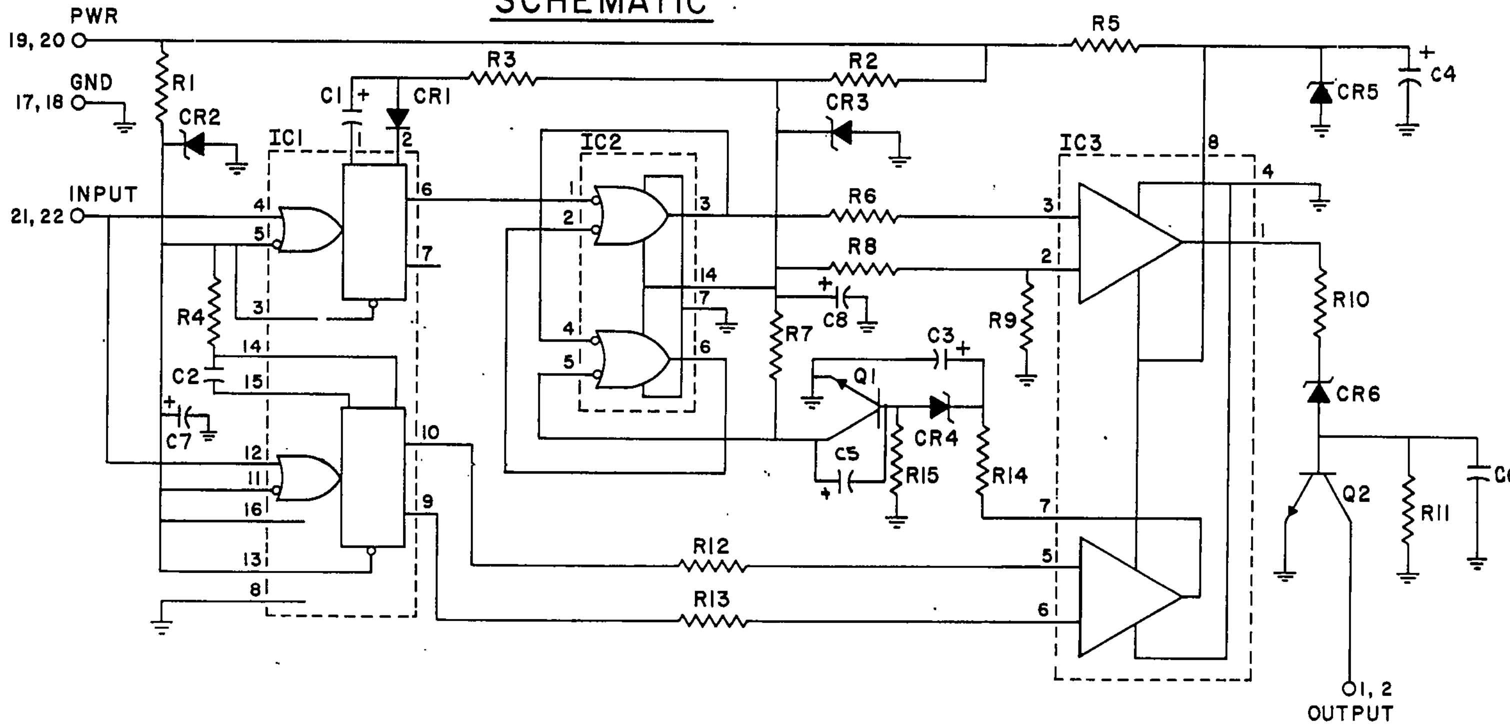

## SPECIFICATIONS

| | |
|---|---|
| INPUT VOLTAGE | 300±100 MVAC |
| INPUT FREQUENCY | 0-800 HZ |
| VOLTAGE B+ | 24 ±6 VDC |
| OUTPUT CURRENT | |
| OUTPUT 1.2 | 100 MA MAX |
| OUTPUT 5.6 | 100 MA MAX |
| OUTPUT VOLTAGE | |
| OUTPUT 1.2 | $5V^{+0}_{-1}$ VDC |
| OUTPUT 5 6 | 24 ±6 VDC |

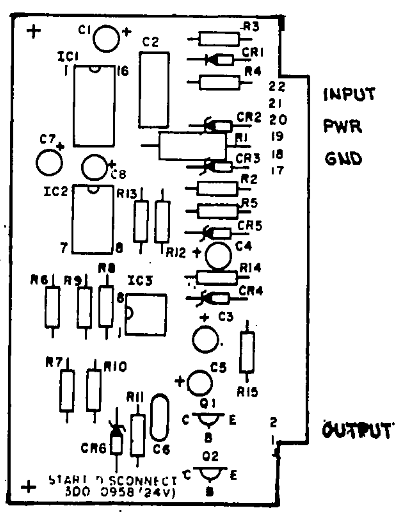
THE CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES AT AN INPUT FREQUENCY OF 700 HZ + 30 HZ

| | | |
|---|---|---|
| DATE 11-10-72 | Onan | DIVISION OF ONAN CORPORATION Minneapolis Minnesota |
| | MODULE -OVERSPEED SEN | |
| MODEL YB | DWG NO 300-0957 | DWG SIZE C |

## SCHEMATIC



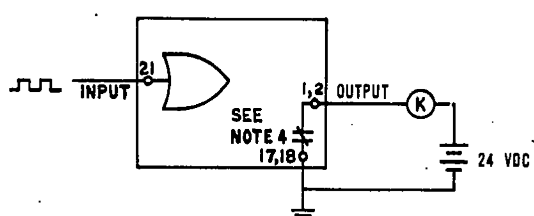

## MECHANICAL ASSY




## SPECIFICATIONS

| | |
|---|---|
| INPUT VOLTAGE | $5V^{+0}_{-1}$ SQ WAVE |
| INPUT FREQUENCY | 0-400 HZ |
| B+ POWER | 24 ±6 VDC |
| LOAD CURRENT | 100MA MAX |
| LOAD VOLTAGE | 24 ±6 VDC |

SYMBOL FOR SCHEMATIC DIAGRAM




THE CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT OPENS AT AN INPUT FREQUENCY OF 170 HZ ± 20 HZ AND CLOSES AT 10 ± 10 HZ

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

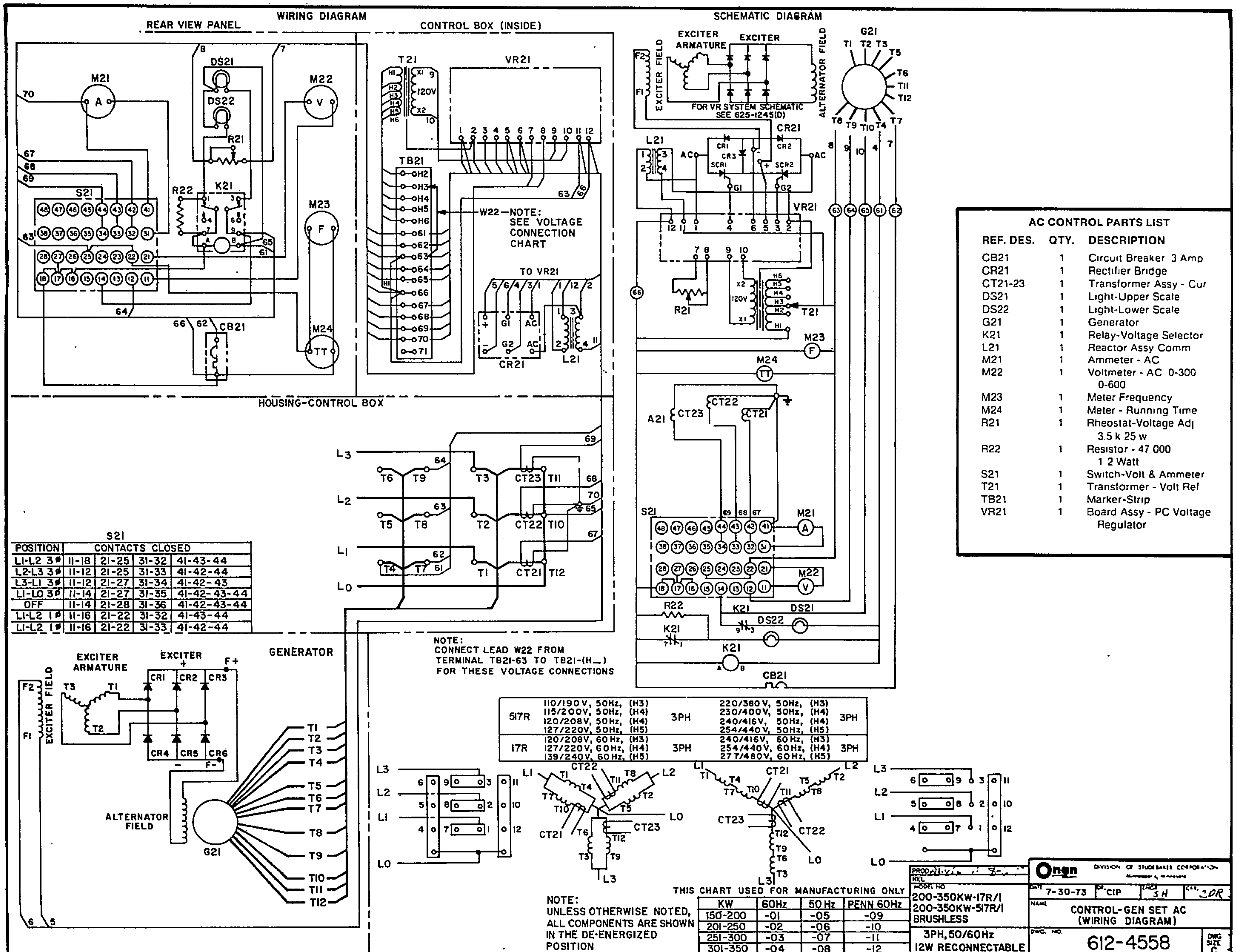
MODULE-STARTER DISC

DATE 11-8-72

MODEL YB

DWG NO. 300-0958

DWG SIZE C




| AC CONTROL PARTS LIST | | |
|---|---|---|
| REF. DES. | QTY. | DESCRIPTION |
| CB21 | 1 | Circuit Breaker 3 Amp |
| CR21 | 1 | Rectifier Bridge |
| CT21-23 | 1 | Transformer Assy - Cur |
| DS21 | 1 | Light-Upper Scale |
| DS22 | 1 | Light-Lower Scale |
| G21 | 1 | Generator |
| K21 | 1 | Relay-Voltage Selector |
| L21 | 1 | Reactor Assy Comm |
| M21 | 1 | Ammeter - AC |
| M22 | 1 | Voltmeter - AC 0-300 0-600 |
| M23 | 1 | Meter Frequency |
| M24 | 1 | Meter - Running Time |
| R21 | 1 | Rheostat-Voltage Adj 3.5 k 25 w |
| R22 | 1 | Resistor - 47 000 1 2 Watt |
| S21 | 1 | Switch-Volt & Ammeter |
| T21 | 1 | Transformer - Volt Ref |
| TB21 | 1 | Marker-Strip |
| VR21 | 1 | Board Assy - PC Voltage Regulator |

S21

| POSITION | CONTACTS CLOSED | | | |
|---|---|---|---|---|
| L1-L2 3ø | 11-18 | 21-25 | 31-32 | 41-43-44 |
| L2-L3 3ø | 11-12 | 21-25 | 31-33 | 41-42-44 |
| L3-L1 3ø | 11-12 | 21-27 | 31-34 | 41-42-43 |
| L1-L0 3ø | 11-14 | 21-27 | 31-35 | 41-42-43-44 |
| OFF | 11-14 | 21-28 | 31-36 | 41-42-43-44 |
| L1-L2 1ø | 11-16 | 21-22 | 31-32 | 41-43-44 |
| L1-L2 1ø | 11-16 | 21-22 | 31-33 | 41-42-44 |

NOTE:
CONNECT LEAD W22 FROM TERMINAL TB21-63 TO TB21-(H__) FOR THESE VOLTAGE CONNECTIONS

| | | | | |
|---|---|---|---|---|
| 517R | 110/190V, 50Hz, (H3)<br>115/200V, 50Hz, (H4)<br>120/208V, 50Hz, (H4)<br>127/220V, 50Hz, (H5) | 3PH | 220/380V, 50Hz, (H3)<br>230/400V, 50Hz, (H4)<br>240/416V, 50Hz, (H4)<br>254/440V, 50Hz, (H5) | 3PH |
| 17R | 120/208V, 60Hz, (H3)<br>127/220V, 60Hz, (H4)<br>139/240V, 60Hz, (H5) | 3PH | 240/416V, 60Hz, (H3)<br>254/440V, 60Hz, (H4)<br>277/480V, 60Hz, (H5) | 3PH |

NOTE:
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

THIS CHART USED FOR MANUFACTURING ONLY

| KW | 60Hz | 50 Hz | PENN 60Hz |
|---|---|---|---|
| 150-200 | -01 | -05 | -09 |
| 201-250 | -02 | -06 | -10 |
| 251-300 | -03 | -07 | -11 |
| 301-350 | -04 | -08 | -12 |

MODEL NO 200-350KW-17R/1 200-350KW-517R/1 BRUSHLESS
3PH, 50/60Hz 12W RECONNECTABLE

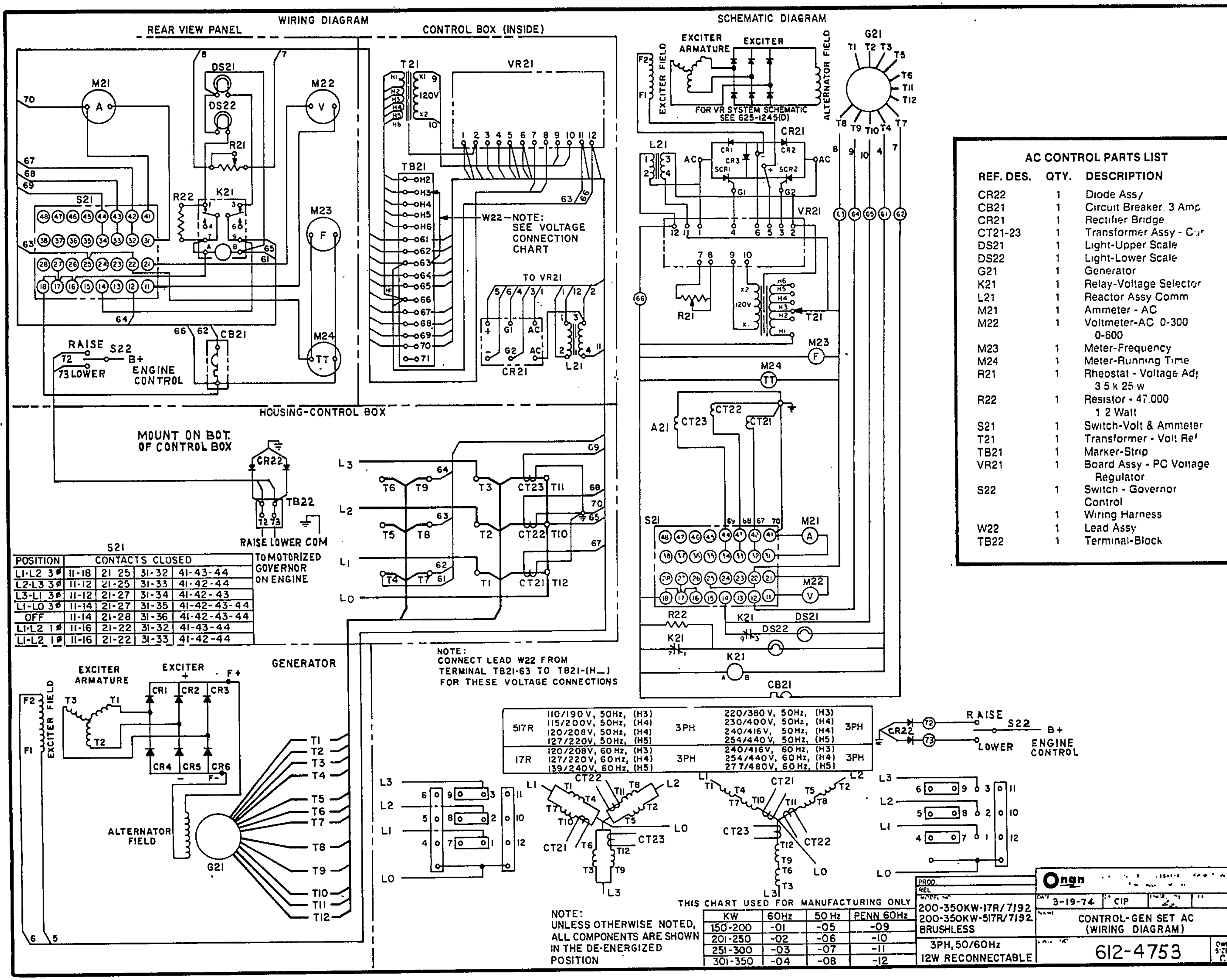
Onan DIVISION OF STUDEBAKER CORPORATION

DATE 7-30-73

NAME CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG. NO. 612-4558

DWG SIZE C




S21

| POSITION | CONTACTS CLOSED | | | |
|---|---|---|---|---|
| L1-L2 3ø | 11-18 | 21-25 | 31-32 | 41-43-44 |
| L2-L3 3ø | 11-12 | 21-25 | 31-33 | 41-42-44 |
| L3-L1 3ø | 11-12 | 21-27 | 31-34 | 41-42-43 |
| L1-L0 3ø | 11-14 | 21-27 | 31-35 | 41-42-43-44 |
| OFF | 11-14 | 21-28 | 31-36 | 41-42-43-44 |
| L1-L2 1ø | 11-16 | 21-22 | 31-32 | 41-43-44 |
| L1-L2 1ø | 11-16 | 21-22 | 31-33 | 41-42-44 |

| | | | | |
|---|---|---|---|---|
| 517R | 110/190V, 50Hz, (H3)<br>115/200V, 50Hz, (H4)<br>120/208V, 50Hz, (H4)<br>127/220V, 50Hz, (H5) | 3PH | 220/380V, 50Hz, (H3)<br>230/400V, 50Hz, (H4)<br>240/416V, 50Hz, (H4)<br>254/440V, 50Hz, (H5) | 3PH |
| 17R | 120/208V, 60Hz, (H3)<br>127/220V, 60Hz, (H4)<br>139/240V, 60Hz, (H5) | 3PH | 240/416V, 60Hz, (H3)<br>254/440V, 60Hz, (H4)<br>277/480V, 60Hz, (H5) | 3PH |

## AC CONTROL PARTS LIST

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| CR22 | 1 | Diode Assy |
| CB21 | 1 | Circuit Breaker 3 Amp |
| CR21 | 1 | Rectifier Bridge |
| CT21-23 | 1 | Transformer Assy - Cur |
| DS21 | 1 | Light-Upper Scale |
| DS22 | 1 | Light-Lower Scale |
| G21 | 1 | Generator |
| K21 | 1 | Relay-Voltage Selector |
| L21 | 1 | Reactor Assy Comm |
| M21 | 1 | Ammeter - AC |
| M22 | 1 | Voltmeter-AC 0-300 0-600 |
| M23 | 1 | Meter-Frequency |
| M24 | 1 | Meter-Running Time |
| R21 | 1 | Rheostat - Voltage Adj 3 5 k 25 w |
| R22 | 1 | Resistor - 47,000 1 2 Watt |
| S21 | 1 | Switch-Volt & Ammeter |
| T21 | 1 | Transformer - Volt Ref |
| TB21 | 1 | Marker-Strip |
| VR21 | 1 | Board Assy - PC Voltage Regulator |
| S22 | 1 | Switch - Governor Control |
| | 1 | Wiring Harness |
| W22 | 1 | Lead Assy |
| TB22 | 1 | Terminal-Block |

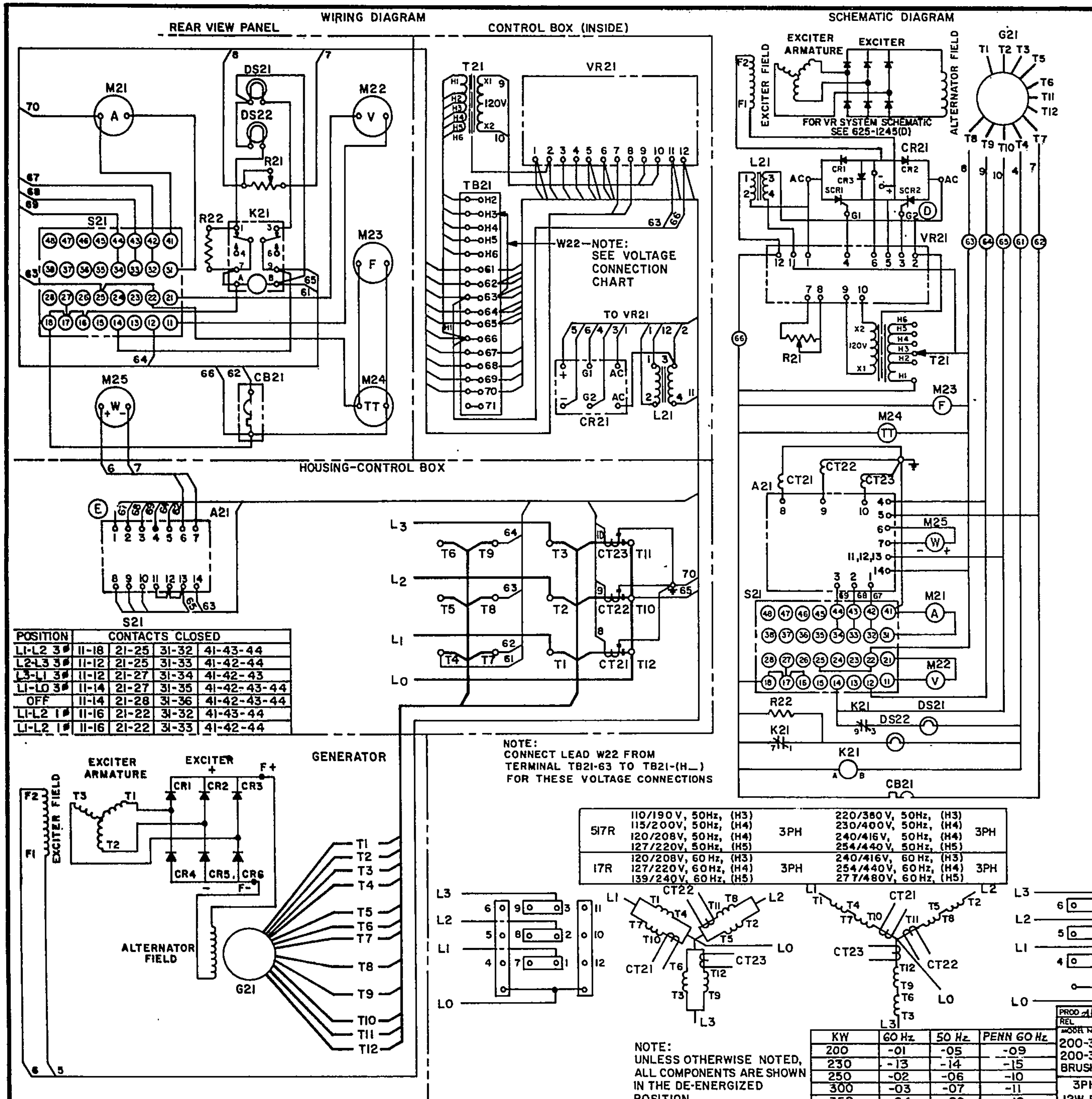
NOTE:
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

THIS CHART USED FOR MANUFACTURING ONLY

| KW | 60Hz | 50 Hz | PENN 60Hz |
|---|---|---|---|
| 150-200 | -01 | -05 | -09 |
| 201-250 | -02 | -06 | -10 |
| 251-300 | -03 | -07 | -11 |
| 301-350 | -04 | -08 | -12 |

Onan

| | | | |
|---|---|---|---|
| PROD<br>REL | | | |
| 200-350KW-17R/7192<br>200-350KW-517R/7192<br>BRUSHLESS | 3-19-74 | CIP | |
| | CONTROL-GEN SET AC<br>(WIRING DIAGRAM) | | |
| 3PH, 50/60Hz<br>12W RECONNECTABLE | 612-4753 | DWG SIZE C | |




| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A21 | 1 | Watt Transducer |
| CB21 | 1 | Circuit Breaker 3 Amp |
| CR21 | 1 | Rectifier Bridge |
| CT21-23 | 1 | Transformer Assy - Cur |
| DS21 | 1 | Light Upper Scale |
| DS22 | 1 | Light Lower Scale |
| G21 | 1 | Generator |
| K21 | 1 | Relay - Voltage Selector |
| L21 | 1 | Reactor Assy Comm |
| M21 | 1 | Ammeter - AC |
| M22 | 1 | Voltmeter - AC 0-300. 0-600 |
| M23 | 1 | Meter - Frequency |
| M24 | 1 | Meter - Running Time |
| M25 | 1 | Wattmeter - AC |
| R21 | 1 | Rheostat - Voltage Adj 3 5 K 25 W |
| R22 | 1 | 1 Resistor 47 000 1 2 W |
| S21 | 1 | Switch - Volt & Ammeter |
| T21 | 1 | Transformer - Volt - Ref |
| TB21 | 1 | Marker Strip |
| VR21 | 1 | PC Board Assy - Voltage Regulator |

S21

| POSITION | CONTACTS CLOSED | | | |
|---|---|---|---|---|
| L1-L2 3φ | 11-18 | 21-25 | 31-32 | 41-43-44 |
| L2-L3 3φ | 11-12 | 21-25 | 31-33 | 41-42-44 |
| L3-L1 3φ | 11-12 | 21-27 | 31-34 | 41-42-43 |
| L1-L0 3φ | 11-14 | 21-27 | 31-35 | 41-42-43-44 |
| OFF | 11-14 | 21-28 | 31-36 | 41-42-43-44 |
| L1-L2 1φ | 11-16 | 21-22 | 31-32 | 41-43-44 |
| L1-L2 1φ | 11-16 | 21-22 | 31-33 | 41-42-44 |

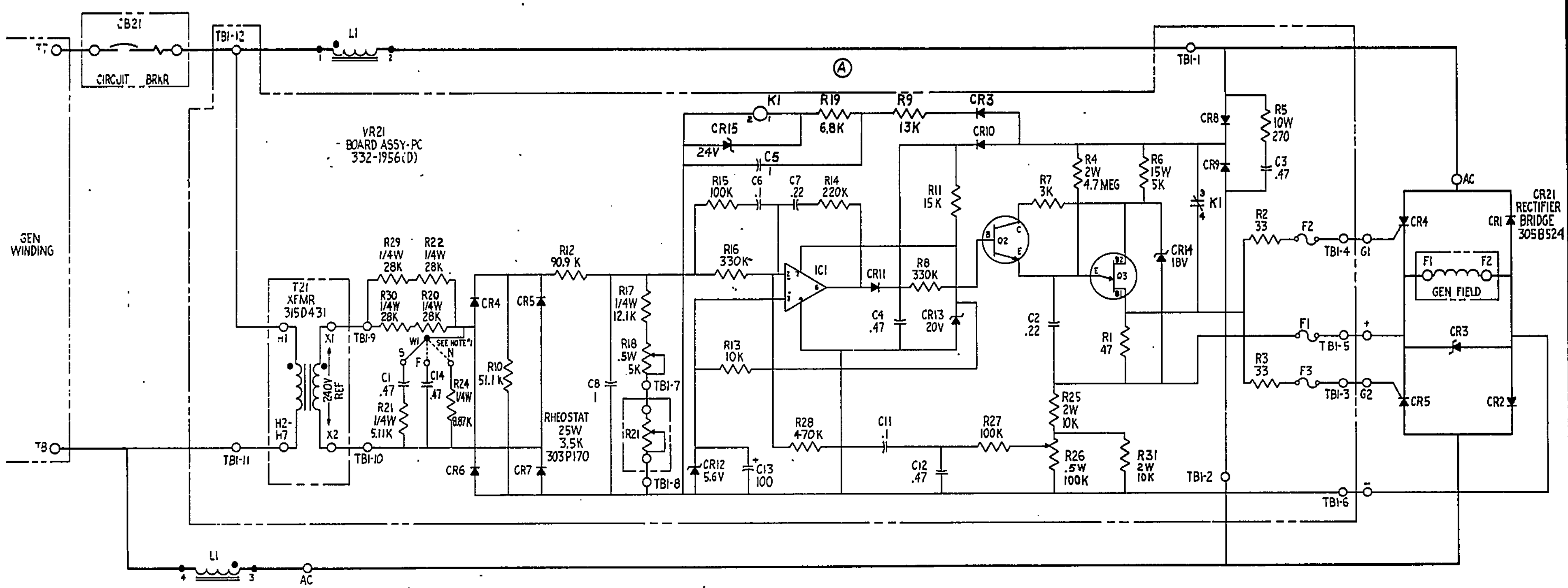
NOTE:
CONNECT LEAD W22 FROM TERMINAL TB21-63 TO TB21-(H_) FOR THESE VOLTAGE CONNECTIONS

| | | | | |
|---|---|---|---|---|
| 517R | 110/190V, 50Hz, (H3)<br>115/200V, 50Hz, (H4)<br>120/208V, 50Hz, (H4)<br>127/220V, 50Hz, (H5) | 3PH | 220/380V, 50Hz, (H3)<br>230/400V, 50Hz, (H4)<br>240/416V, 50Hz, (H4)<br>254/440V, 50Hz, (H5) | 3PH |
| 17R | 120/208V, 60Hz, (H3)<br>127/220V, 60Hz, (H4)<br>139/240V, 60Hz, (H5) | 3PH | 240/416V, 60Hz, (H3)<br>254/440V, 60Hz, (H4)<br>277/480V, 60Hz, (H5) | 3PH |

NOTE:
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

| KW | 60 Hz | 50 Hz | PENN 60 Hz |
|---|---|---|---|
| 200 | -01 | -05 | -09 |
| 230 | -13 | -14 | -15 |
| 250 | -02 | -06 | -10 |
| 300 | -03 | -07 | -11 |
| 350 | -04 | -08 | -12 |

| | |
|---|---|
| PROD REL | 8-6-73 |
| MODEL NO | 200-350KW-17R/7686<br>200-350KW-517R/7686<br>BRUSHLESS<br>3PH, 50/60Hz<br>12W RECONNECTABLE |
| Onan | DIVISION OF STUDEBAKER CORPORATION |
| DATE | 7-30-73 |
| DR | CIP |
| CHKD | CDR |
| NAME | CONTROL-GEN SET AC (WIRING DIAGRAM) |
| DWG NO | 612-4795 |
| DWG SIZE | C |




NOTES

1 CONNECTIONS:
W1-S SEMI-FREQUENCY SENSITIVE
W1-F FREQUENCY SENSITIVE
W1-N NON-FREQUENCY SENSITIVE

2 ALL PART NUMBERS AND VALUES ARE REFERENCE ONLY

3 ALL RESISTORS 1 2 WATT EXCEPT WHERE NOTED

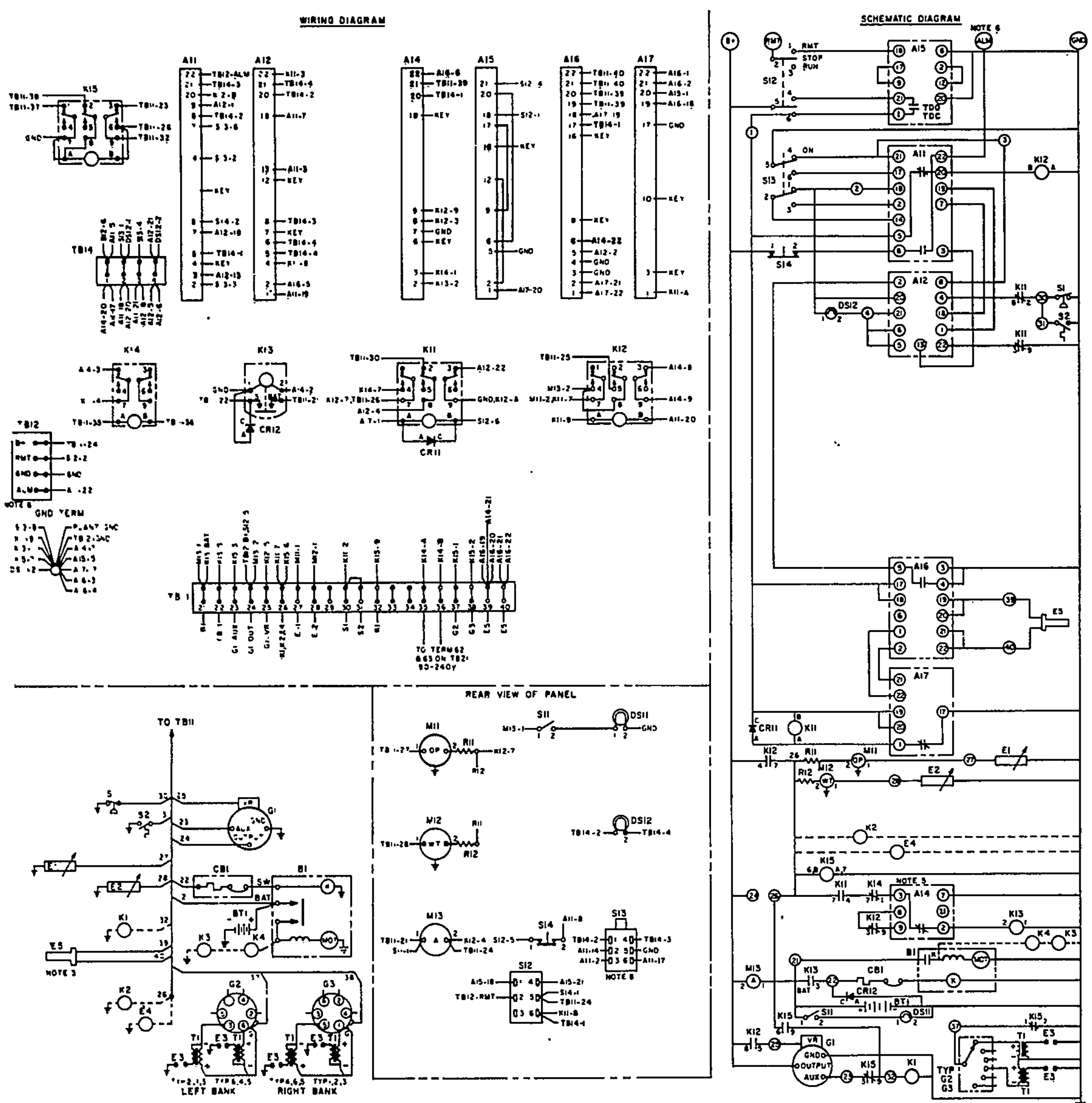
4 ALL CAPACITOR RATING IN MICROFARADS

5 FOR TYPE AND RATING OF SEMI CONDUCTORS SEE INDIVIDUAL ASSEMBLY MATERIAL LISTS

Onan DIVISION OF ONAN CORPORATION

SCHEMATIC DIAG-VR SYSTEM

CLASS B BRUSHLESS EXCITER 625-1440 D




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START.........0.5 TO 10 SECONDS
   STOP..........0.5 TO 5 MINUTES
   TOLERANCE.... ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510 ± 60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100 ± 90 RPM

**ENGINE PARTS LIST (REF)**

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker, 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E3 | 12 | Spark Plug |
| *E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| G2,3 | 2 | Magneto |
| *K1 | 1 | Solenoid-Fuel |
| *K2 | 1 | Solenoid-Water |
| K3,4 | 2 | Valve-Gas |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| T1 | 12 | Coil-Ignition |

**CONTROL BOX PARTS LIST (REF)**

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11,12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Fault |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Stop |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |

* - When Used

Onan

2-26-73 CIP

WF-R/IC

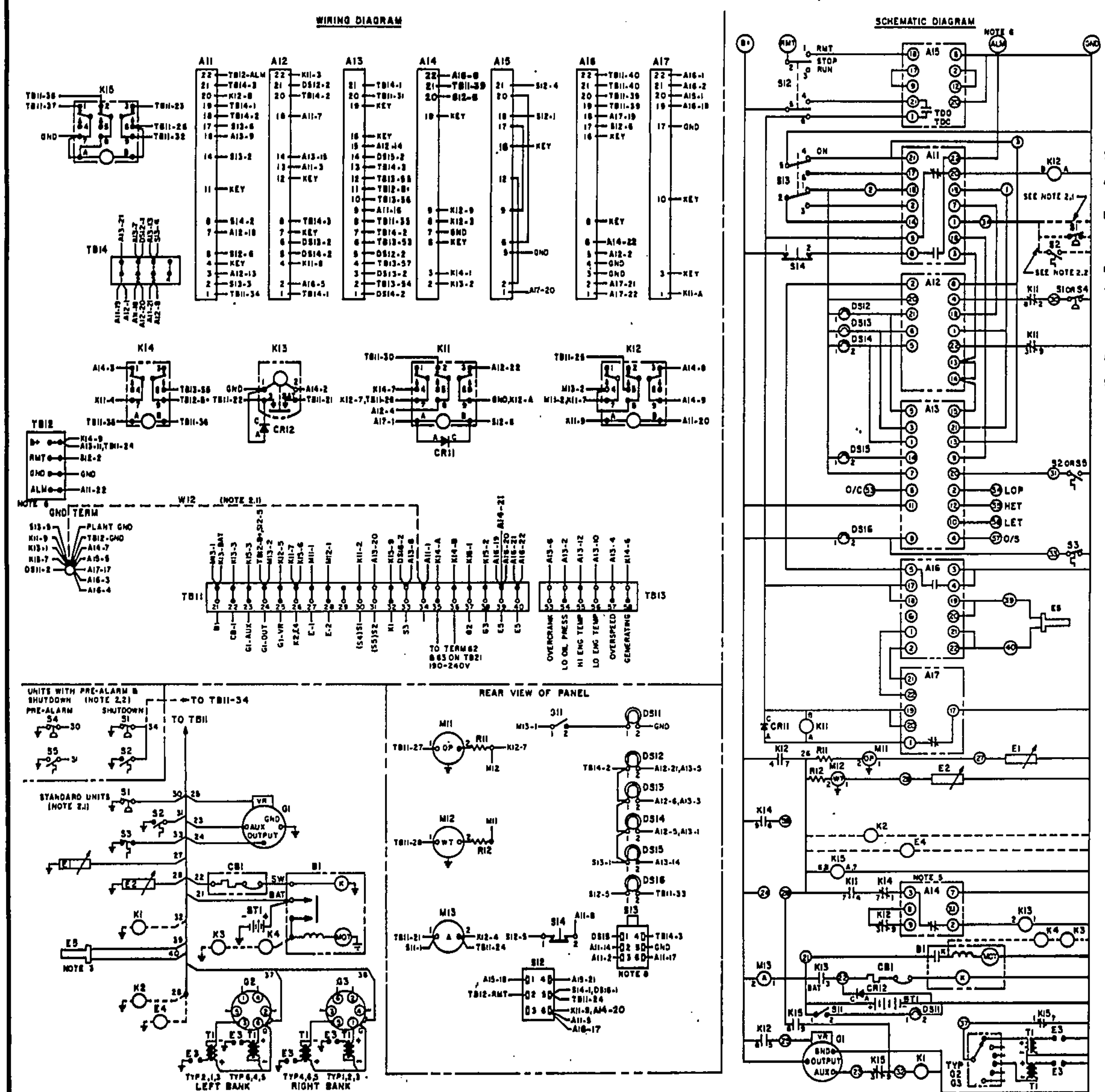
CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM)

2 WIRE REMOTE STARTING

6120

612-4546

D




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.

2. SHUTDOWNS AND ALARMS.
   - 2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   - 2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.

3. MAGNETIC SENSORS (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050

4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.

5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.

6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX

7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START·········0.5 TO 10 SECONDS
   STOP·········0.5 TO 5 MINUTES
   TOLERANCE···· ±20%

8. S13 MUST BE MOUNTED WITH SOLDER TERM UP

9. STARTER DISCONNECT 510 ± 60RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100 ± 50RPM

## ENGINE PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E3 | 12 | Spark Plug |
| *E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| G2,3 | 2 | Magneto |
| *K1 | 1 | Solenoid-Fuel |
| *K2 | 1 | Solenoid-Water |
| K3,4 | 2 | Valve-Gas |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| S3 | 1 | Switch-Low Water Temp |
| S4 | 1 | Switch-Low Oil Pressure (Pre-Alarm) |
| S5 | 1 | Switch-Hi Water Temp (Pre-Alarm) |
| T1 | 12 | Coil-Ignition |

## CONTROL BOX PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A13 | 1 | Module-Remote Indicator |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11,12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Overcrank |
| DS13 | 1 | Lamp-Overspeed |
| DS14 | 1 | Lamp-Low Oil Pres |
| DS15 | 1 | Lamp-Hi Eng Temp |
| DS16 | 1 | Lamp-Lo Eng Temp |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Stop |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |
| TB13 | 1 | Terminal Block |

* - When Used

Onan

2-8-73 CIP

WF-R/9222C

CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM)

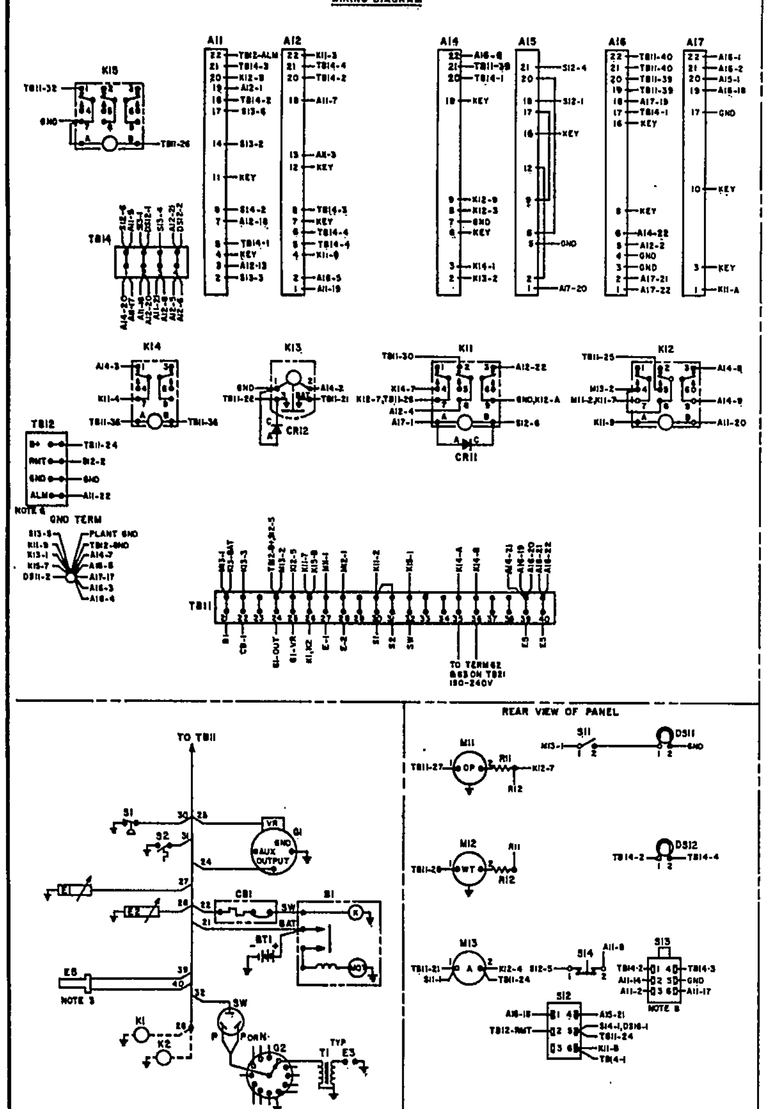
2 WIRE REMOTE STARTING

6/20

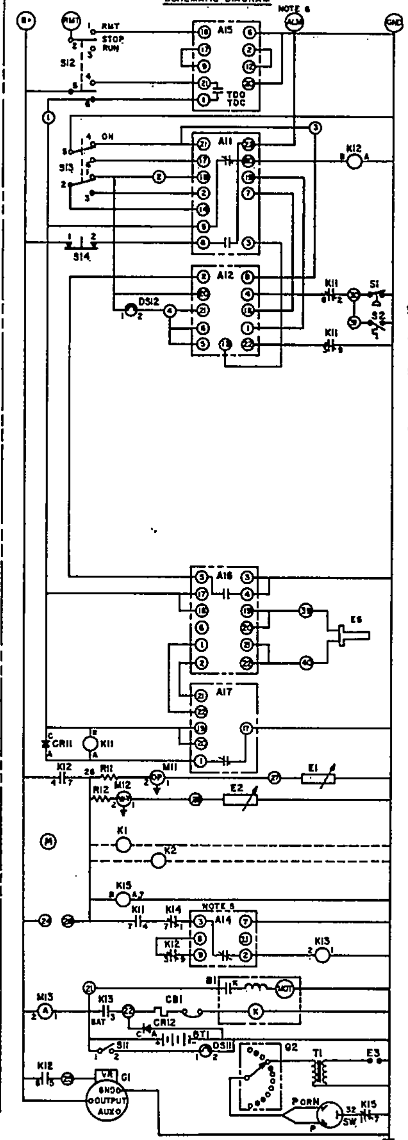
612-4547

D

WIRING DIAGRAM




SCHEMATIC DIAGRAM




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .080/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START.......... 0.5 TO 10 SECONDS
   STOP.......... 0.5 TO 5 MINUTES
   TOLERANCE.... ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90RPM

**ENGINE PARTS LIST (REF)**

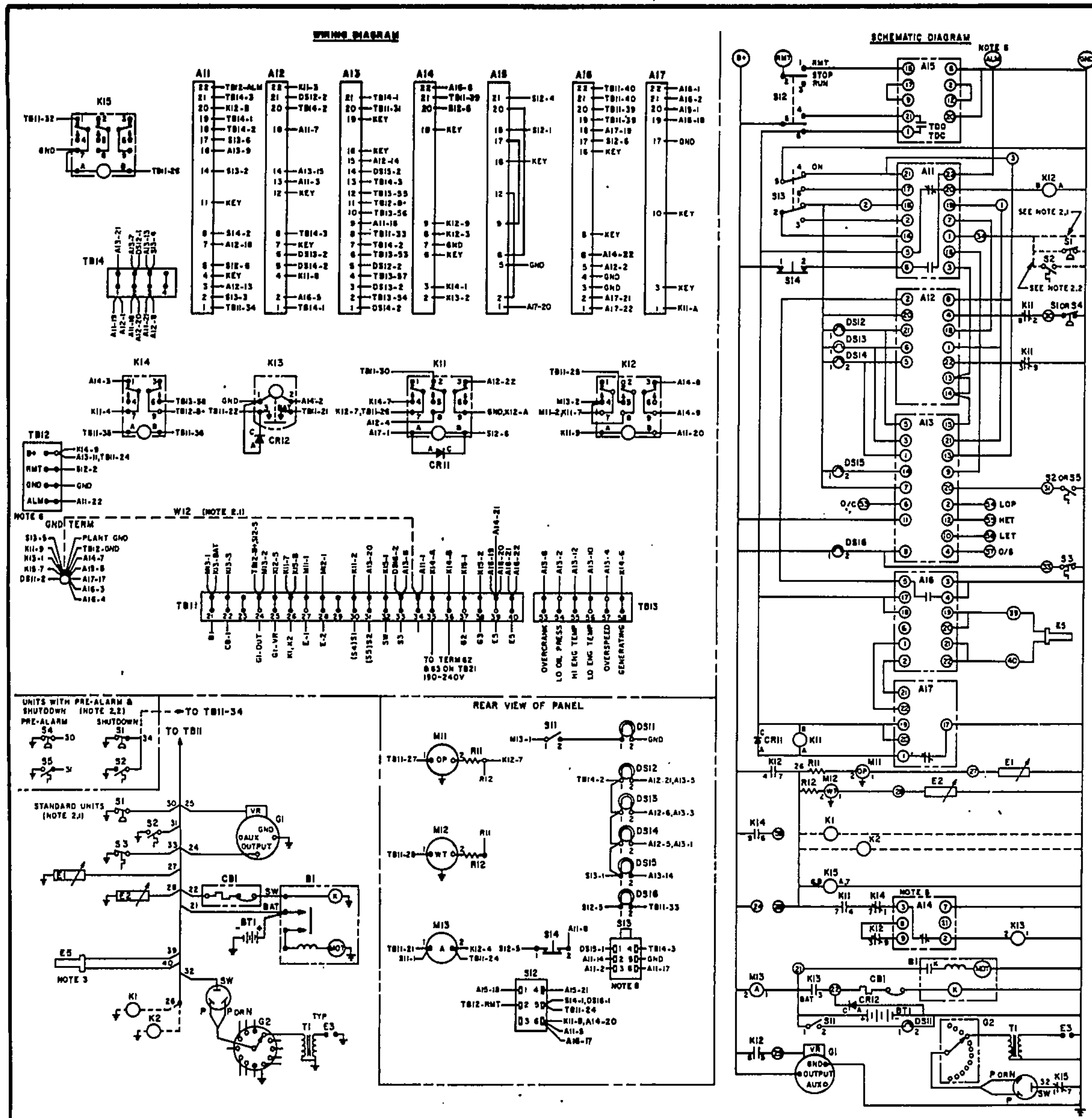
| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker, 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E3 | 12 | Spark Plug |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| G2 | 1 | Magneto & Ignition Isolator |
| *K1 | 1 | Solenoid |
| *K2 | 1 | Solenoid-Water |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| T1 | 12 | Coil-Ignition |

**CONTROL BOX PARTS LIST (REF)**

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11,12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Fault |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Stop |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |

* - When Used

| | | |
|---|---|---|
| FT-R/IC | 2-27-73 | CIP |
| | CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM) | |
| 2 WIRE REMOTE STARTING | 6120 | 612-4548 D |



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS.
   - 2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   - 2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .080/.050
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START.......... 0.5 TO 10 SECONDS
   STOP.......... 0.5 TO 5 MINUTES
   TOLERANCE.... ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER [redacted]
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90RPM

## ENGINE PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E3 | 12 | Spark Plug |
| E5 | 1 | Sensor-Speed Mag Ref |
| G1 | 1 | Alternator & Regulator |
| G2 | 1 | Magneto |
| *K1 | 1 | Solenoid-Fuel |
| *K2 | 1 | Solenoid-Water |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| S3 | 1 | Switch-Low Water Temp |
| S4 | 1 | Switch-Low Oil Pressure Pre-Alarm |
| S5 | 1 | Switch-Hi Water Temp Pre-Alarm |
| T1 | 12 | Coil-Ignition |

## CONTROL BOX PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A13 | 1 | Module-Remote Indicator |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Dis |
| CR11,12 | 2 | Diode-Rect |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Overcrank |
| DS13 | 1 | Lamp-Overspeed |
| DS14 | 1 | Lamp-Low Oil Press |
| DS15 | 1 | Lamp-Hi Eng Temp |
| DS16 | 1 | Lamp-Lo Eng Temp |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Stop |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |
| TB13 | 1 | Terminal Block |

* - When Used

FT-R/9222C

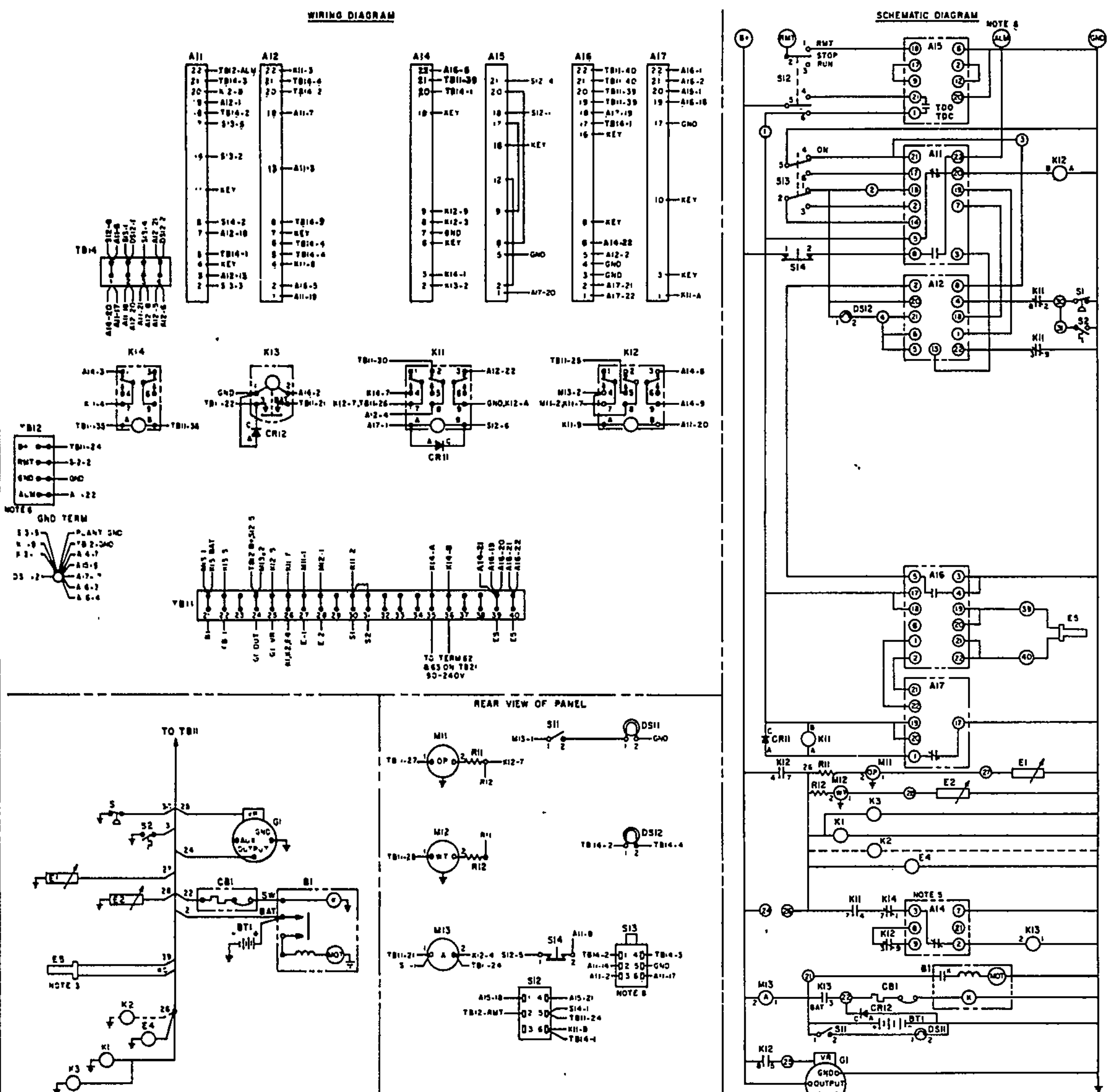
2 WIRE REMOTE STARTING

Onan

2-20-73 CP

CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM)

6120 612-4549 D




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .080/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START----------0.5 TO 10 SECONDS
   STOP----------0.5 TO 5 MINUTES
   TOLERANCE----±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 810±80 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100± [illegible] RPM

## ENGINE PARTS LIST (REF)

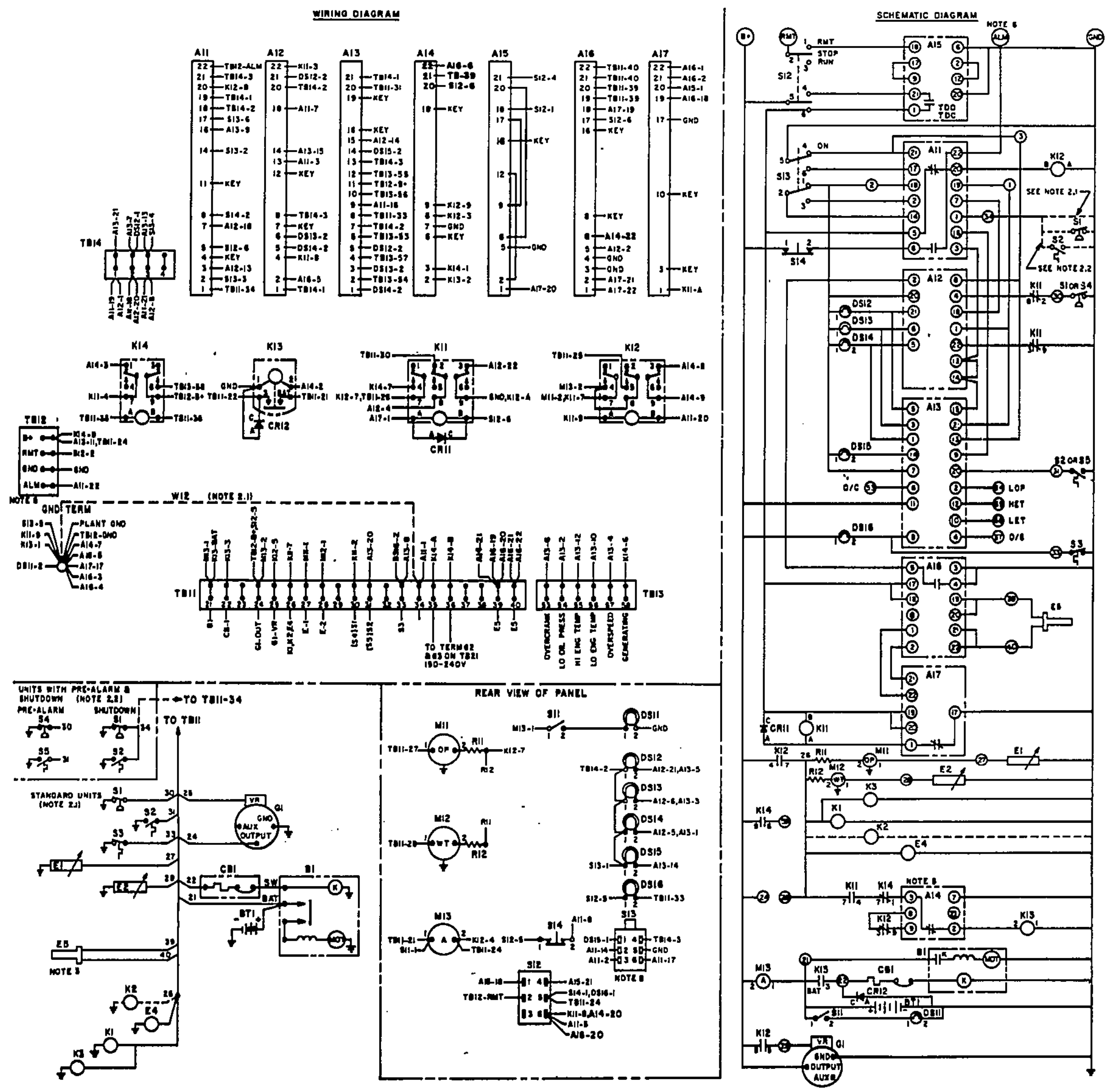
| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker. 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| K1 | 1 | Solenoid-Eng Stoping |
| *K2 | 1 | Solenoid-Water |
| K3 | 1 | Sol-Eng Stopping |
| K4 | 1 | Solenoid-Air Inlet |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |

## CONTROL BOX PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11,12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Fault |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |

* - When Used

| | |
|---|---|
| Onan | |
| DYH-R/1B<br>DYG-R/1C<br>DFT-R/1D<br>DFU-R/1E | 1-31-73 · CIP<br>CONTROL-GEN SET ENG(24V DIESEL) (WIRING DIAGRAM) |
| 2 WIRE REMOTE STARTING | 612D · 612-4645 · D |




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS.
   2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOW IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START··········0.5 TO 10 SECONDS
   STOP··········0.5 TO 5 MINUTES
   TOLERANCE···· ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510 ± 50 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100 ± 50 RPM

## ENGINE PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag (Ref) |
| G1 | 1 | Alternator & Regulator |
| K1 | 1 | Solenoid-Eng Stopping |
| *K2 | 1 | Solenoid-Water |
| K3 | 1 | Sol-Eng Stopping DYB DYH Only |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| S3 | 1 | Switch-Low Water Temp |
| S4 | 1 | Switch-Low Oil Pressure (Pre-Alarm) |
| S5 | 1 | Switch-Hi Water Temp (Pre-Alarm) |

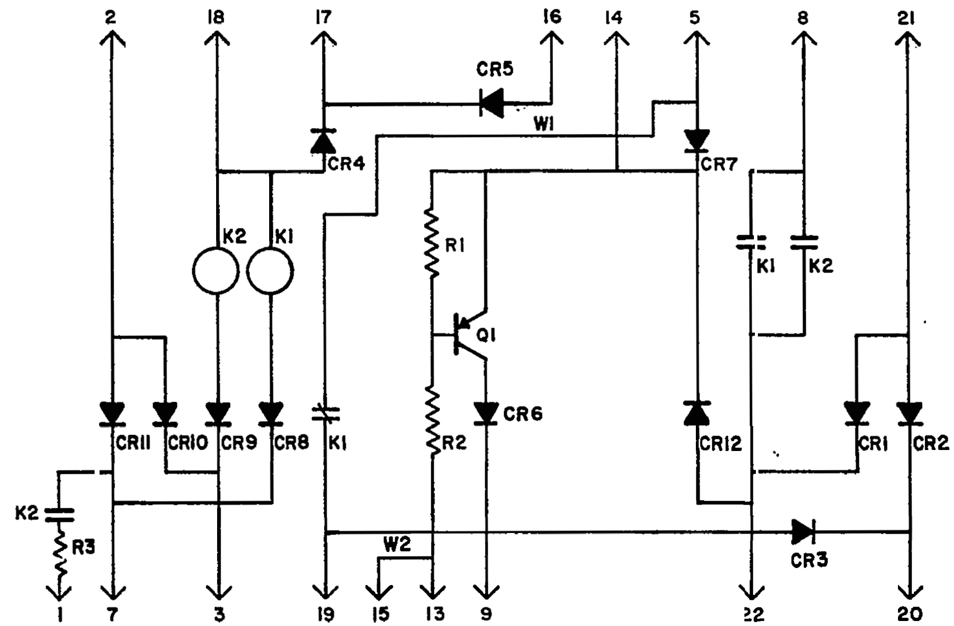
## CONTROL BOX PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A13 | 1 | Module-Remote Indicator |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11.12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Overcrank |
| DS13 | 1 | Lamp-Overspeed |
| DS14 | 1 | Lamp-Low Oil Press |
| DS15 | 1 | Lamp-Hi Eng Temp |
| DS16 | 1 | Lamp-Lo Eng Temp |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11.12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12.14 | 2 | Terminal Block |
| TB13 | 1 | Terminal Block |

* - When Used

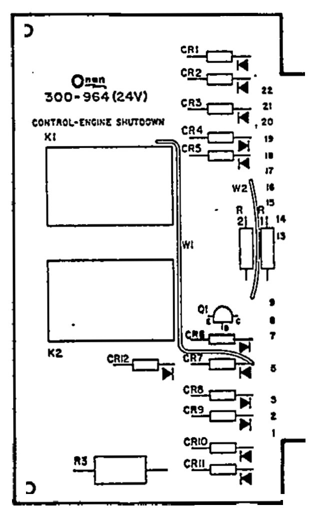
Onan
2-22-73
CONTROL-GEN SET EMK (24V DIESEL) (WIRING DIAGRAM)
2 WIRE REMOTE STARTING
612-4754

## SCHEMATIC DIAGRAM




| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| W1 W2 | 5 0" | Sleeving |
| W1. W2 | 5 0" | Wire No 20 |
| Q1 | 1 | Transistor - PNP (6533) |
| R3 | 1 | Resistor - 200 Ω 10% 2W |
| R2 | 1 | Resistor - 5600 Ω 10% 1/2W |
| R21 | 1 | Resistor - 10 000 Ω 10% 1/2W |
| K1 K2 | 2 | Relay |
| CR1 CR12 | 12 | Rectifier - Diode |

## MECHANICAL ASSY




DR Bushard
CKR CDR
SCALE NONE

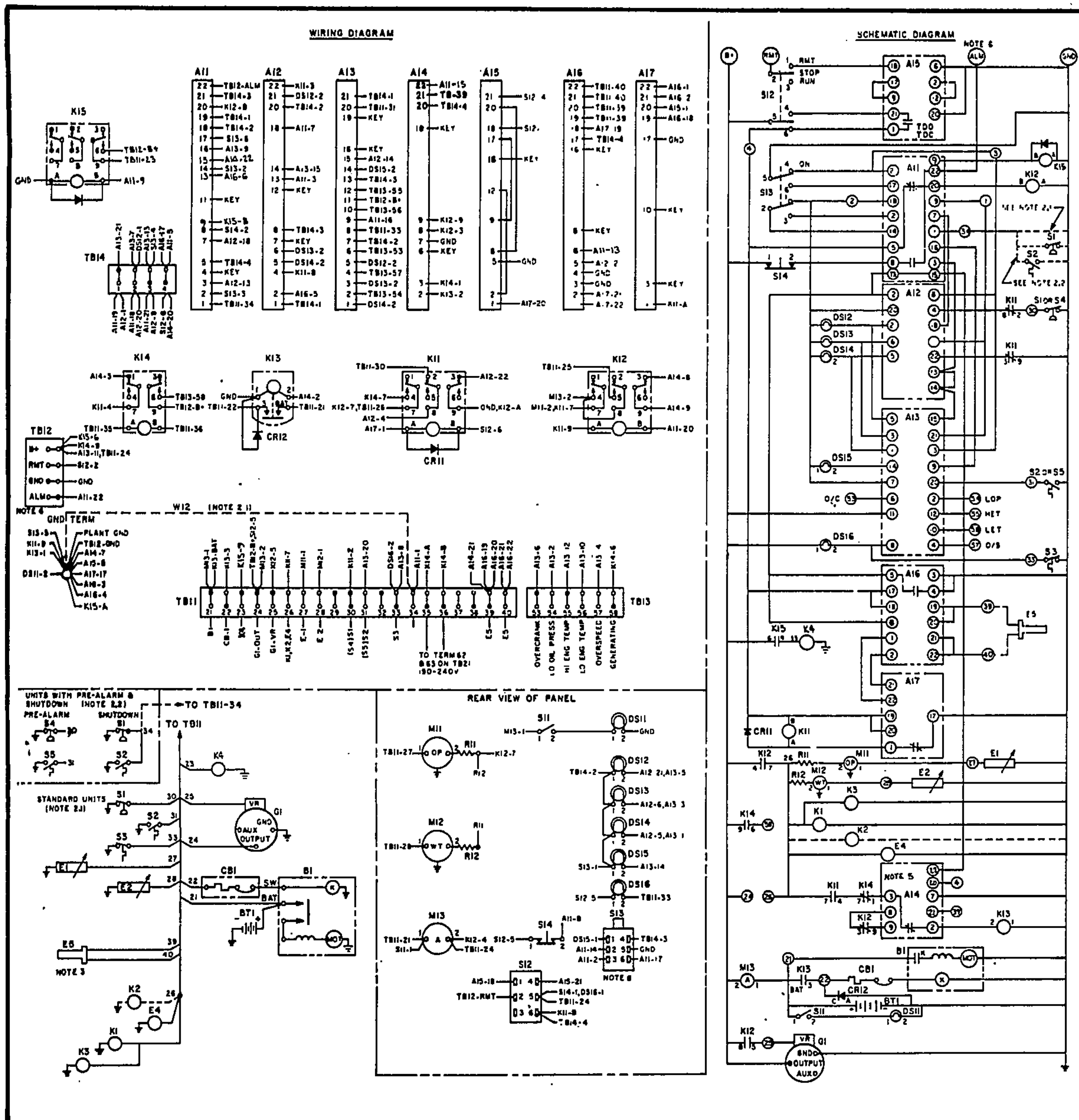
Onan
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

CONTROL-ENG SHUTDOWN

DHA

300-964

C




NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS,
   - 2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE #12 MUST CONNECT TB1-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   - 2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5. (WIRE W12 NOT REQUIRED THIS CONNECTION)
3. MAGNETIC SENSORS (E5) MOUNTED IN GEN. BELL GAP SETTING 060/050
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOW IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START.......... 0.5 TO 10 SECONDS
   STOP.......... 0.5 TO 5 MINUTES
   TOLERANCE.... ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510±60RPM
   STARTER RECONNECT LESS THAN 30RPM
   OVERSPEED SHUTDOWN 2100±90RPM

**ENGINE PARTS LIST (REF)**

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| K1 | 1 | Solenoid-Eng Stopping |
| *K2 | 1 | Solenoid-Water |
| K3 | 1 | Sol-Eng Stopping |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |
| S3 | 1 | Switch-Low Water Temp |
| S4 | 1 | Switch-Low Oil Pressure (Pre-Alarm) |
| S5 | 1 | Switch-Hi Water Temp (Pre-Alarm) |

**CONTROL BOX PARTS LIST (REF)**

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A13 | 1 | Module-Remote Indicator |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11,12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Overcrank |
| DS13 | 1 | Lamp-Overspeed |
| DS14 | 1 | Lamp-Low Oil Press |
| DS15 | 1 | Lamp-Hi Eng Temp |
| DS16 | 1 | Lamp-Lo Eng Temp |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Overspeed |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11,12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12,14 | 2 | Terminal Block |
| TB13 | 1 | Terminal Block |

* - When Used

DHA-R/9222 A

Onan

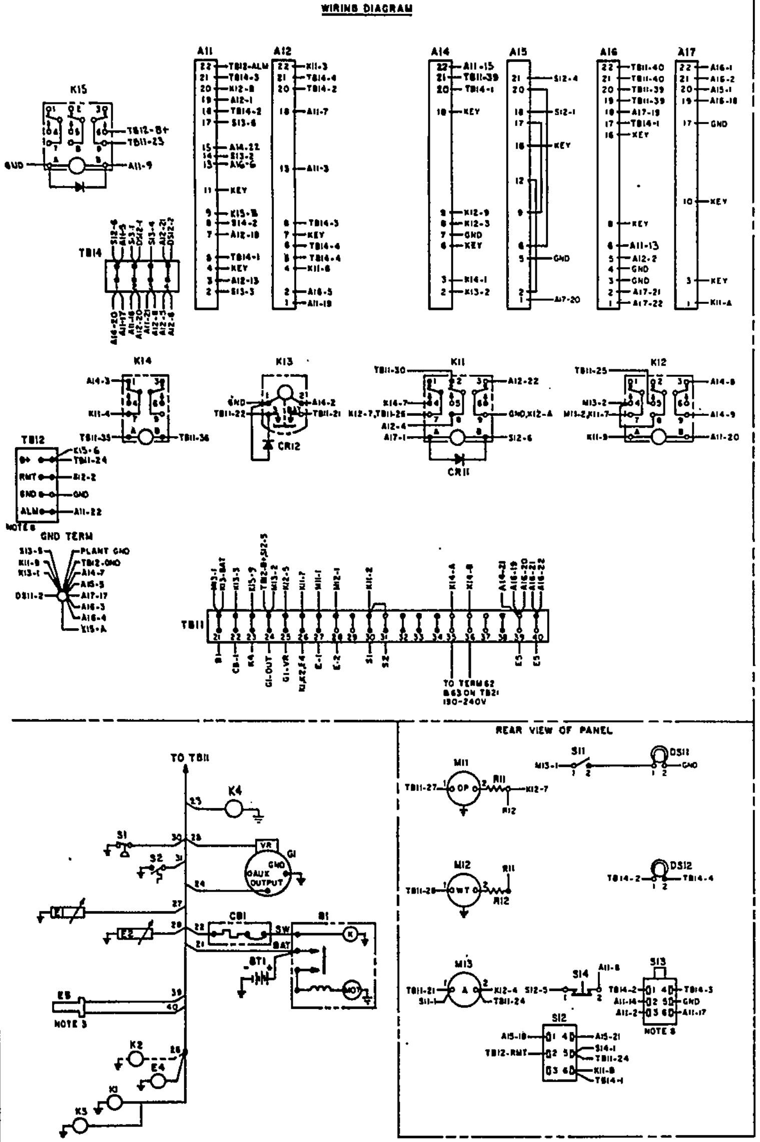
9-25-74

CONTROL-GEN SET ENG(24V DIESEL) (WIRING DIAGRAM)

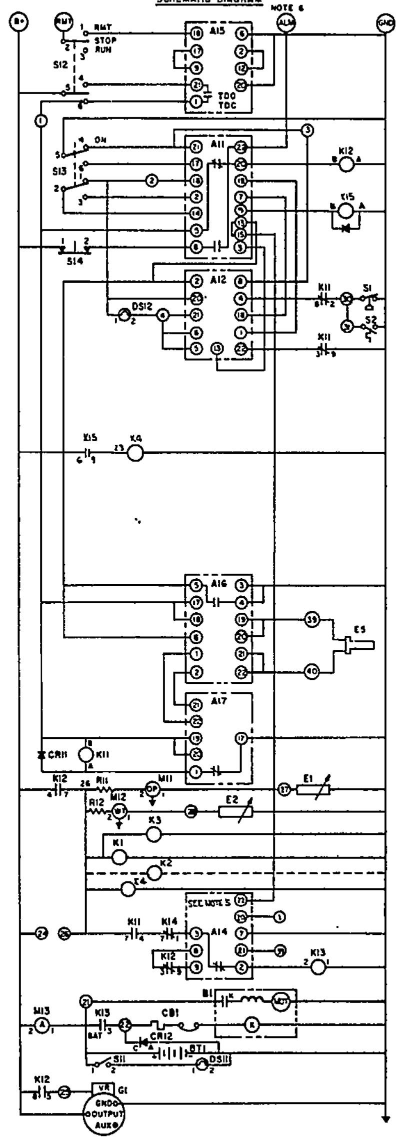
2 WIRE REMOTE STARTING

612-5048 D

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL AIR GAP SETTING .060/.050
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START---------0.5 TO 10 SECONDS
   STOP----------0.5 TO 5 MINUTES
   TOLERANCE----±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510 ± 60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100 ± 90 RPM

## ENGINE PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| B1 | 1 | Starter & Solenoid - Engine |
| BT1 | 1 | Battery-24 V |
| CB1 | 1 | Circuit Breaker 12.5 Amp |
| E1 | 1 | Sender-Oil Pressure |
| E2 | 1 | Sender-Water Temp |
| E4 | 1 | Fuel Pump |
| E5 | 1 | Sensor-Speed (Mag) (Ref) |
| G1 | 1 | Alternator & Regulator |
| K1 | 1 | Solenoid-Eng Stoping |
| *K2 | 1 | Solenoid-Water |
| K3 | 1 | Sol-Eng Stopping |
| K4 | 1 | Solenoid-Air Inlet |
| S1 | 1 | Switch-Low Oil Pressure |
| S2 | 1 | Switch-High Water Temp |

## CONTROL BOX PARTS LIST (REF)

| REF. DES. | QTY. | DESCRIPTION |
|---|---|---|
| A11 | 1 | Module-Engine Shutdown |
| A12 | 1 | Module-Engine Monitor |
| A14 | 1 | Module-Cranker |
| A15 | 1 | Module-TD Start-Stop |
| A16 | 1 | Module-Overspeed Sen |
| A17 | 1 | Module-Starter Disc |
| CR11.12 | 2 | Diode (Ref) |
| DS11 | 1 | Lamp-Panel |
| DS12 | 1 | Lamp-Fault |
| K11 | 1 | Relay-Start Disconnect |
| K12 | 1 | Relay-Ignition |
| K13 | 1 | Relay-Start Solenoid |
| K14 | 1 | Relay-Starter Protection |
| K15 | 1 | Relay-Overspeed |
| M11 | 1 | Gauge-Oil Pressure |
| M12 | 1 | Gauge-Water Temp |
| M13 | 1 | Ammeter-Charge 30-0-30 |
| R11.12 | 2 | Resistor-Gauge |
| S11 | 1 | Switch-Panel Light |
| S12 | 1 | Switch-Selector |
| S13 | 1 | Switch-Lamp Test |
| S14 | 1 | Switch-Alarm Reset |
| TB11 | 1 | Terminal Block |
| TB12.14 | 2 | Terminal Block |

* - When Used

Onan
9-25-74
DHA-R/1A
CONTROL-GEN SET DHC-24V DIESEL (WIRING DIAGRAM)
2 WIRE REMOTE STARTING
612-5049
D

Onan

Onan Corporation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
1-800-888-ONAN
612-574-5000 International Use
Telex: 275477
Fax: 612-574-8087