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Onan

Service Manual
25 to 180 kW
UR
Generators And Controls

Troubleshooting and Test Procedures For

- **Generators**
- **Regulator**
- **Controls**

900-0150
10-78
Printed in U.S.A.

Safety Precautions

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

WARNING ***This symbol is used throughout the manual to warn of possible serious personal injury.***

CAUTION ***This symbol refers to possible equipment damage.***

PROTECT AGAINST MOVING PARTS

Avoid moving parts of the unit. Avoid use of loose jackets, shirts or sleeves due to danger of becoming caught in moving parts.

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

If you must make adjustments 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.

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 codes. To avoid possible personal injury or equipment damage, a qualified electrician or an authorized service representative must perform installation and all service.

WARNING

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, a poisonous gas that might cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:

- ***Dizziness***
- ***Headache***
- ***Weakness and Sleepiness***
- ***Vomiting***
- ***Muscular Twitching***
- ***Throbbing in Temples***

If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use until it has been inspected.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent visual and audible inspections of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

UR

GENERATORS AND CONTROLS
25 kW - 180 kW

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ONAN RECOMMENDS THAT ALL SERVICE, INCLUDING INSTALLATION OF REPLACEMENT PARTS, BE PERFORMED BY QUALIFIED PERSONNEL.

INTRODUCTION

FOREWORD

This manual provides troubleshooting and repair information for ONAN series UR 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 prime mover; refer to the engine manufacturer's manual.

Repair information is not extensive because the plug-in solid-state printed circuit 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, whereby faulty modules can be returned and exchanged for good units. For more information, contact your distributor or the ONAN service department.

CAUTION **Application of meters or high heat soldering irons to modules by other than qualified personnel can result in unnecessary and expensive damage.**

This manual is arranged as follows:

1. **GENERATOR** - *Section I* **contains general specifications on the UR generator, troubleshooting guides and procedures for testing and repairing of the early UR generator with VR22 exciter regulator and general information on later UR generator.** *Section II* **contains troubleshooting information for the later model UR generator where the exciter diode rectifier assembly has been relocated into the control panel.** *Refer to Table 1 for a description of the appropriate section for your generator.*
2. **CONTROLS** - *Section III* **contains troubleshooting guides and procedures for testing and repairing the system controls. A description of the components and an analysis of the module circuitry is included.**

TEST EQUIPMENT

Most of the tests outlined in this manual can be performed with an AC-DC multimeter such as a Simpson 260 VOM.

Other suggested test instruments are —

- ONAN multitester Part No. 420-0303
- Wheatstone or Kelvin bridge

CAUTION **Exercise care when purchasing a foreign made VOM. Some units deliver +9VDC, others, +22VDC to the circuit under test on R x 1 scale. Maximum recommended voltage is +1.5VDC. Damage to solid state devices can result from excessive voltage application.**

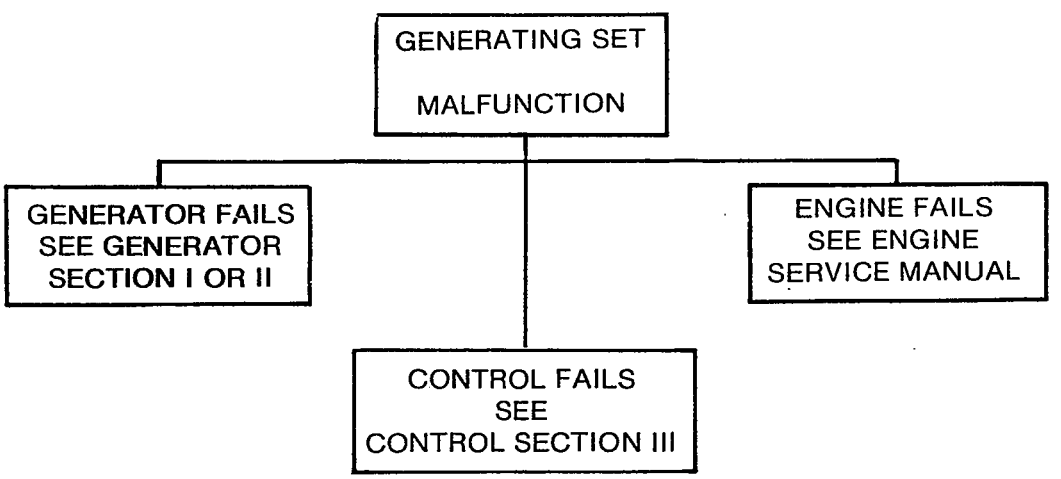


TABLE 1. GENERATOR SPECIFICATION BREAKDOWN

kW Model	Frequency	Section 1 Spec A Thru	Section 2 Begin Spec
25.0 EK	50 Hz	E	F
30.0 EK	60 Hz	D	F
Penn EK		E	F
25.0 DDA	50 Hz	—	A
30.0 DDB	60 Hz	—	A
30.0 DEH	60 Hz	D	G
25.0 MDEH	50 Hz	D	G
30.0 MDEH	60 Hz	C	G
Penn DEH		E	G
37.5 EM	50 Hz	E	F
45.0 EM	60 Hz	D	F
Penn EM		E	F
37.5 DEF	50 Hz	H	J
45.0 DEF	60 Hz	F	J
Penn DEF		G	J
37.5 DYJ	50 Hz	—	A
45.0 DYJ	60 Hz	—	A
40.0 DDB	50 Hz	—	A
50.0 DDB	60 Hz	—	A
40.0 DEG	50 Hz	G	H
50.0 DEG	60 Hz	E	H
Penn DEG		F	H
40.0 MDEG	50 Hz	F	H
50.0 MDEG	60 Hz	E	H
45.0 KB	50 Hz	R	S
55.0 KB	60 Hz	P	S
Penn KB		Q	S
50.0 DYA	50 Hz	E	F
60.0 DYA	60 Hz	C	F
Penn DYA		D	F
55.0 EN	60 Hz	—	A
70.0 EN	60 Hz	—	A

kW Model	Frequency	Section 1 Spec A Thru	Section 2 Begin Spec
55.0 KB	50 Hz	R	S
65.0 KB	60 Hz	P	S
Penn KB		Q	S
60.0 DYC	50 Hz	D	E
75.0 DYC	60 Hz	B	E
80.0 DYC	50 Hz	—	G
100.0 DYC	60 Hz	—	G
Penn DYC		C	E
70.0 KR	50 Hz	R	S
85.0 KR	60 Hz	P	S
Penn KR		Q	S
75.0 DYC	50 Hz	D	E
90.0 DYC	60 Hz	B	E
80.0 DYD	50 Hz	C	D
100.0 DYD	60 Hz	A	D
Penn DYD		B	D
95.0 WA	50 Hz	H	J
115.0 WA	60 Hz	G	J
100.0 DYD	50 Hz	C	D
125.0 DYD	60 Hz	A	D
Penn DYD		B	D
115.0 WE	50 Hz	B	—
140.0 WE	60 Hz	B	—
125.0 WE	50 Hz	B	—
150.0 WE	60 Hz	B	—
125.0 DYG	50 Hz	C	D
150.0 DYG	60 Hz	A	D
Penn DYG		B	D
130.0 DFE	50 Hz	—	H
155.0 DFE	60 Hz	—	H
Penn DFE		—	H
140.0 WB	50 Hz	K	L
170.0 WB	60 Hz	J	L
145.0 DYG	50 Hz	C	D
175.0 DYG	60 Hz	A	D
Penn DYG		B	D
150.0 DFE	50 Hz	—	H
180.0 DFE	60 Hz	—	H
Penn DFE		—	H

UR GENERATOR VOLTAGE/CURRENT OPTIONS

RATING		HERTZ		1-PHASE STANDARD	1-PHASE SPECIAL (B125)			3-PHASE													
		Code 515	Code 15	(2) (4)	(1)	(1)	(2)	(1)	(1)	(3)	(1)	(3)	(1)	(2)	(2)	(1)	(1)	(3)	(3)	(2)	(2) (4)
				120	110	115	120	110	115	120	110	127	115	120	139	220	230	240	254	277	347
kW	kVA	50	60	240	220	230	240	190	200	208	220	220	230	240	240	380	400	416	440	480	600
25.0	31.25	x			142	136		95	90	87	82	82	78			47	45	43	41		
30.0	37.50		x	156			156			104		98		90	90			52	49	45	36
37.5	46.88	x			213	204		142	135	130	123	123	118			71	68	65	62		
40.0	50.0	x			227	217		152	144	139	131	131	126			76	72	69	66		
45.0	56.25	x	x	234	256	245	234	171	162	156	148	148	141	135	135	85	81	78	74	68	54
50.0	62.5	x	x		284	272	260	190	180	173	164	164	157	150	150	95	90	87	82	75	60
55.0	68.75	x	x		313	299	286	209	198	191	180	180	173	165	165	104	99	95	90	83	66
60.0	75.0		x				313			208		197		180	180			104	98	90	72
62.5	78.13	x			355	340		237	226	217	205	205	196			119	113	108	103		
65.0	81.25		x				339			226		213		195	195			113	107	98	78
70.0	87.5	x	x		398	380	365	266	253	243	230	230	220	210	210	133	126	121	115	105	84
75.0	93.75	x	x		426	408	391	285	271	260	246	246	235	226	226	142	135	130	123	113	90
80.0	100.0	x			455	435		304	289	278	262	262	251			152	144	139	131		
85.0	106.25		x				443			295		279		256	256			147	139	128	102
90.0	112.5		x				469			312		295		271	271			156	148	135	108
95.0	118.75	x			540	516		361	343	330	312	312	298			180	171	165	156		
100.0	125.0	x	x		568	543	521	380	361	347	328	328	314	301	301	190	180	173	164	150	120
115.0	143.75	x	x				599	437	415	399	377	377	361	346	346	218	207	200	189	173	138
120.0	150.0						625														
125.0	156.25	x	x					475	451	434	410	410	392	376	376	237	226	217	205	188	150
130.0	162.50	x						494	469	451	426	426	408			247	235	226	213		
140.0	175.0	x	x					532	505	486	459	459	439	421	421	266	253	243	230	210	168
145.0	181.25	x						551	523	503	476	476	455			275	262	252	238		
150.0	187.5	x	x					570	541	520	492	492	471	451	451	285	271	260	246	226	180
155.0	193.75		x							538		508		466	466			269	254	233	186
170.0	212.5		x							590		558		511	511			295	279	256	204
175.0	218.75		x							607		574		526	526			304	287	263	210
180.0	225.25		x							625		591		542	542			313	296	271	217

(1) - 50 Hz only.
(2) - 60 Hz only.
(3) - 50- and 60 Hz
(4) - Not Reconnectible.

GENERATOR — SECTION I

GENERAL

There are two generator designs used on the UR series. They are basically the same except for the method of field excitation.

The **Static Exciter** (brush type) design uses a brush rig and collector rings for field excitation. This design was used on some of the earlier models within the range of 25 KW - 90 KW.

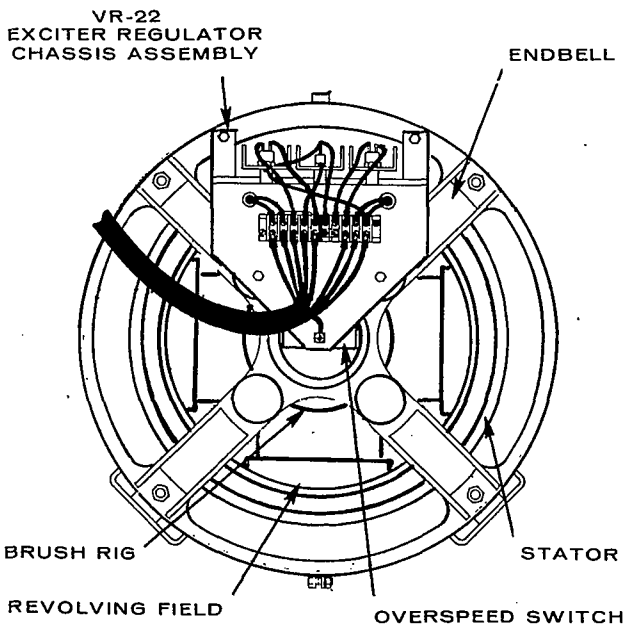
The **Brushless** design uses a rotating rectifier exciter assembly in place of the brush rig for field excitation. The brushless design is standard on all models from 25 KW - 175 KW.

Unless otherwise specified, the tests in this section apply to both designs.

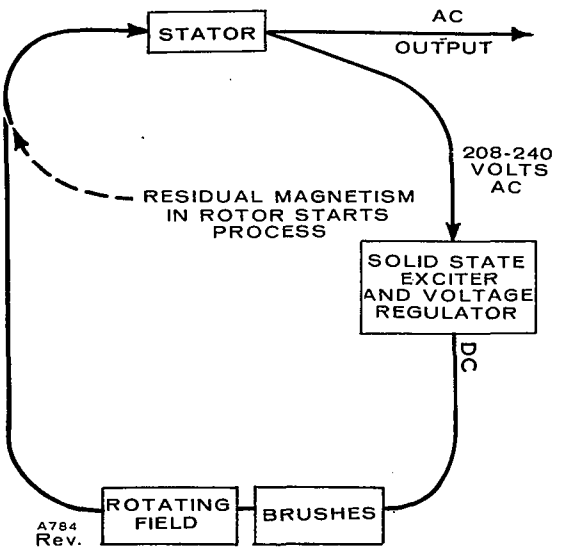
COMPONENT LOCATION

To gain access to generator, remove grille section below control box.

1. Exciter-regulator chassis assembly VR22 mounts on the rear portion of the generator; SCR's (silicon controlled rectifiers) and diodes are easily accessible for testing. See Figures 1-3.
2. On static-excited generators, brushes attach to the brush rig inside of end bell housing; inspect through large access holes in the end bell. See Figure 1.
3. On brushless models, rotating exciter assembly mounts directly behind exciter-regulator chassis assembly with all diodes accessible for servicing. See Figure 2.
4. Voltage-regulator PC Board VR21 (Printed Circuit Board) mounts inside the control box on the rear panel (left side); turn 1/4 turn fasteners on front of control box to gain access. See Figure 4.



GENERATOR END VIEW (GRILLE REMOVED)



EXCITATION SCHEMATIC

FIGURE 1. STATIC EXCITER DESIGN

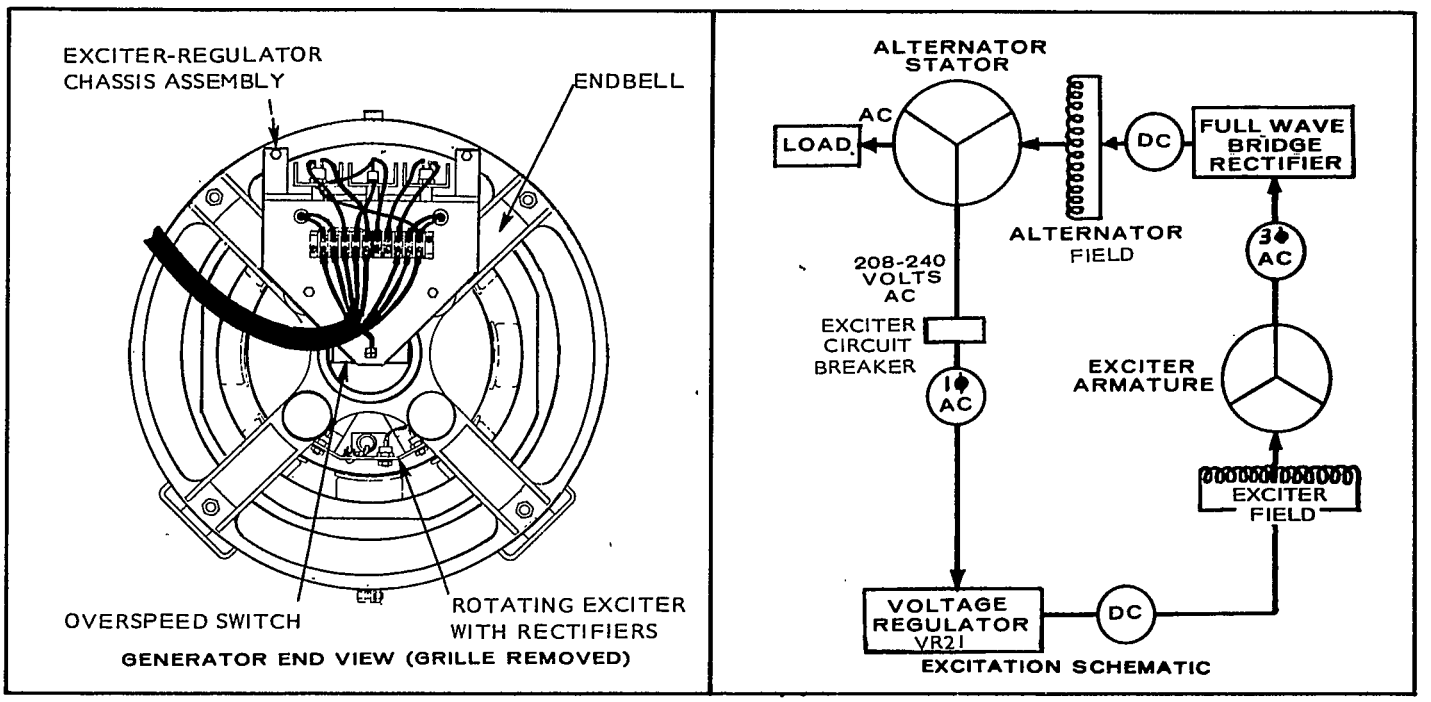


FIGURE 2. ROTATING (BRUSHLESS) EXCITER DESIGN

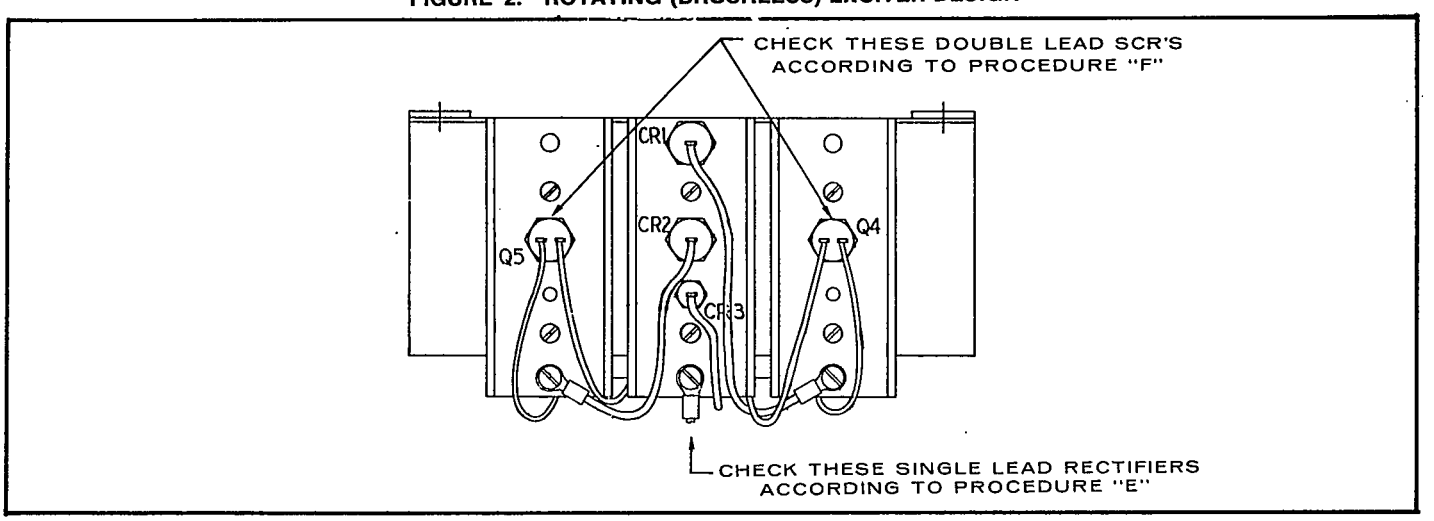


FIGURE 3. TOP VIEW OF EXCITER-REGULATOR CHASSIS ASSEMBLY

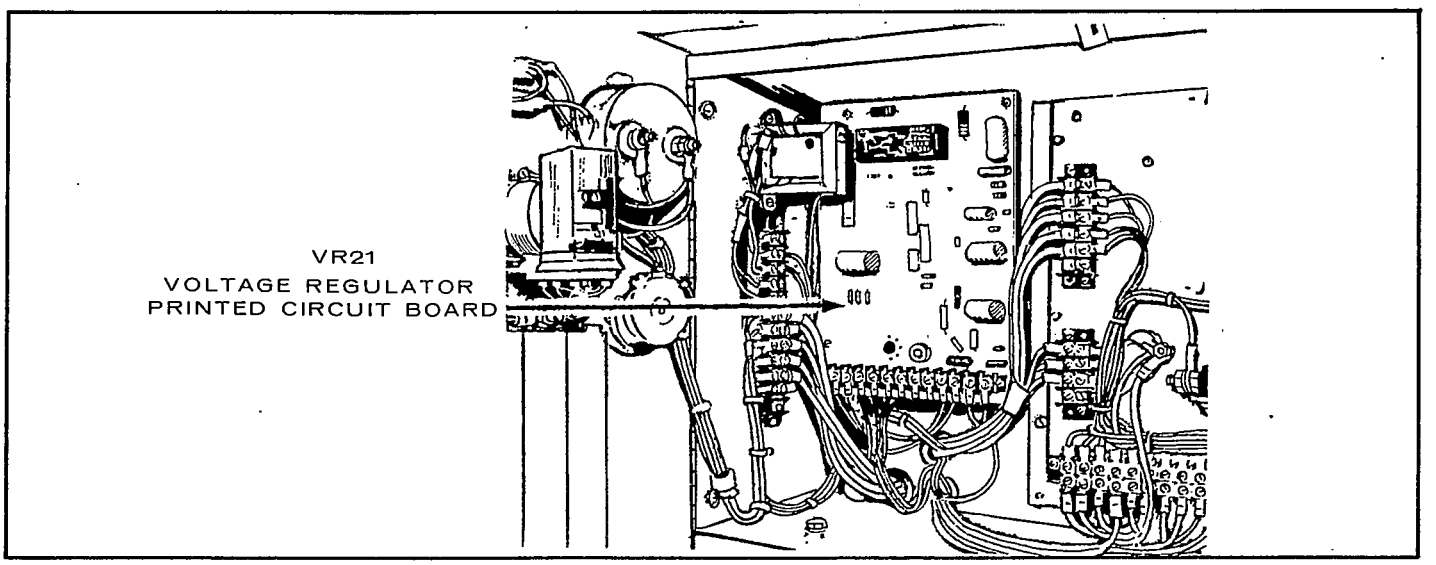


FIGURE 4. VOLTAGE REGULATOR PRINTED CIRCUIT BOARD LOCATION

VISUAL INSPECTION

Before proceeding with the troubleshooting on the following pages, a few simple checks can be made which could directly indicate the cause of trouble.

1. Always be sure that connection of generator leads is correct. Whenever leads are reconnected for a different voltage, check the output with an independent voltmeter. Do not use the control panel meter since it could indicate that the voltage is correct even if connection is wrong.
2. Visually inspect the voltage regulator printed circuit board assembly (VR21) in the control box for burned components, broken wires, loose connections, dust, dirt or moisture. If dirty, clean with a suitable solvent and compressed air.
3. Visually inspect the exciter-regulator chassis assembly (VR22) for burned components, broken wires, loose connections, carbon tracks caused by arcing between parts or between parts and ground. Also check for shorted paths between terminals caused by dust, dirt and moisture.
4. Large banks of SCR (Silicon Controlled Rectifier) regulated loads can cause the generator voltage to increase as load is applied. If such loads exist, and the voltage increased more than 5 or 10%, consult the factory; an additional filter is available for the regulator circuit to correct the situation.

THE QUESTION AND ANSWER TROUBLESHOOTING GUIDES BEGINNING ON PAGE 8 GIVE A STEP-BY-STEP PROCEDURE FOR CHECKING THE GENERATOR. THE FLOW-CHART TROUBLESHOOTING GUIDES ARE GIVEN AS A GENERAL GUIDE TO RESOLVE VARIOUS GENERATOR PROBLEMS. ALL CHARTS REFER TO PROCEDURES SHOWN AT THE END OF THIS SECTION.

PRIOR TO ANY TROUBLESHOOTING, CHECK ALL MODIFICATIONS, REPAIRS, REPLACEMENTS, ETC., PERFORMED SINCE LAST SATISFACTORY OPERATION OF SET.

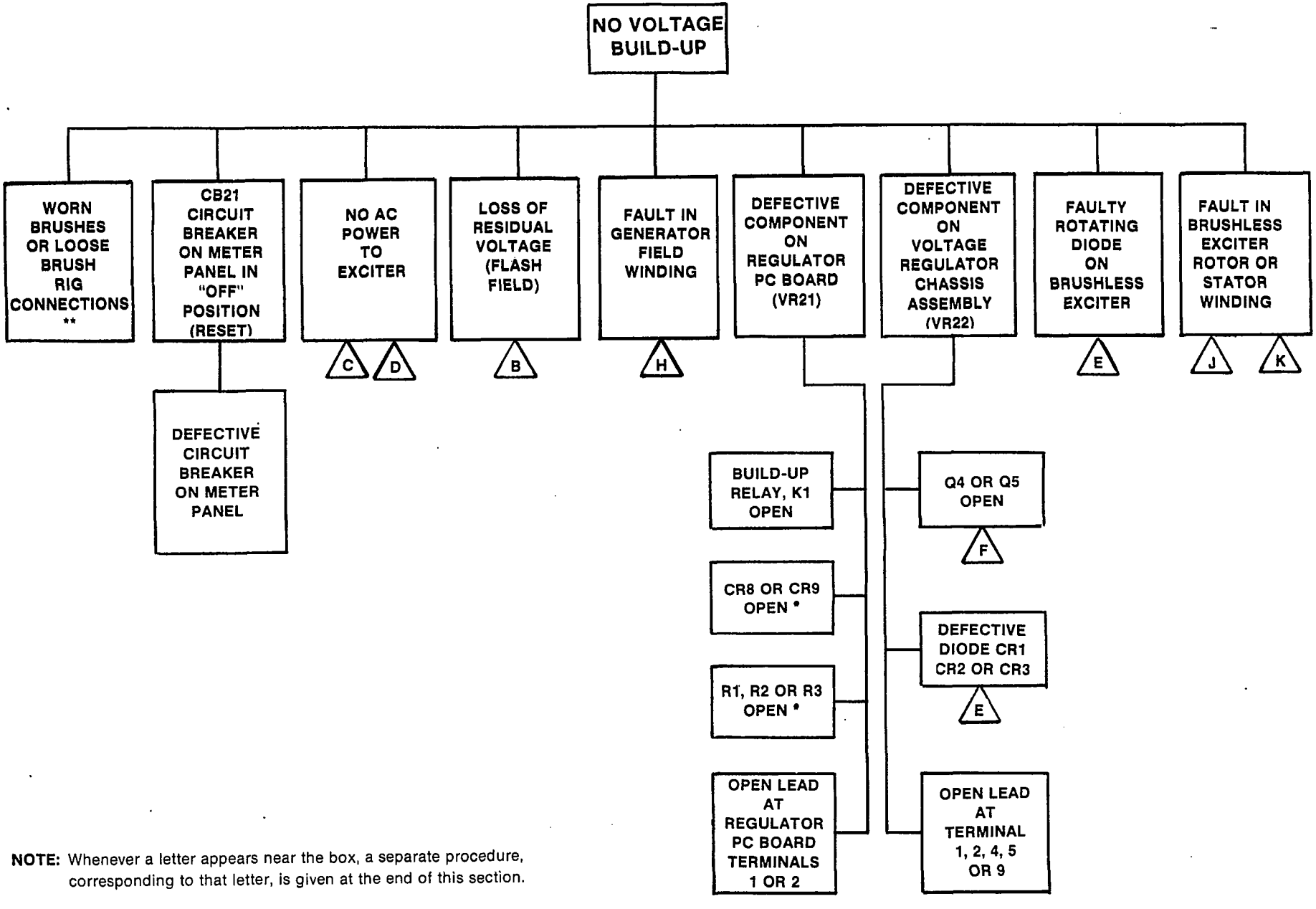
QUESTION AND ANSWER TROUBLESHOOTING GUIDE

To correct a particular problem, answer the question either "yes" or "no," then proceed to the next step given in whichever column question was answered. Procedures A thru P follow the troubleshooting guide.

ITEM NO.	TABLE A. NO OUTPUT VOLTAGE - ENGINE RUNNING	YES	NO	PROCEDURE
1.	Is circuit breaker on the meter panel in the "on" position?	3	2	
2.	Switch circuit breaker to the "on" position. Does AC voltage build up? **NOTE:** If voltage builds up, but is high, low or unstable, or causes the circuit breaker on the meter panel to trip, refer to Table "B," "C" or "D" of the troubleshooting guide.		3	
3.	Is AC voltage at terminals 1 and 2 on VR21 voltage regulator printed circuit board and at terminals 9 and 10 on VR22 exciter-regulator chassis assembly 5 to 10 volts?	5	4	C
4.	Check continuity of wires and connections between terminal 1 on VR21 printed circuit board and terminal 9 on VR22 chassis assembly; and between terminal 2 on VR21 printed circuit board and terminal 10 on VR22 chassis assembly. Is there continuity between these connections?	—	10	
5.	Check for broken wires and loose connections on VR22 exciter-regulator chassis assembly. Replace or repair any that are defective and clean all dust, dirt and other foreign material from the assembly. Does AC voltage now build up?	—	6	
6.	Is DC voltage at terminals 4 and 5 on VR22 exciter-regulator chassis assembly 5 to 10 volts?	13	7	
7.	Are diodes CR1, CR2 and CR3 on VR22 exciter-regulator chassis assembly OK?	8	—	E
8.	Are SCR's Q4 and Q5 on VR22 exciter-regulator chassis assembly OK?	9	—	F
9.	The trouble is probably caused by a defective component on the voltage regulator printed circuit board. REPLACE VR21 PRINTED CIRCUIT BOARD (see Figure 4).	—	—	
10.	With the circuit breaker on the meter panel in the "off" position, is AC voltage at terminals 62 and 63 (on terminal board TB21 on the left side of control box) 5 to 10 volts?	14	11	
11.	With the circuit breaker on the meter panel in the "off" position, flash the exciter field. Is AC voltage at terminals 62 and 63 now 5 to 10 volts?	12	13	B

ITEM NO.	TABLE A. NO OUTPUT VOLTAGE — ENGINE RUNNING (continued)	YES	NO	PROCEDURE
12.	Turn circuit breaker on the meter panel to the "on" position. Does AC output voltage build up? **NOTE:** If voltage builds up, but is high, low or unstable, or causes circuit breaker to trip, refer to table "B," "C" or "D" of this troubleshooting guide.	—	15	
13.	Is brushless exciter stator winding OK?	17	—	K
14.	With a jumper wire connected across the terminals of the circuit breaker on the meter panel, does voltage build up? **NOTE:** If voltage does build up, the circuit breaker CB21 is defective and MUST BE REPLACED.	—	15	
15.	Is L1 commutating reactor mounted on the back side of VR22 exciter-regulator chassis assembly OK?	16	—	D
16.	Check continuity of wires and connections between TB21 terminal 62 on left side of control box and terminal 1 on VR21 printed circuit board. Also check between TB21 terminal 63 on the left side of control box and terminal 2 on VR21 printed circuit board.	—	—	
17.	Are rotating diodes CR1, CR2, CR3, CR4, CR5 and CR6 on brushless exciter rotor OK?	18	—	E
18.	Is generator field winding OK?	19	—	G
19.	Is brushless exciter rotor winding OK?	20	—	J
20.	Are generator stator windings OK?	—	—	H

TABLE A. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

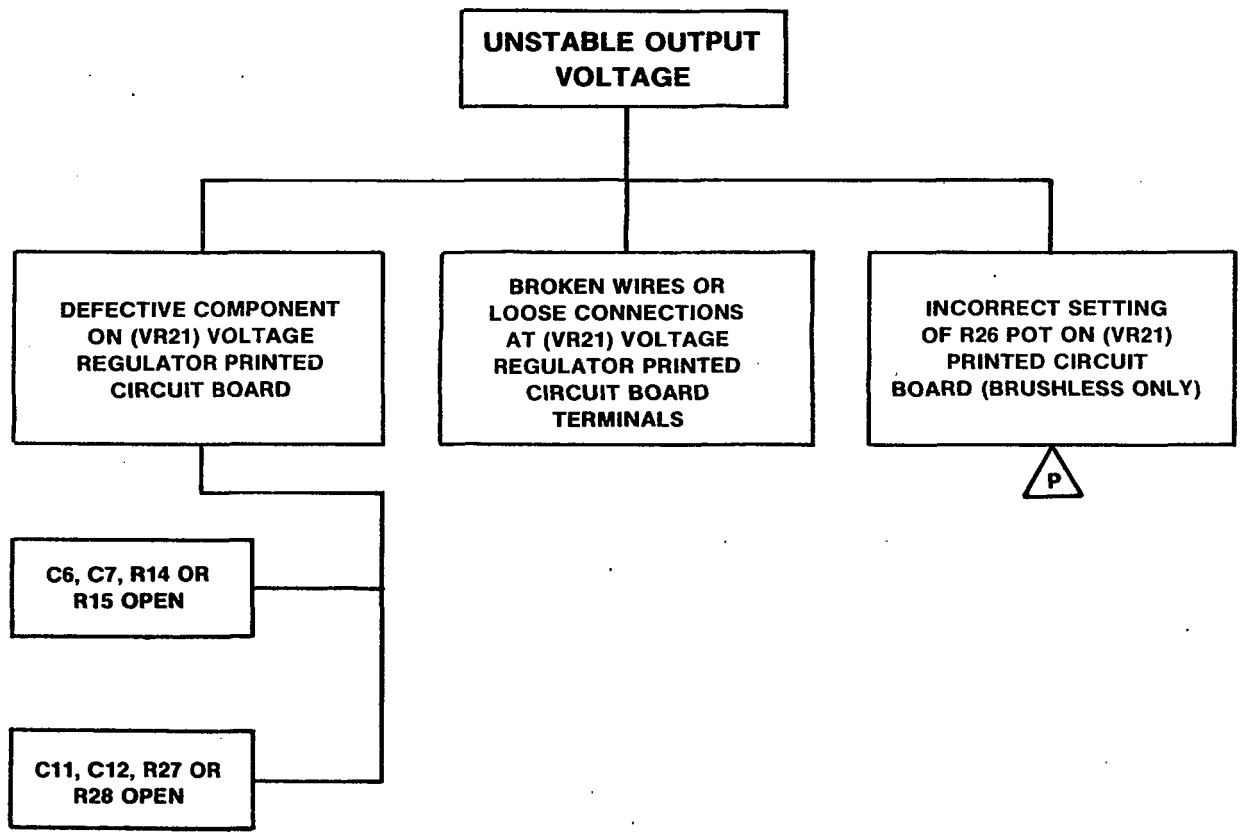
* - Check SCR's, Q4 and Q5 on VR22 voltage regulator chassis assembly and replace (if defective) before repairing or replacing VR21 voltage regulator printed circuit board.

** - Static excited generators only.

ITEM NO.	TABLE B. OUTPUT VOLTAGE BUILDS UP BUT IS UNSTABLE — ENGINE RUNNING OK	YES	NO	PROCEDURE
1.	Are there any loose or broken wires or connections at VR21 printed circuit board terminals?	—	2	
2.	Does adjustment of R26* (damping control pot) on VR21 printed circuit board result in stable generator voltage?	—	3	P
3.	The trouble is probably caused by a defective component on VR21 voltage regulator printed circuit board. REPLACE VR21 PRINTED CIRCUIT BOARD (see Figure 4).	—	—	

* - R26 is used on brushless generators only.

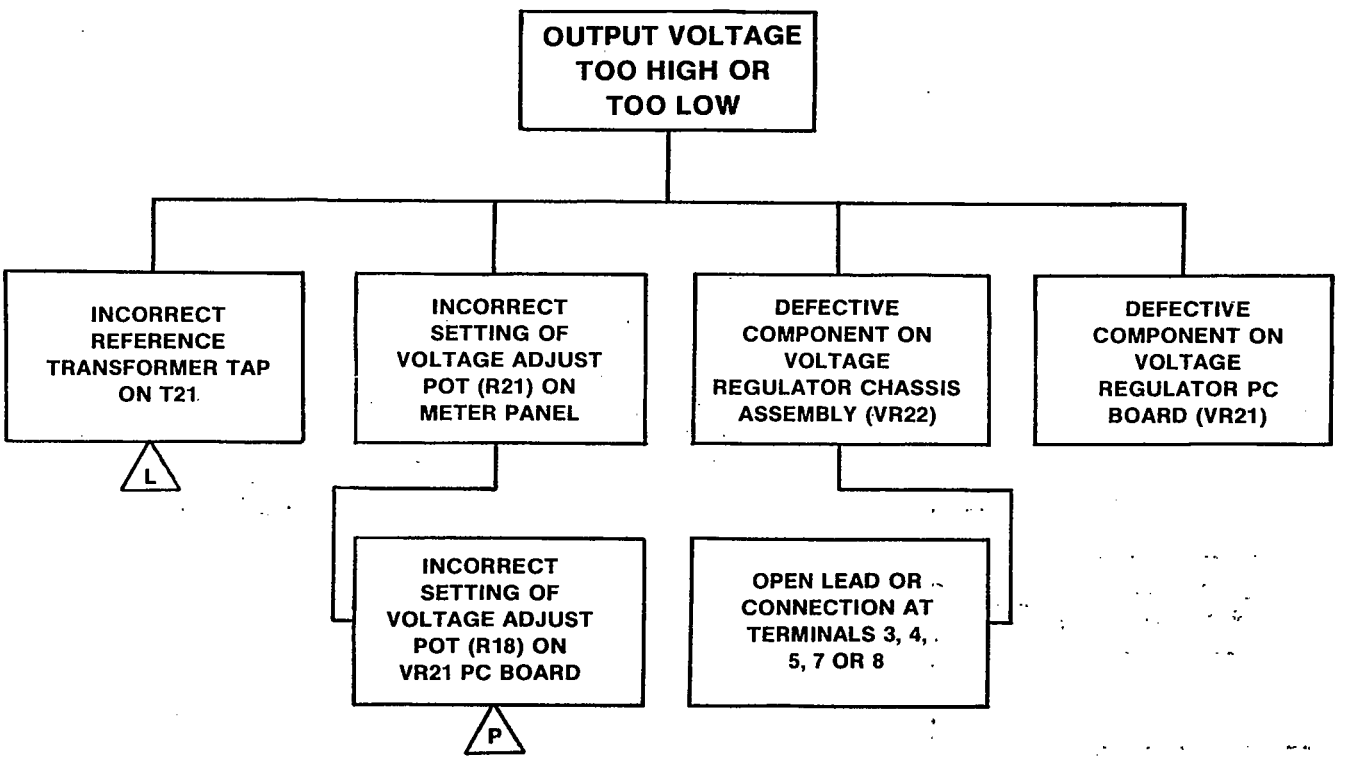
TABLE B. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

ITEM NO.	TABLE C. OUTPUT BUILDS UP BUT IS HIGH OR LOW — ENGINE RUNNING OK	YES	NO	PROCEDURE
1.	Does adjustment of R21 "Voltage Adjust" knob on the meter panel result in correct voltage?	—	2	
2.	Does adjustment of R18 potentiometer on VR21 printed circuit board result in correct voltage?	—	3	P
3.	Is correct voltage reference transformer tap on TB21 being used?	4	—	L
4.	Are generator output leads properly connected?	5	—	L
5.	The trouble is probably caused by a defective component on VR21 voltage regulator printed circuit board. REPLACE VR21 PRINTED CIRCUIT BOARD.	—	—	

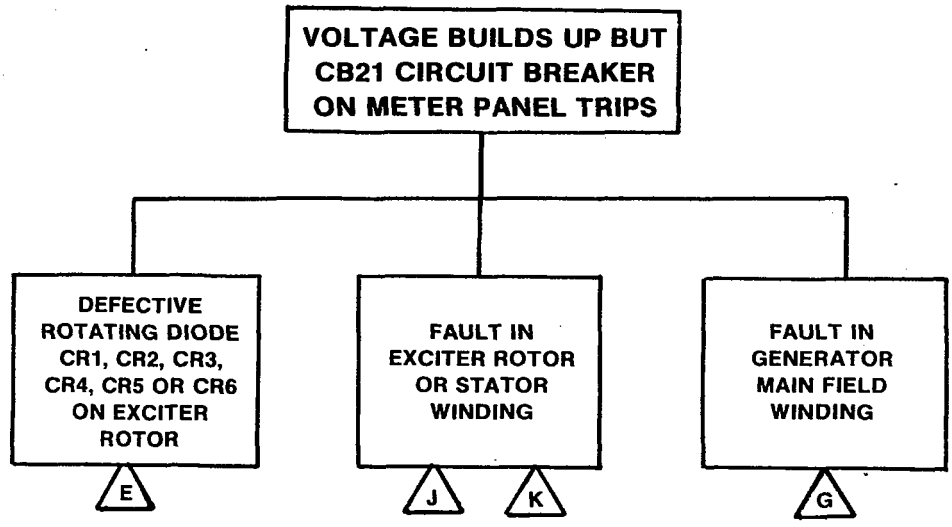
TABLE C. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

ITEM NO.	TABLE D. GENERATOR VOLTAGE BUILDS UP BUT CAUSES THE CIRCUIT BREAKER ON CONTROL PANEL TO TRIP. ENGINE RUNNING OK.	YES	NO	PROCEDURE
1.	Does AC output voltage build up to 150% or more of rated voltage before CB21 circuit breaker trips?	2	7	
2.	Are there any loose or broken terminals or connections at VR21 voltage regulator printed circuit board terminals?	—	3	
3.	Is diode CR3 on center heat sink of VR22 exciter-regulator chassis assembly OK?	4	—	E
4.	Are voltage regulator transformer (T21) windings and connections OK?	5	—	
5.	Are stator leads connected properly?	6	—	L
6.	The trouble is probably caused by a defective component on VR21 voltage regulator printed circuit board. REPLACE VR21 PRINTED CIRCUIT BOARD (see Figure 4).	—	—	
7.	Does AC output voltage build up to rated voltage or less before tripping CB21 circuit breaker on meter panel?	8	—	
8.	Are rotating diodes CR1, CR2, CR3, CR4, CR5 and CR6 on brushless exciter rotor OK?	9	—	E
9.	Is brushless exciter stator winding OK?	10	—	K
10.	Is generator field winding OK?	11	—	G
11.	Is brushless exciter rotor winding OK?	—	—	J

TABLE D. SYNOPSIS

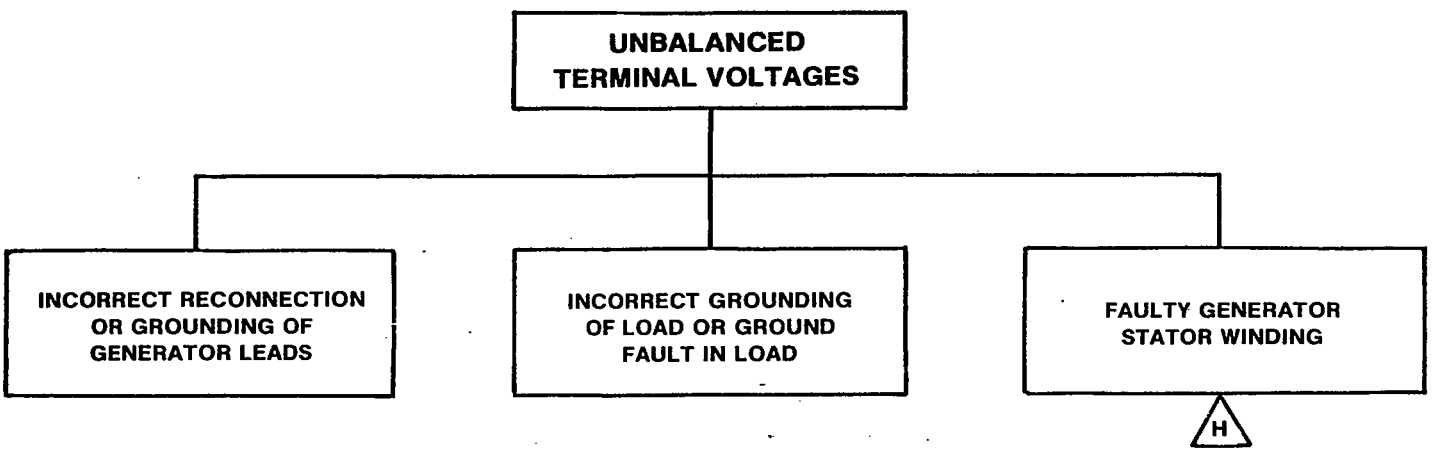


NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

ITEM NO.	TABLE E. UNBALANCED GENERATOR TERMINAL VOLTAGE	YES	NO	PROCEDURE
1.	Remove load from generator terminals. Are generator terminal voltages still unbalanced?	2	4	
2.	Are generator leads properly connected and/or grounded?	3	—	
3.	Is continuity of generator stator windings OK?	—	—	H
4.	Is grounding procedure of generator and load correct?	5	—	
5.	Check for ground faults in load.	—	—	

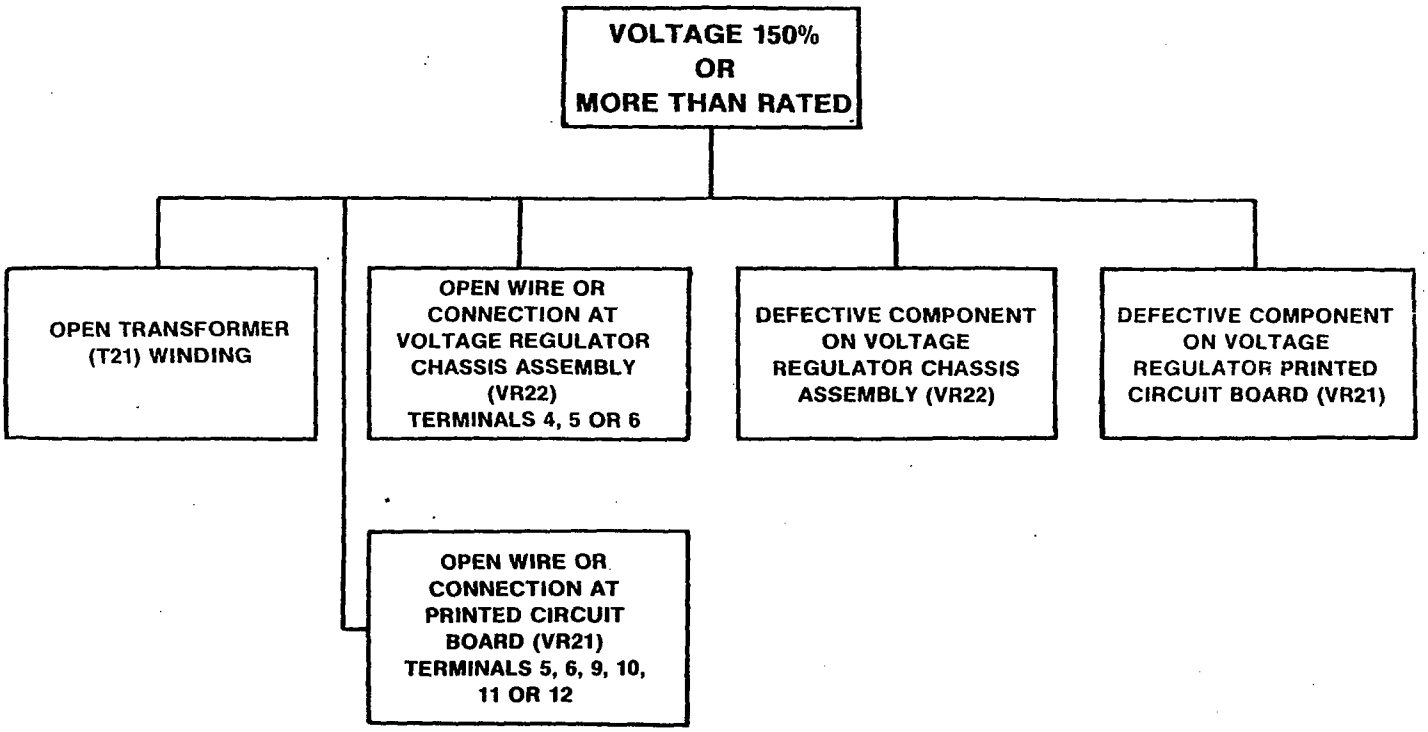
* NOTE: Unbalanced voltages of up to 5 percent will occur if unbalanced loads are applied to the generator terminals.

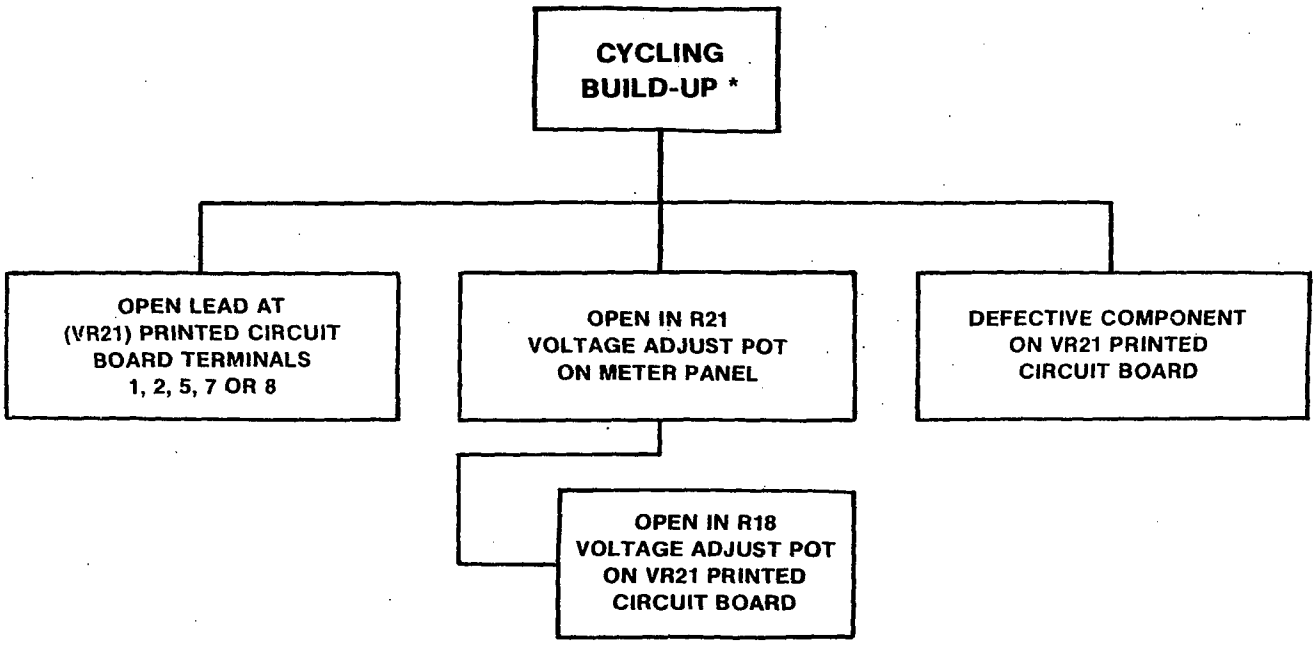
TABLE E. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

TABLE E. SYNOPSIS





NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

* - Generator voltage builds up, then collapses, builds up, etc.

ADJUSTMENTS AND PROCEDURES

[A]

BRUSHES

When brushes wear to approximately 5/8 inch or when wear extends into the stamped Onan part number, replace brushes. Do not attempt to remove the brush without first removing its spring and brackets. Never bend a spring back over its bracket—doing so will put a kink in it and require its replacement. Do not use a substitute brush that may look identical but may have entirely different electrical characteristics. Be sure to install the brush so that the short side of its taper is toward the spring and its bracket. See Figures 5 and 6.

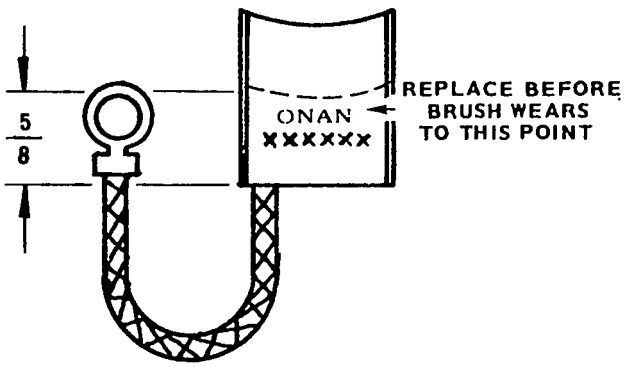


FIGURE 5. BRUSH REPLACEMENT

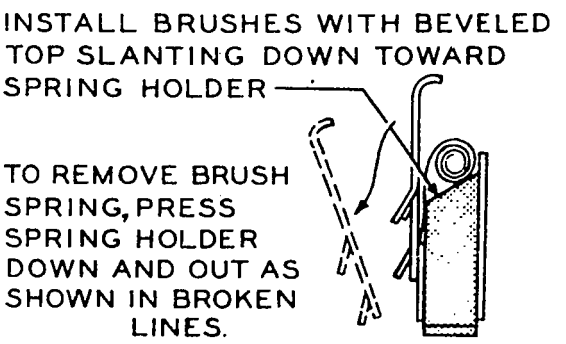


FIGURE 6. BRUSH REMOVAL

[B]

FLASHING THE FIELD (No Voltage)

If output voltage will not build up, it may be necessary to flash the field to restore residual magnetism.

1. Remove end grille to obtain access to exciter-regulator chassis assembly.
2. Use a six volt dry cell (lantern) battery with a 12 amp 300 volt diode as shown in Figure 7. This prevents current flow from exciter circuit to battery when voltage builds up. If a lantern battery is not available, a 12 volt automotive (generator set) battery can be used by installing a 20-ohm 2-watt resistor in series with diode; or a 24 volt automotive (generator set) battery can be used by increasing the resistor value to 40-ohms.
3. After starting the set, touch the positive (+) lead to TB5 and the negative (-) lead to TB4; hold 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.**

WARNING **Be cautious when working on a generator that is running. High voltages are present.**

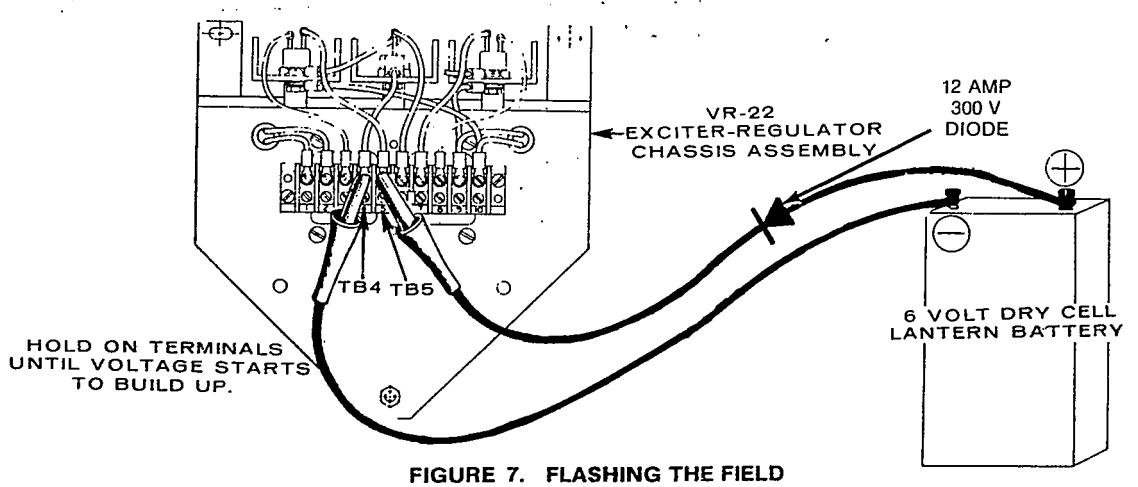


FIGURE 7. FLASHING THE FIELD

[C]

NO AC POWER TO EXCITER

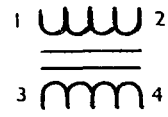
Residual should be checked before the circuit breaker; the best place to check it is at the five leads 61 through 65 coming directly out of the stator. The combination of leads should be chosen by the wiring configuration of the stator, i.e., 120/240 Delta, 120/208 Parallel Wye, 277/430 Series Wye. After checking residual, proceed to VR21 PC board and then check the circuit breaker CB21.

If residual voltage is present, check AC voltage at terminals 1 and 2 on VR21 voltage regulator printed circuit board. Voltage should be 5-10 volts. The AC voltage at terminals 9 and 10 on VR22 exciter-regulator chassis assembly should be the same (5 to 10 volts). If not, check continuity between these points. If voltage is low, check L1 reactor.

[D]

TESTING L1 REACTOR

The L1 reactor mounts on the rear of VR22 exciter-regulator chassis assembly. Terminals are marked 1, 2, 3 and 4.



Coils 1-2 and 3-4 are wound on the same iron core. Resistance between 1-2 and 3-4 should be .0544 and .0614-ohms ± 10% respectively (brush type generators).

Resistance between coils (e.g., 1-4) or from any terminal to reactor frame should be infinity.

If any of the above conditions are not met, install a new reactor.

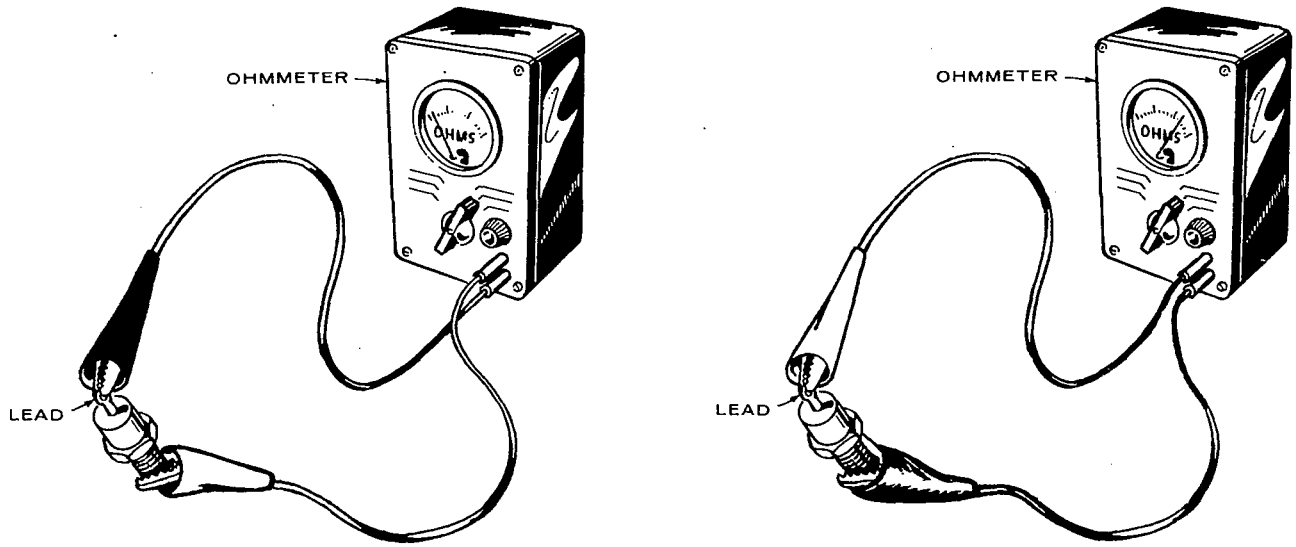
[E]

TESTING DIODES

On both brushless and brush type generators, three diodes mount on the center heat sink of the exciter-regulator chassis assembly. They are labeled CR1, CR2 and CR3 as shown in Figure 3. On brushless generators, six diodes mount on the rotating exciter assembly as shown in Figure 2. These six diodes are labeled CR1, CR2, CR3, CR4, CR5 and CR6. Test diodes as follows:

1. Disconnect one diode at a time. Test that diode and reconnect lead before proceeding to the next one.
2. Use an accurate ohmmeter to check the resistance of the diode. Connect one lead to the top of the diode and the other lead to the heat sink. 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 a new, identical part.

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



GOOD DIODE WILL HAVE HIGH RESISTANCE READING IN ONE DIRECTION AND LOW READING WHEN OHMMETER LEADS ARE REVERSED.

FIGURE 8. TESTING DIODES

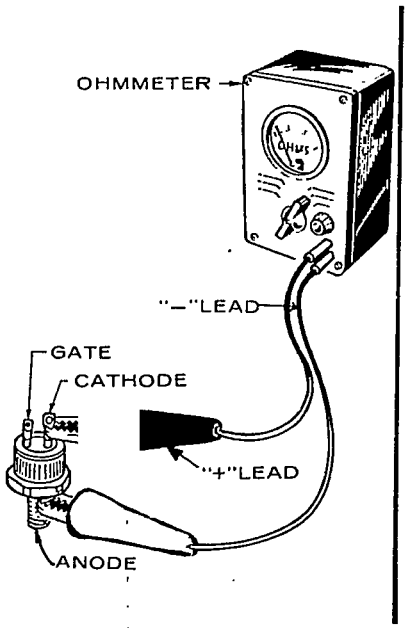


FIGURE 9. TESTING SCR's

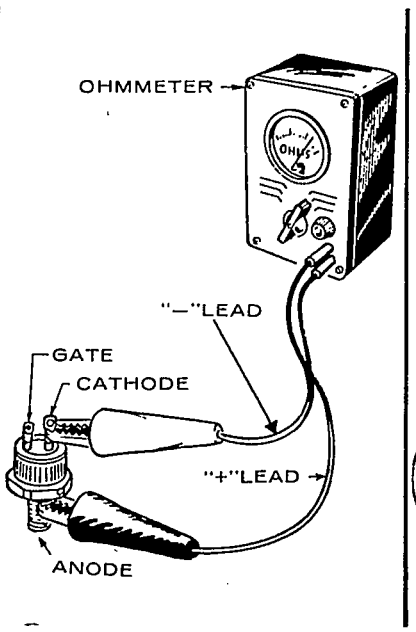


FIGURE 10. TESTING SCR's

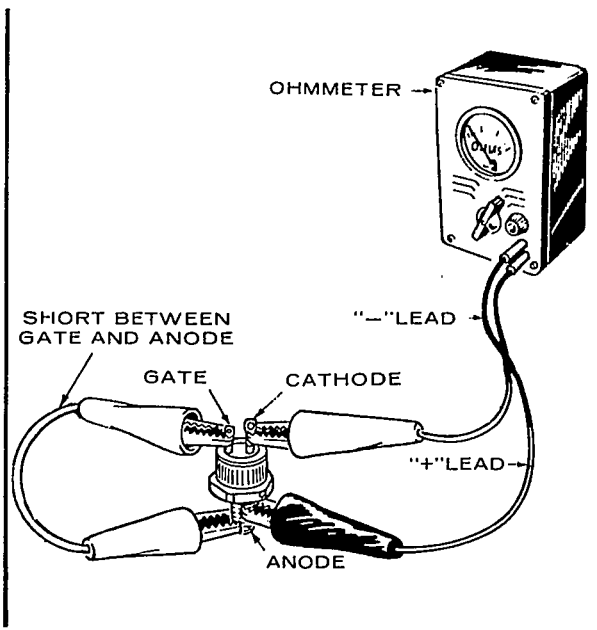


FIGURE 11. TESTING SCR's

[F]

TESTING SCR's

SCR's mount on the outer heat sinks of the exciter-regulator chassis assembly. They are labeled Q4 and Q5 as shown in Figure 3.

1. Remove the leads from both SCR's.
2. Determine polarity of ohmmeter leads. Connect the ohmmeter leads to the anode and cathode as shown in Figure 9. Use the high scale on the ohmmeter. The resistance should be 1 megohm or greater.

The cathode is the longer lead, the gate is the shorter lead. The anode is the threaded stud.

3. Reverse the leads as shown in Figure 10. The resistance again should be 1 megohm or greater.
4. With the leads connected as in Step 3, and using the low scale on the ohmmeter, short the gate to the anode as shown in Figure 11. The resistance should drop to a low value.
5. Remove the short between the anode and the gate. The resistance should remain at the same low value.

REPLACING RECTIFIERS (SCR's and Diodes)

1. Unsolder leadwires from terminals.
2. Use proper size wrenches to hold the body while removing the nut.
3. Push the rectifier free of its mounting hole in the heat sink.
4. Insert new rectifier into its mounting hole in the heat sink. Using nut and washer provided, secure rectifier to heat sink.
5. Torque the two large diodes on the center heat sink of exciter-regulator chassis assembly to 20-25 in. lb.
6. Torque the small diode on center heat sink of exciter-regulator chassis assembly to 12-15 in. lb.
7. Torque SCR's on outer heat sinks to 20-25 in. lb.
8. On brushless generators, torque diodes on rotating exciter assembly to 15 in. lb.
9. 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.**

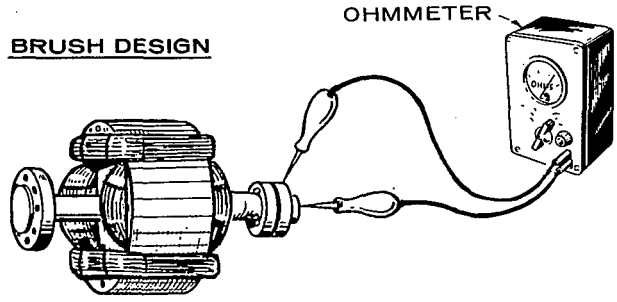
[G]

TESTING GENERATOR ROTOR

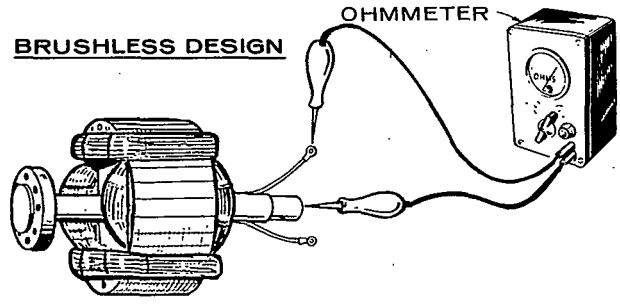
Testing for Grounds: Use an ohmmeter (R x 100 scale); measure as follows:

Brush Type — from each slip ring to the rotor shaft.

Brushless Type — disconnect F1 and F2 rotor leads from the rotating diodes; measure between either lead and the rotor shaft. A reading of less than infinity indicates a ground. See Figure 12.



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



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

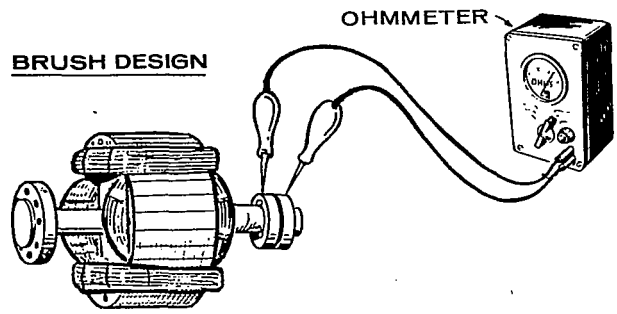
FIGURE 12. TESTING ROTOR FOR GROUNDS

Testing for an Open Circuit: On brush type generators, check for an open circuit by measuring resistance in the windings. Check between the two slip rings as shown in Figure 13.

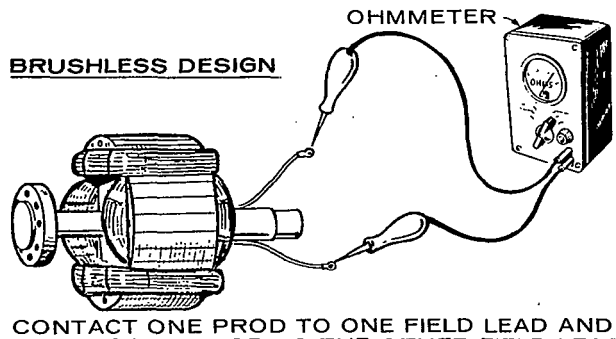
On brushless generators, disconnect and test between F1 and F2 leads as shown in Figure 13.

Resistance values given in Table 3 apply to both brushless and brush type generator rotors.

Replace the rotor if it is grounded or has an open or short.



CONTACT ONE PROD TO ONE SLIP RING AND THE OTHER PROD TO THE SECOND SLIP RING.



CONTACT ONE PROD TO ONE FIELD LEAD AND THE SECOND PROD TO THE OTHER FIELD LEAD

FIGURE 13. TESTING ROTOR FOR AN OPEN CIRCUIT

TABLE 3. RESISTANCE VALUES FOR ROTORS

KW RATING		RESISTANCE IN OHMS	
50 HERTZ	60 HERTZ	FROM	TO
25.0	30.0	3.32	4.06
	40.0	2.49	3.05
37.0	45.0	2.49	3.05
40.0	50.0	2.49	3.05
	55.0	2.76	3.38
45.0	55.0	2.76	3.38
50.0	60.0	3.02	3.70
55.0	65.0	3.02	3.70
60.0	75.0	3.16	3.86
70.0	85.0	2.76	3.38
75.0	90.0	2.76	3.38
80.0	100.0	3.19	3.90
95.0	115.0	3.26	3.99
110.0	125.0	3.96	4.40
115.0	140.0	3.96	4.40
125.0	150.0	3.09	3.78
140.0	170.0	3.42	4.18
145.0	175.0	3.42	4.18

All resistances should be within the values specified at 20°C (68°F). This includes readings between slip rings on static excited rotors and between field leads (with rectifiers disconnected) on brushless rotors. Use Wheatstone Bridge for testing.

[H]

TESTING GENERATOR STATOR

Testing for Grounds: Connect all stator output leads (T1-T12) together. Use an ohmmeter set on the R x 100 scale and measure the insulation resistance between these windings and the stator frame. A reading of less than infinity indicates a ground. Field circuit breaker can be either "ON" or "OFF".

Testing for Shorts: To check for shorts between individual windings first refer to Figure 18 to determine individual coil lead wires (T1-T4, T7 - T10, etc.) Connect one lead of an ohmmeter (RX100 scale) to one of the stator windings and the other ohmmeter lead to all other stator leads connected together. A reading of less than infinity indicates a short. Repeat until all stator coils have been tested in this manner.

Coil Resistances: Measure resistance of windings using a Wheatstone or Kelvin bridge meter. See Table 4 and Figure 14. 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).

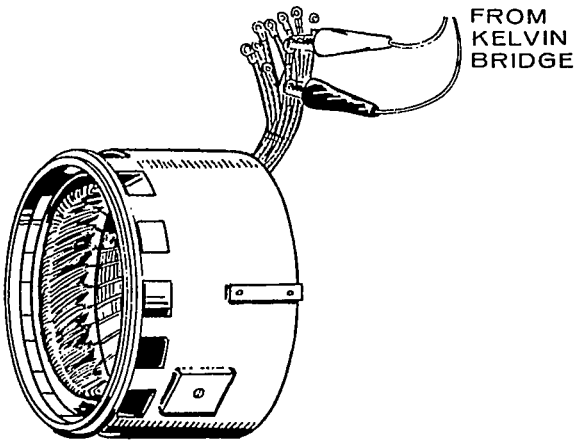


FIGURE 14. TESTING STATOR WINDINGS

TABLE 4. RESISTANCE VALUES FOR STATORS*

KW RATING		VOLTAGE CODE (Resistance in Ohms)		
50 HERTZ	60 HERTZ	15	9X	3
25.0	30.0	0.116 - 0.141	0.425 - 0.520	0.052 - 0.063
	40.0	0.047 - 0.058		0.047 - 0.058
37.0	45.0	0.047 - 0.058	0.193 - 0.236	0.047 - 0.058
40.0	50.0	0.047 - 0.058	0.193 - 0.236	
	55.0	0.028 - 0.035		
45.0	55.0	0.038 - 0.047	0.156 - 0.191	
50.0	60.0	0.028 - 0.035	0.113 - 0.138	
55.0	65.0	0.028 - 0.035	0.113 - 0.138	
60.0	75.0	0.022 - 0.027	0.089 - 0.108	
70.0	85.0	0.019 - 0.024	0.072 - 0.089	
75.0	90.0	0.019 - 0.024	0.072 - 0.089	
80.0	100.0	0.015 - 0.018	0.054 - 0.067	
95.0	115.0	0.012 - 0.015	0.045 - 0.055	
110.0	125.0	0.009 - 0.011	0.039 - 0.048	
115.0	140.0	0.009 - 0.011	0.039 - 0.048	
125.0	150.0	0.0075 - 0.0092	0.027 - 0.033	
140.0	170.0	0.0059 - 0.0072	0.018 - 0.023	
145.0	175.0	0.0059 - 0.0072	0.018 - 0.023	

All resistances should be within the values shown at 20° C (68° F).
Use an accurate instrument such as a Kelvin Bridge for this test.
Test between the following coil leads:

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

[J]

TESTING EXCITER ROTOR (Armature)

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 0.464 to 0.567 ohms at 20° C (68° F). See Figure 15.

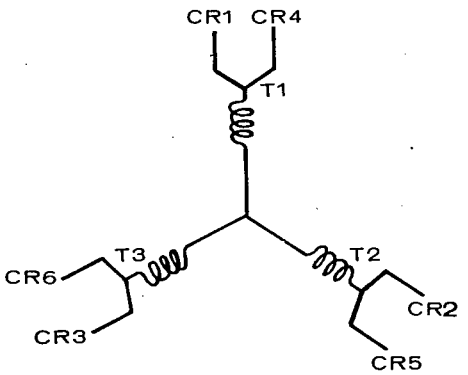


FIGURE 15. TESTING EXCITER ARMATURE

[K]

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 ground. See Figure 16.

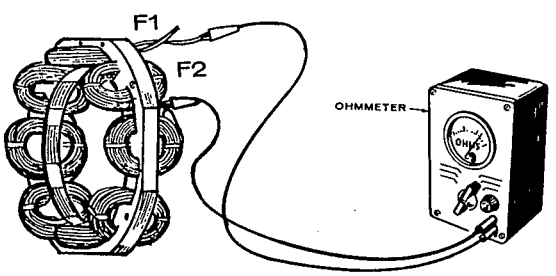


FIGURE 16. TESTING EXCITER FIELD

Testing Winding Resistance: Measure coil resistance between leads F1 and F2 with an ohmmeter (scale R x 1). Resistance should be 17.82 to 21.78 ohms at 20° C (68° F). See Figure 16A.

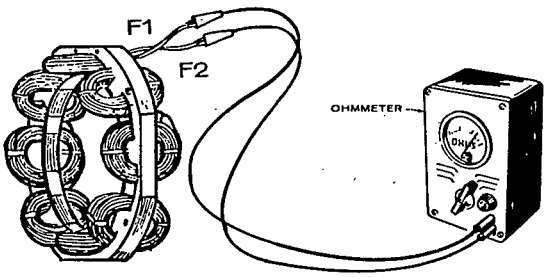


FIGURE 16A. TESTING EXCITER FIELD

[L]

RECONNECTION

Figure 18 shows reconnection possibilities for the UR series generators. When reconnecting for a different voltage, be sure to also reconnect lead from terminal 63 (inside control box) to either H3, H4, H5 or H6. See Figures 17 and 18.

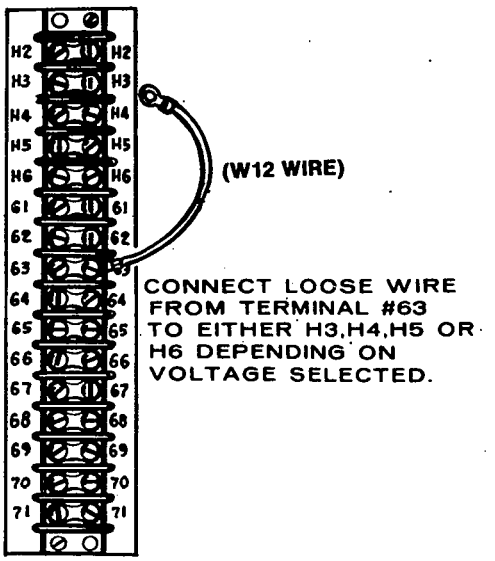


FIGURE 17. CONNECTING LEAD FROM TERMINAL 63

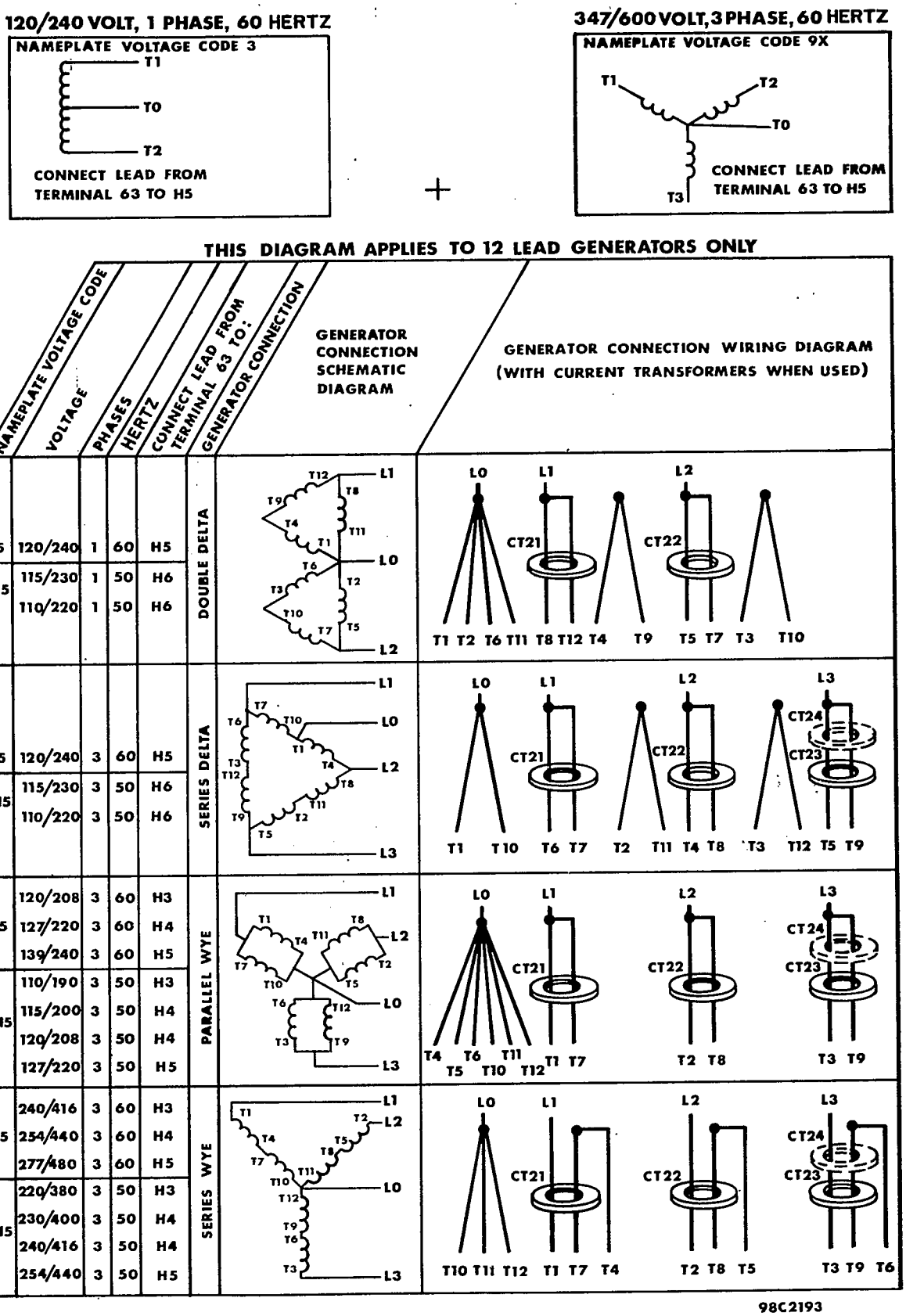


FIGURE 18. RECONNECTION DIAGRAM

[M]

SENSITIVITY REFERENCE CIRCUIT

UR series voltage regulators (VR21) can be set to either frequency sensitive or non-frequency sensitive reference. With a frequency sensitive reference, the output voltage of the generator will decrease in proportion to the frequency (i.e., prime mover speed). This decrease in output voltage will reduce the load on the prime mover, permitting it to return to rated voltage and frequency when overload is removed. A temporary overload with a non-frequency sensitive reference could cause a prime mover to reduce speed, then would require a further 50% to 60% load reduction to allow it to return to rated speed.

This reference change is accomplished by soldering wire W1 to terminal E1 for frequency sensitivity or to terminal E2 for non-frequency sensitive reference. See Figure 19.

Unless requested otherwise by purchaser, Onan sets are connected at the factory to a frequency sensitive reference.

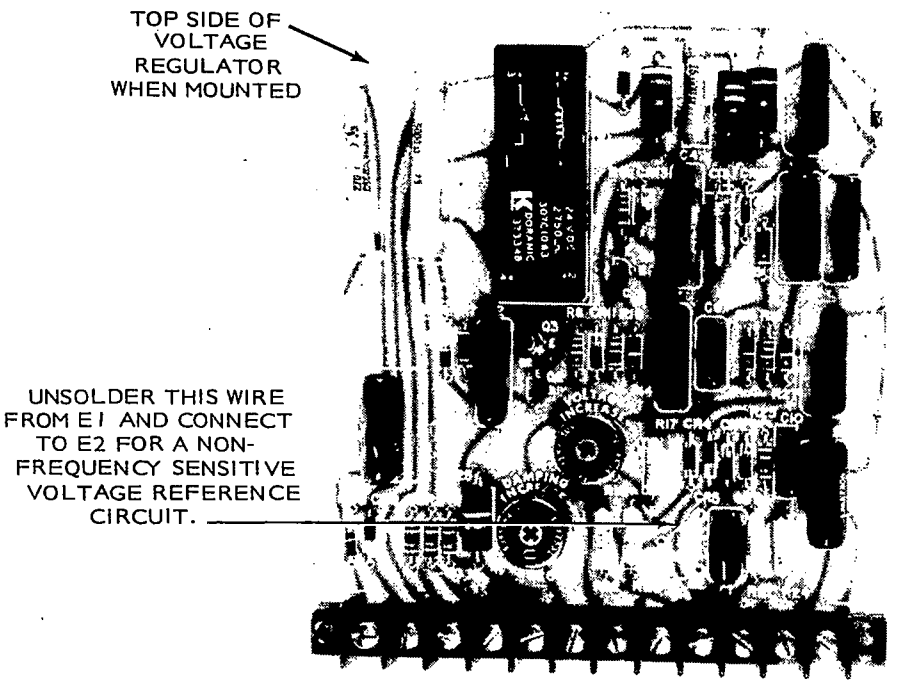


FIGURE 19. VR21 PRINTED CIRCUIT BOARD

[N]

GENERATOR DISASSEMBLY

If generator testing determines that generator needs repair, remove and disassemble according to Figure 20 and the following instructions:

1. Disconnect and remove load wires.
2. Disconnect leadwires from the control box. Check wire markings for legibility to ease assembly. Arrange leads so they can be withdrawn easily from the control box.
3. Remove front grille (14) and sheet metal work.
4. Remove the four capscrews securing voltage regulator chassis (23) to end bell (9) and remove chassis assembly.
5. Remove the centrifugal switch (8) from end bell and rotor shaft. On static excited models, slip the brushes (7) and brush springs (6) from brush rig (5) — it is not necessary to disconnect the brush leads unless brush replacement is required.
6. Block the rear of the engine in place by supporting the flywheel housing. Remove the narrow generator band (10). Remove the large capscrews securing generator mounting pad (11) to the skid base. Remove the capscrews securing the stator assembly (4) to the engine flywheel housing.
7. Using an overhead hoist and sling, slide the stator assembly off the rotor assembly.

   CAUTION **Use care not to damage the brush rig (or exciter on brushless models) while removing the stator. Do not allow the stator to rest on rotor during removal.**
8. Remove end bell from stator assembly; disconnect and remove brush rig from end bell on static excited generators. On brushless models, remove exciter field (24) from end bell assembly if required.
9. Attach the hoist and sling to the rotor assembly (1) and apply a slight lift to support the rotor. Remove the capscrews securing the flexible drive coupling (13) to the engine flywheel and remove rotor from the engine.
10. Remove bearing capscrew (18) and washer (17) and remove bearing from shaft. If required, remove blower (2) from the rotor.
11. Disconnect rotor field leads from heat sinks F1 and F2 on the exciter armature. Remove exciter armature (25).

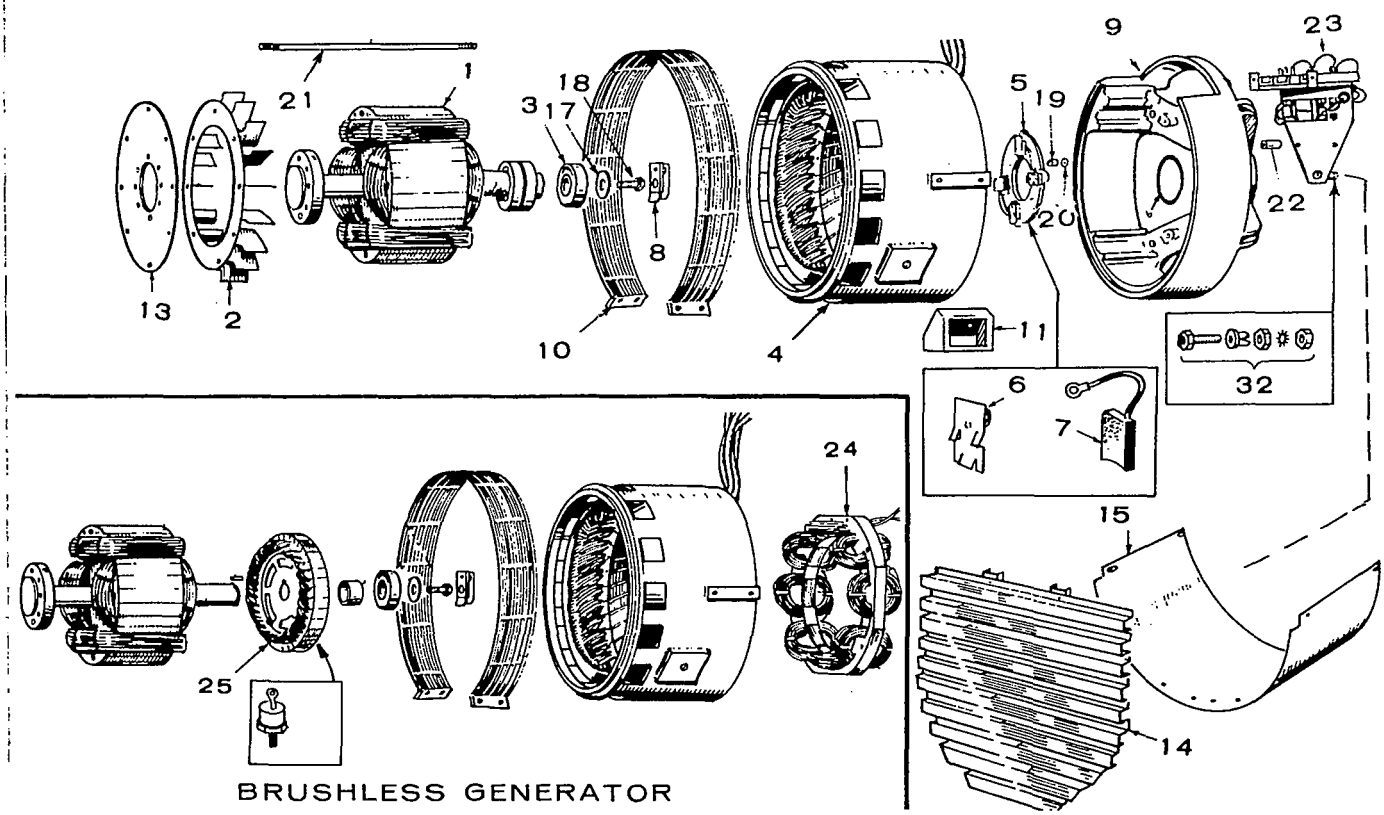


FIGURE 20. GENERATOR DISASSEMBLY

GENERATOR ASSEMBLY

Generator assembly is the reverse of disassembly procedure:

1. Always replace bearing with a new one; apply a layer of grease on end bell bearing hole before inserting bearing.
2. Torque bearing capscrew to 60-70 lb. ft.
3. Torque drive disc-to-rotor capscrews to 200-240 lb. ft.
4. Torque drive disc-to-flywheel capscrews to 45-50 lb. ft.
5. Torque generator through-stud nuts to 30-40 lb. ft.
6. Refer to *Parts Catalog* for replaceable parts and assemblies. Refer to *Wiring Diagram* for reassembly.

[P]

VOLTAGE ADJUSTMENT

After replacement, voltage regulator (VR21) adjustment is performed as follows (see Figure 21):

1. Center the voltage adjust knob so pointer is in a vertical position.
2. Open meter panel doors. Start unit.
3. Using a screwdriver, turn R18 potentiometer on printed circuit board VR21 counterclockwise to increase the voltage or clockwise to decrease the voltage. Observe voltmeter on meter panel while making adjustment. Set voltage with no load connected to generator. (Example: For a 120/240 volt connection, set at no-load voltage or 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 voltage sensitivity.

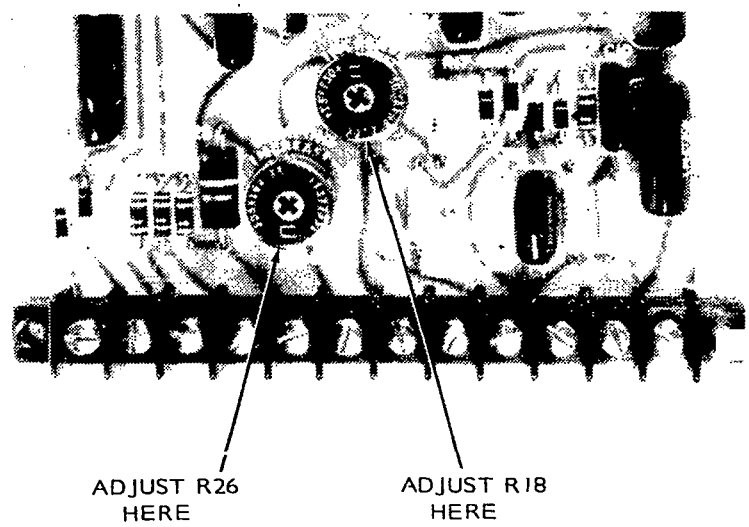


FIGURE 21. ADJUSTING VOLTAGE ON VR21

GENERATOR — SECTION II

GENERAL

Generators discussed in this section are brushless type only. The difference between these and the generators in Section I is in the VR22 diode assembly and the commutating reactor. These have been removed from the generator end bell and relocated in the control panel. The diodes are now encapsulated within a hermetically sealed block, therefore if any diode or silicon controlled rectifier fails, the entire unit has to be replaced. See Figure 27 for details of the rectifier assembly (CR21) and Figure 25 for the reactor (L21).

Principles of operation and method of excitation remain unchanged from the units described in Section I.

Refer to Table 1 for generators to which this section applies.

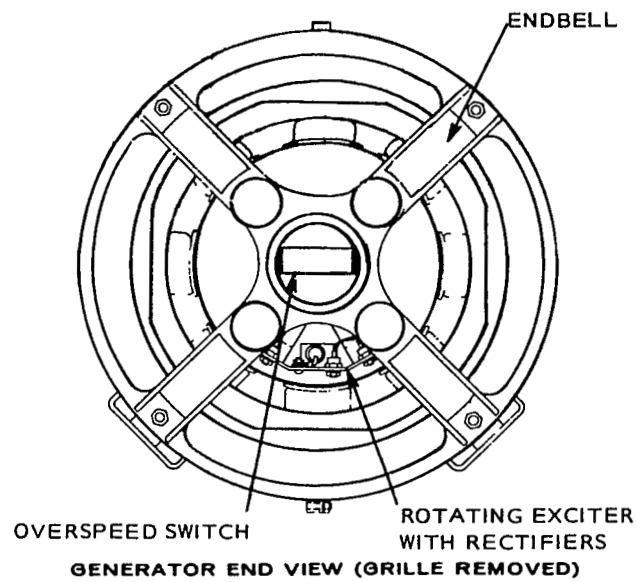


FIGURE 22. ROTATING RECTIFIER ASSEMBLY

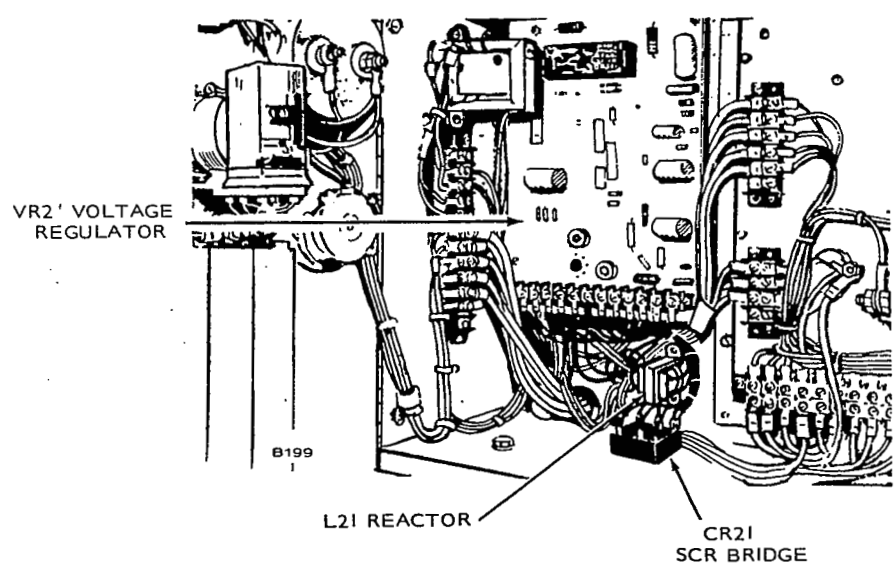


FIGURE 23. SCR BRIDGE AND REACTOR LOCATION

TROUBLESHOOTING

Use the following troubleshooting charts and procedures to locate malfunctions in the generating system. *Section II* also references procedures A thru P of *Section I.*

The question and answer troubleshooting guides which follow give a step-by-step procedure for checking the generator. To use the guides, answer the questions either "yes" or "no" then proceed to the next step given in whichever column is indicated.

When using block diagrams, a letter with a triangle indicates a procedure in *Generator - Section I.* **A letter within a diamond indicates a procedure in** *Generator - Section II.*

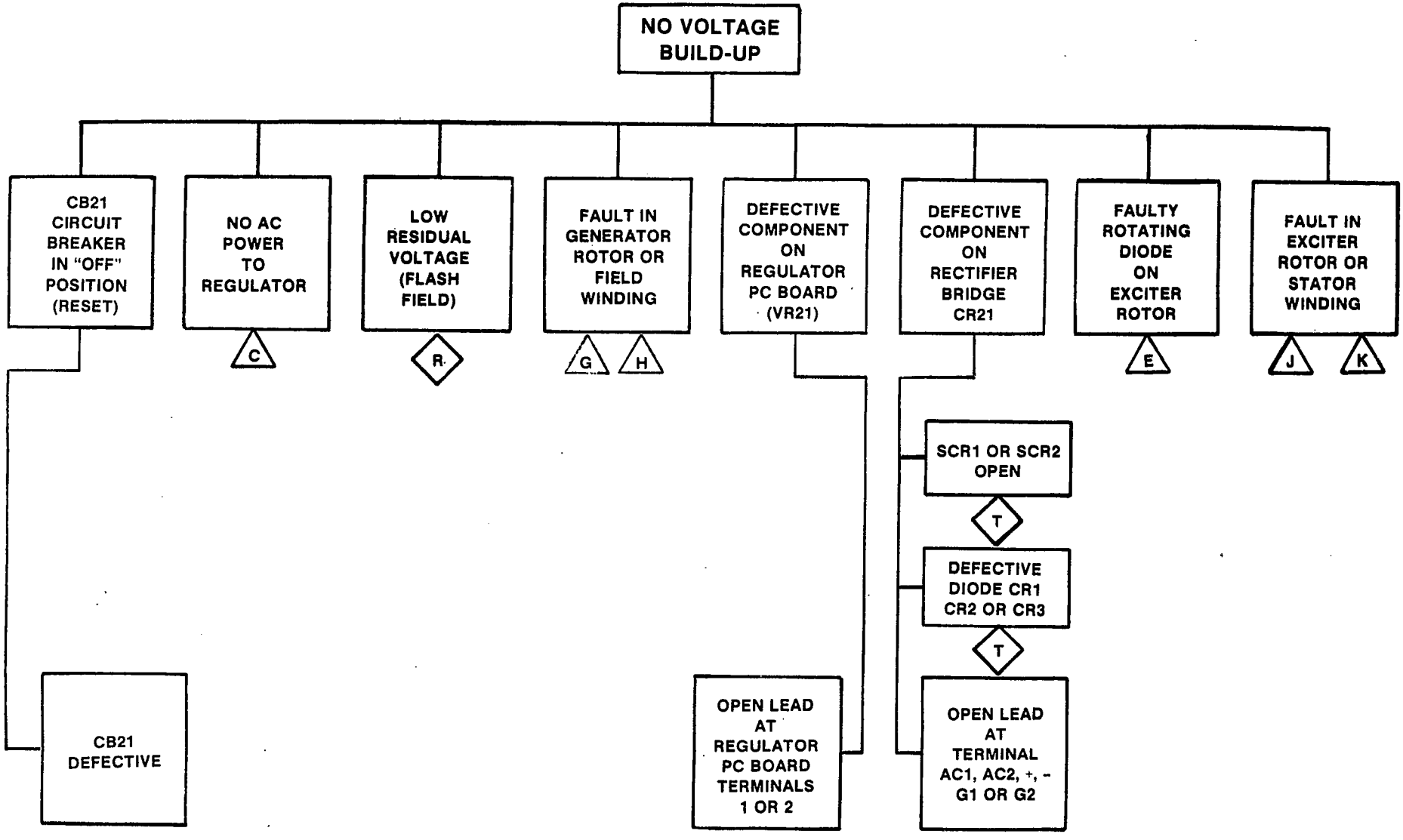
QUESTION AND ANSWER TROUBLESHOOTING GUIDES

To correct a particular problem, answer the question either "yes" or "no," then proceed to the next step given in whichever column question was answered. Procedures R thru P follow the troubleshooting guide.

ITEM NO.	TABLE F. NO AC OUTPUT VOLTAGE — ENGINE RUNNING AT RATED RPM	YES	NO	PROCEDURE
1.	Is Exciter Circuit Breaker (CB21) on the meter panel in the "ON" position?	3	2	
2.	Switch CB21 to "ON" position. Does AC voltage build up? **NOTE:** If voltage builds up but is high, low or unstable, or causes CB21 to trip, refer to table G, H or I of troubleshooting guide.	—	3	
3.	Is AC voltage measured at terminals 1 and 2 on voltage regulator (VR21) printed circuit board 5 to 10 volts?	6	4	
4.	Is AC voltage measured at terminals 11 and 12 on VR21 5 to 10 volts?	5	7	
5.	Replace reactor assembly (L21).	—	—	
6.	Is DC voltage measured at terminals + and - on Rectifier Bridge (CR21) 5 to 10 volts?	15	11	
7.	Shut down generator set. Check continuity through L21 coils between terminal 2 on VR21 and T8 on generator, between terminal 1 on VR21 and T7 on generator. Is there continuity between these connections? VR21-2 to T8 VR21-1 to T7	 14 14	 10 8	
8.	If there is no continuity between VR21-1 and T7 (CB21-ON) apply a shorting jumper across CB21. Is continuity obtained?	9	10	
9.	Replace CB21.	—	—	
10.	Check for loose or broken wires on VR21, CR21, L21, reference voltage transformer (T21), generator bus-bars and terminal board (TB21) in control box. Secure or repair where necessary. If repairs have been made, restart engine. Does AC voltage now build up?	—	14	
11.	Are diodes CR1, CR2 and CR3 on CR21 assembly good? (See method T in procedure section for checking diodes.) If faulty diode located, replace CR21.	12	—	T
12.	Are SCRs 1 and 2 in CR21 good? (See method T in procedure section for checking diodes.) If faulty SCR's located, replace CR21.	13	—	T

ITEM NO.	TABLE F. NO AC OUTPUT VOLTAGE — ENGINE RUNNING AT RATED RPM (continued)	YES	NO	PROCEDURE
13.	Fault probably lies with a defective component on VR21. Replace VR21.	—	—	
14.	Start engine. Place CB21 in "OFF" position. Using method prescribed under "R" in procedure section flash the exciter field to restore residual magnetism. Place CB21 ON. Does the AC output voltage build up?	—	15	R
15.	Shut off engine. Is exciter field winding (F1, F2) OK?	16	—	K
16.	Are rotating diodes CR1, through CR6 on exciter rotor OK?	17	—	E
17.	Is generator stator winding OK?	18	—	H
18.	Is exciter rotor winding OK?	19	—	J
19.	Are generator rotor windings OK?	13	—	G

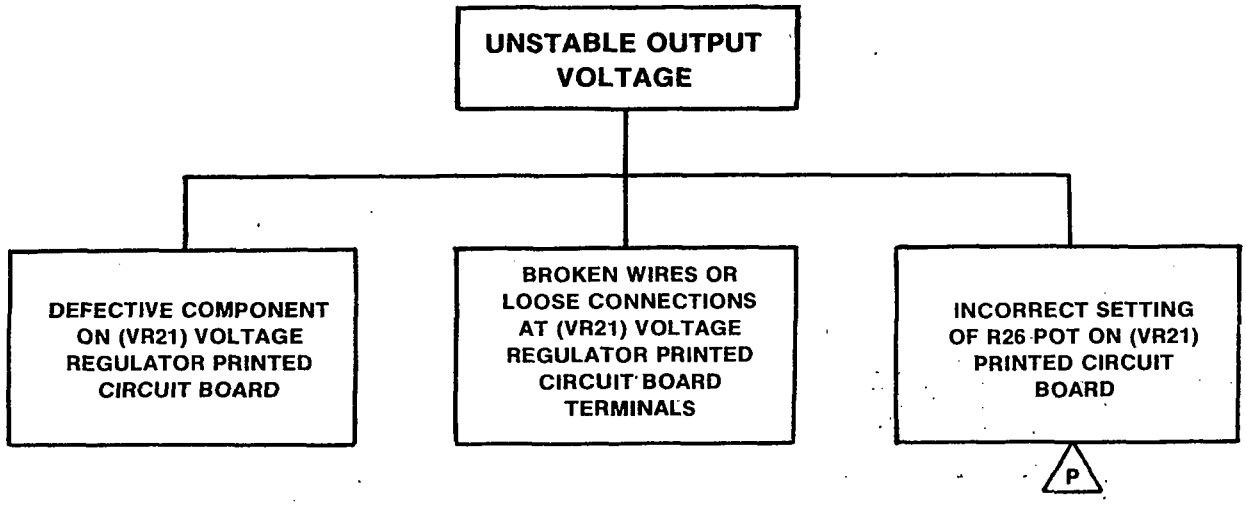
TABLE F. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of the appropriate section.

ITEM NO.	TABLE G. UNSTABLE OUTPUT — ENGINE RUNNING AT 1800 RPM — NO FLUCTUATION	YES	NO	PROCEDURE
1.	Are there any loose or broken wires or connections at VR21 terminals?	—	2	
2.	Does adjustment of R26 (damping control potentiometer) on VR21 stabilize generator voltage?	—	3	P
3.	Replace VR21.	—	—	

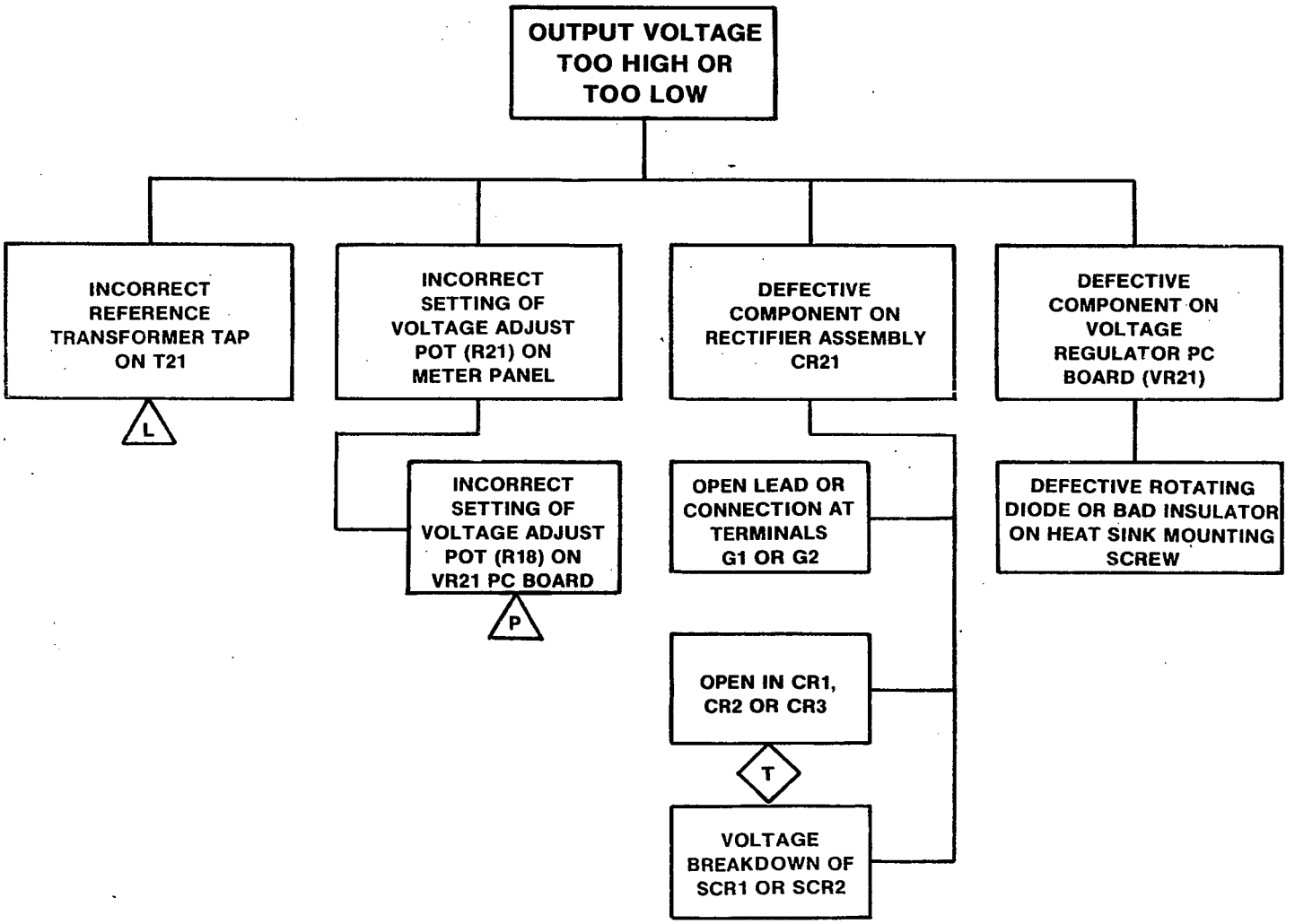
TABLE G. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of the appropriate section.

ITEM NO.	TABLE H. OUTPUT VOLTAGE TO HIGH OR LOW	YES	NO	PROCEDURE
1.	Does adjustment of R21 "voltage adjust knob" on meter panel correct voltage level?	—	2	
2.	Does adjustment of R18 potentiometer on VR21 correct voltage level?	—	3	P
3.	Are rotating diode heat sink mounting screw insulators OK?	—	—	
	If generator output voltage has been optionally reconnected, consider the following —			
4.	Is reference transformer (T21) tap correctly connected on TB21?	5	—	L
5.	Are the reconnections correct and secure?	6	—	
6.	Replace VR21.	—	—	

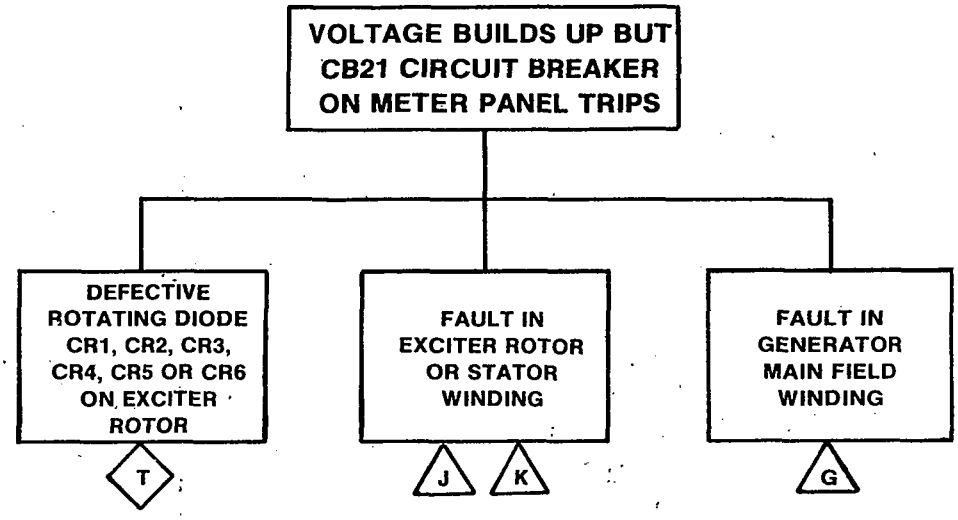
TABLE H. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of the appropriate section.

ITEM NO.	TABLE I. EXCITER CIRCUIT BREAKER TRIPS	YES	NO	PROCEDURE
1.	Does AC output build up to 150% or more of rated voltage before CB21 trips?	2	7	
2.	Are there loose or broken terminals or connections at VR21?	—	3	
3.	Is diode CR3 (connected between + and - in CR21 rectifier assembly) OK?	4	—	T
4.	Are reference voltage transformer (T21) windings and connections OK?	5	—	
5.	Replace VR21.	—	—	
6.	Does AC output build up to rated value before tripping CB21?	7	—	
7.	Are rotating diodes CR1 through CR6 on exciter rotor OK?	8	—	E
8.	Is exciter stator winding OK?	9	—	K
9.	Is generator field winding OK?	10	—	G
10.	Is exciter rotor winding OK?	—	—	J

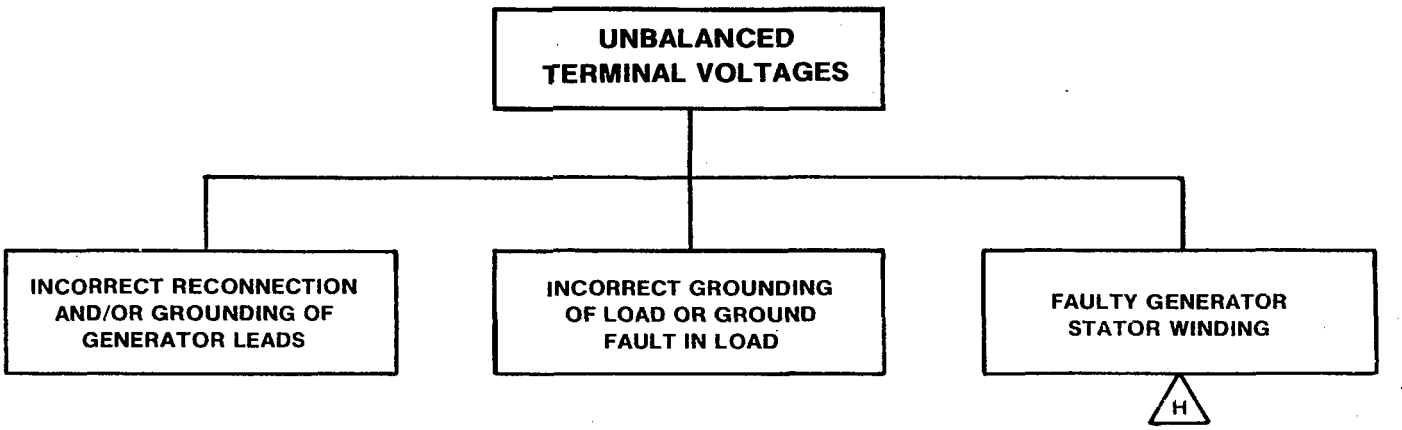
TABLE I. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of the appropriate section.

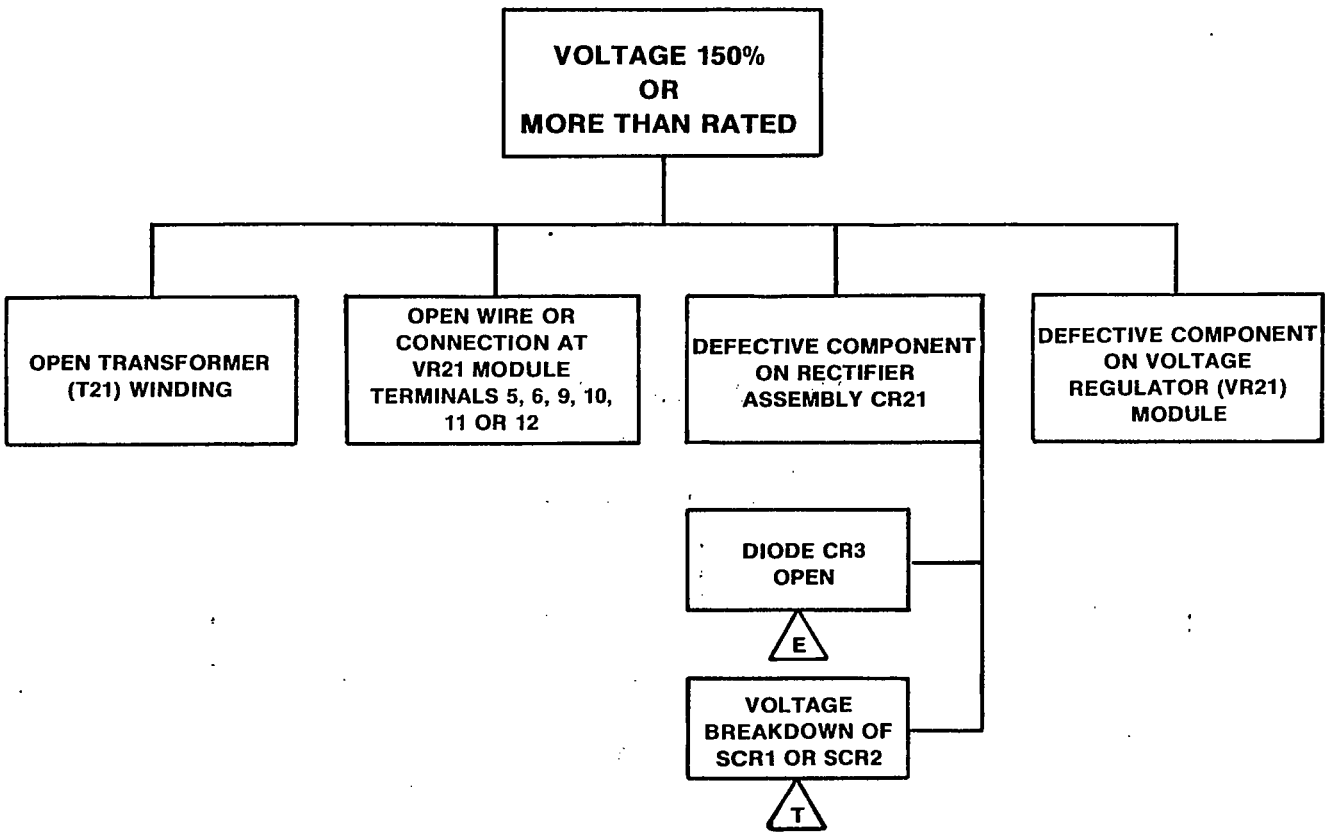
ITEM NO.	TABLE J. UNBALANCED GENERATOR OUTPUT VOLTAGE	YES	NO	PROCEDURE
1.	Remove load from generator terminals. Is output still unbalanced?	2	4	
2.	Are generator leads properly connected or grounded?	3	—	
3.	Is generator stator winding continuous?	4	—	H
4.	Is grounding procedure of generator and load correct?	5	—	
5.	Check for ground faults on load.	—	—	

TABLE J. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter is given at the end of the appropriate section.

TABLE J. SYNOPSIS (Continued)



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of the appropriate section.

Malfunction occurs after warmup or voltage adjustment.

ADJUSTMENTS AND PROCEDURES (Applies to Section II Only)

[R]

FLASHING THE FIELD

If output voltage does not build up it may be necessary to restore the residual magnetism of the poles by flashing the field. Assemble a six volt battery, and diode as shown in Figure 24. If a six volt lantern battery is not available a 12-volt (generator set battery) or a 24-volt battery can be used, however a 20-ohm or a 40-ohm 2 watt resistor must be used in conjunction with the 12 amp 300 V diode. Start the generator set, touch positive lead to + 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.**

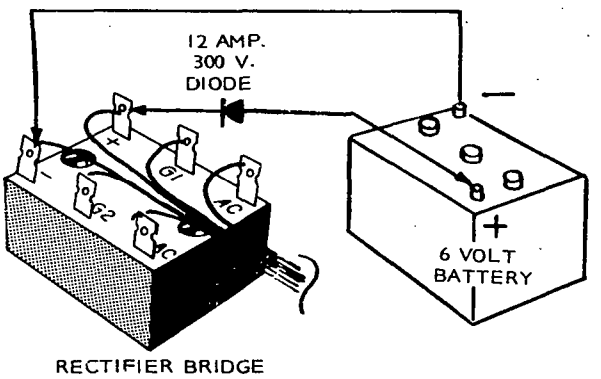


FIGURE 24. FIELD FLASHING CIRCUIT

[S]

TESTING L21 REACTOR

The L21 commutating reactor mounts inside the control box, below the VR21 Voltage Regulator.

The coils 1-2 and 3-4 are wound on the same core. Resistance between 1-2 and 3-4 should be .034 ohm ± .0034 and .042 ohms ± .0042 respectively (brushless units). Resistance between coils (e.g., 1/4) or from any terminal to frame of the reactor should be infinity (Figure 25).

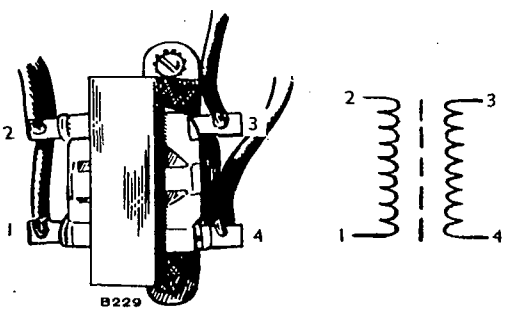


FIGURE 25. L21 REACTOR

[T]

TESTING RECTIFIER BRIDGE ASSEMBLY (CR21)

The rectifier bridge located within the control cabinet, below the voltage regulator, contains 3 diodes, CR1, CR2, and CR3, and two silicon controlled rectifier SCR1 and SCR2. These diodes and SCR's are encapsulated within a hermetically sealed block, therefore failure of any diode or SCR means the entire unit has to be replaced. See Figure 26.

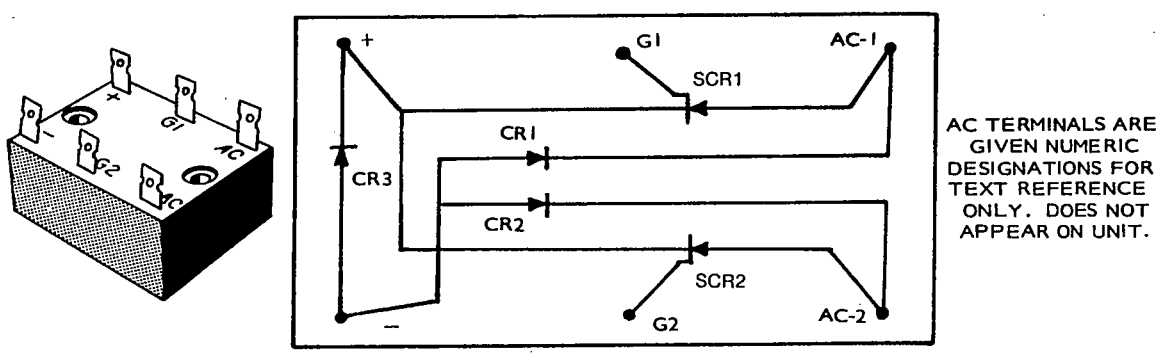


FIGURE 26. RECTIFIER ASSEMBLY

Disconnect wires from rectifier unit prior to testing. Test unit in order shown in Table 5. Refer to Figure 27 for SCR1 and SCR2 test circuit. When test is complete and satisfactory, reconnect unit observing correct wiring hook-up.

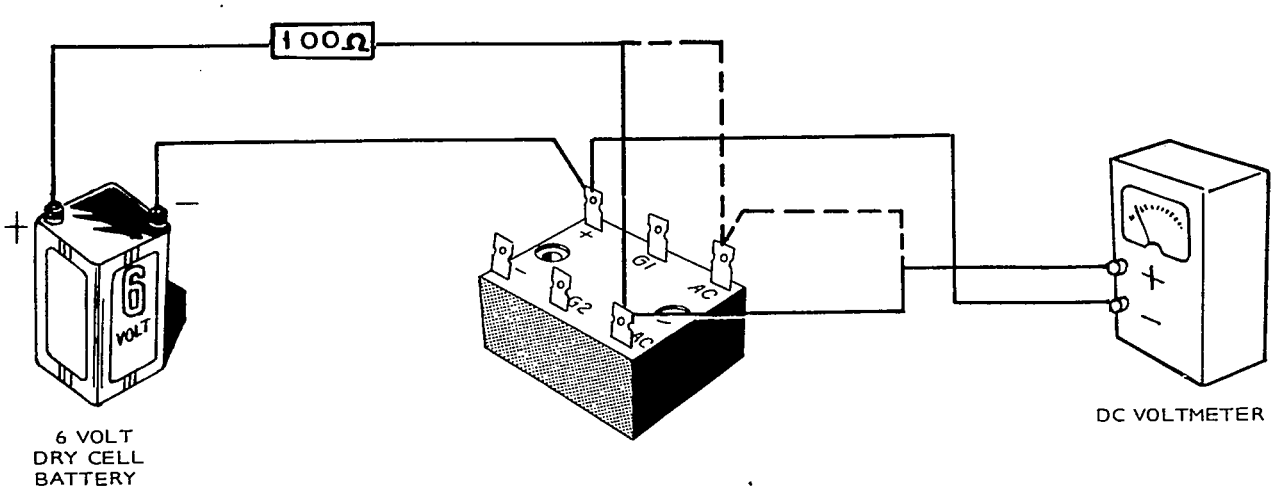


FIGURE 27. TESTING SCR

TABLE 5. TESTING SCR ASSEMBLY CR21

TEST	OHMMETER LEAD +	OHMMETER LEAD -	RECTIFIER TERMINALS	TESTING CR	TESTING SCR	REMARKS	METER SCALE
1	X	X	+ -	CR3		Infinity	RX10K
2	X	X	- +	CR3		6- to 50-Ohms	R X 1
3	X	X	+ AC1		SCR1	Infinity	RX10K
4	X	X	AC1 -			Infinity	RX10K
5	X	X	- AC1	CR1		6- to 50-Ohms	RX1
6	X	X	+ AC2		SCR2	Infinity	RX10K
7	X	X	AC2 -	CR2		Infinity	RX10K
8	X	X	- AC2	CR2		6- to 50-Ohms	R X 1
	6 V Battery with Resistor +	**6 V Battery with Resistor** -				**DC Voltmeter lead** +	**DC Voltmeter lead** - / **DC Voltmeter Reading** 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, read voltmeter. See Figure 27.

** Apply temporary jumper from AC2 to G2 to test SCR2. Remove jumper, read voltmeter. See Figure 27.

INDEX OF GENERATOR ADJUSTMENTS AND PROCEDURES

SECTION I

PROCEDURE	TITLE	PAGE
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C	No AC Power to Exciter	17
D	Testing L1 Reactor	17
E	Testing Diodes	17
F	Testing SCR's	18
G	Testing Generator Rotor	19
H	Testing Generator Stator	20
J	Testing Exciter Rotor	21
K	Testing Exciter Stator	21
L	Reconnection	21
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N	Generator Disassembly	24
P	Voltage Adjustment	25

SECTION II

PROCEDURE	TITLE	PAGE
R	Flashing Field	35
S	Testing L21 Reactor	35
T	Testing Bridge Rectifier (CR21)	36

CONTROLS — SECTION III

GENERAL

The shock mounted control box has two doors that open from the center. The left hand door holds the field circuit breaker, voltmeter and voltage adjusting rheostat. The optional meter package adds running time meter, frequency meter, ammeter or ammeters plus volts-amps selector switch to the left hand door.

The right hand door, attached to a removable bracket, holds the instrument lamp, fault lights, switches and gauges. An optional door has holes for electric tachometer and/or oil temperature gauge. The bracket supports the terminal blocks, cycle cranker and relays in the DC engine control circuit.

Plug mounted relays in both the AC section and DC section plus printed circuit modules in the DC section facilitate troubleshooting and servicing. Snap-in lamps with Faston connectors make lamp replacement very easy. See Figure 28.

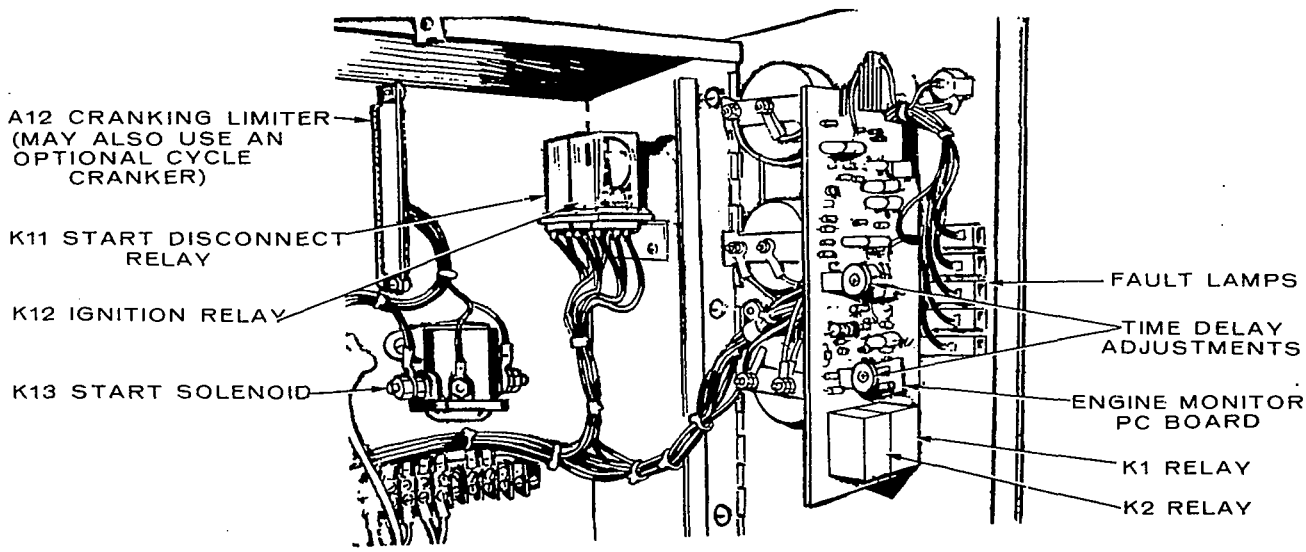


FIGURE 28. LOCATION OF DC CONTROL COMPONENTS

THE QUESTION AND ANSWER TROUBLESHOOTING GUIDES BEGINNING ON PAGE 39 GIVE A STEP-BY-STEP PROCEDURE FOR CHECKING CONTROL SYSTEM PROBLEMS. THE FLOW-CHART TROUBLESHOOTING GUIDES ARE GIVEN AS A GENERAL GUIDE TO RESOLVE VARIOUS CONTROL SYSTEM PROBLEMS. ALL CHARTS REFER TO PROCEDURES AND NOTES WHICH ARE GIVEN AT THE END OF THIS SECTION.

QUESTION AND ANSWER TROUBLESHOOTING GUIDE

FOR UNITS WITH ONE FAULT LAMP

To correct a particular problem, answer the question either "yes" or "no" then proceed to the next step given in whichever column question was answered.

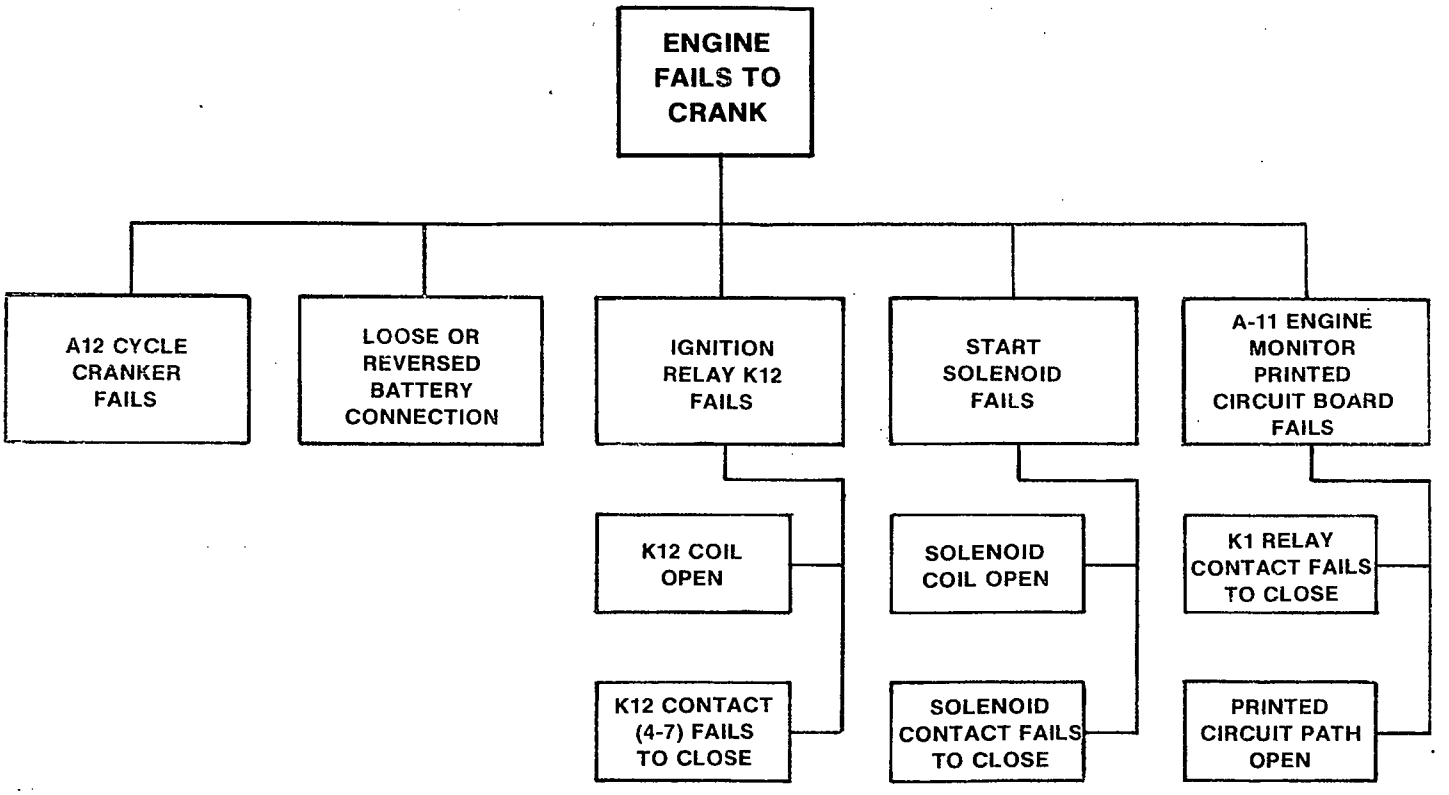
ITEM NO.	TABLE A. ENGINE FAILS TO CRANK WHEN SWITCH TO "RUN"	YES	NO	PROCEDURE
1.	Does fault lamp light?	1	2	
2.	Is battery connected correctly and is voltage normal?	3	—	
3.	Does relay K13* (start solenoid) pick up?	17	4	
4.	Does ignition relay K12 pick up?	10	5	
5.	Is voltage from ground terminal to center terminal of run-stop-remote switch equal to battery voltage?	7	6	
6.	Switch is defective or in "stop" position.	—	—	
7.	Is voltage from ground terminal to ignition relay K12 terminal "B" equal to battery voltage?	10	8	
8.	Jumper battery positive from center terminal of run-stop-remote switch to terminal "B" of ignition relay K12. Does engine now crank?	9	—	M
9.	Replace engine monitor printed circuit board.	—	—	
10.	Is voltage from ground to terminal 26 on TB11 equal to battery voltage?	14	11	
11.	Does ignition relay K12 (4-7) contact close?	13	12	
12.	a. Check socket connection. b. Coil may be open. c. Replace ignition relay K12.	—	—	
13.	Clean relay contacts and check wiring.	—	—	F
14.	Is voltage from ground to start disconnect relay K11 terminal 1 equal to battery voltage?	16	15	
15.	Clean relay contact K11 (7-1) and check wiring.	—	—	G

* **NOTE:** On EK, EM, and EN series, start solenoid relay is mounted on the engine, rather than in the control, and is designated K6.

ITEM NO.	A. ENGINE FAILS TO CRANK WHEN SWITCHED TO "RUN" (Continued)	YES	NO	PROCEDURE
16.	Is voltage from ground to coil terminal of K13* start solenoid equal to battery voltage?	17	18	
17.	Does voltage from ground to TB11-22 equal battery voltage?	21	20	
18.	Jumper from K13* coil terminal to K11 terminal 1. Does relay K13* pick up?	19	—	
19.	Replace cycle cranker printed circuit board A12.	—	—	
20.	Replace start solenoid K13*.	—	—	
21.	Is voltage from ground to starter coil terminal equal to battery voltage?	22	23	
22.	Replace starter.	—	—	
23.	Check thermal breaker CB1 and wiring to starter.	—	—	

*NOTE: On EK, EM, and EN series, start solenoid is mounted on engine, rather than in the control, and is designated K6.

TABLE A. SYNOPSIS

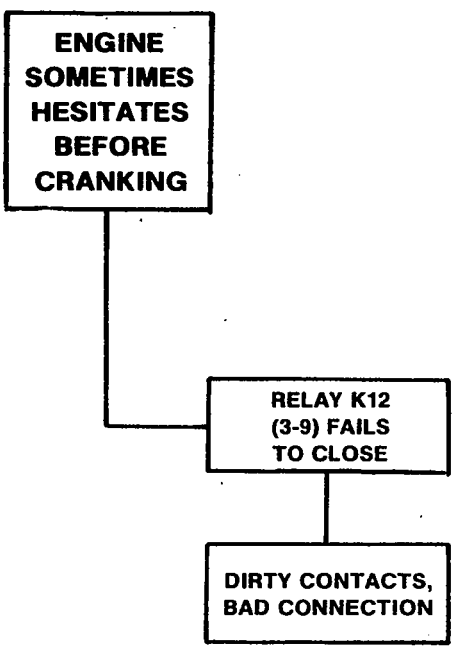


ITEM NO.	TABLE B. ENGINE SHUTS DOWN IMMEDIATELY AFTER START	YES	NO	PROCEDURE
1.	Is overspeed switch S3 closed?	2	3	H
2.	Open overspeed switch, then reset fault lamp by switching to "stop", then back to "run". Does engine crank and run OK?	—	3	
3.	Remove wire from TB11-29. Reset fault lamp by switching to "stop", then back to "run". Does engine crank?	4	6	
4.	Place wire back onto TB11-29 while engine is running. Does fault lamp light and engine stop?	5	—	
5.	Check overspeed switch and wiring for grounds.	—	—	
6.	Jumper from ignition relay K12 terminal "B" to center terminal of run-stop-remote switch. See Method M in Procedure section. Does engine crank?	7	—	
7.	Replace engine monitor printed circuit board and remove jumper.	—	—	

ITEM NO.	TABLE C. ENGINE SHUTS DOWN AFTER RUNNING A SHORT TIME	YES	NO	PROCEDURE
1.	Does fault lamp light and does plant stop after running about 12 seconds?	3	2	
2.	Does fault lamp light and does plant stop after running about 1 minute?	7	—	
3.	Remove wire from terminal TB11-30. Does engine run OK after restarting?	4	5	
4.	Engine is either not pumping oil properly or oil pressure sensor is defective.	—	—	
5.	Replace wire on TB11-30 and remove wire from TB11-31. Does engine run OK after restarting?	6	—	
6.	Engine is either operating over temperature, temperature sensor is defective or wire between sensor and terminal block is grounded.	—	—	
7.	Jumper K11 terminals 6-9. Does engine run OK?	8	9	
8.	Replace relay K11 or clean contacts 6-9.	—	—	
9.	Replace engine monitor.	—	—	

ITEM NO.	TABLE D. ENGINE HESITATES WHEN ATTEMPTING TO CRANK	YES	NO	PROCEDURE
1.	Does engine crank as soon as run-stop switch is put into "run" position?	—	2	
2.	Check contacts K12 (3-9) for failure to close or to make proper contact.	—	—	

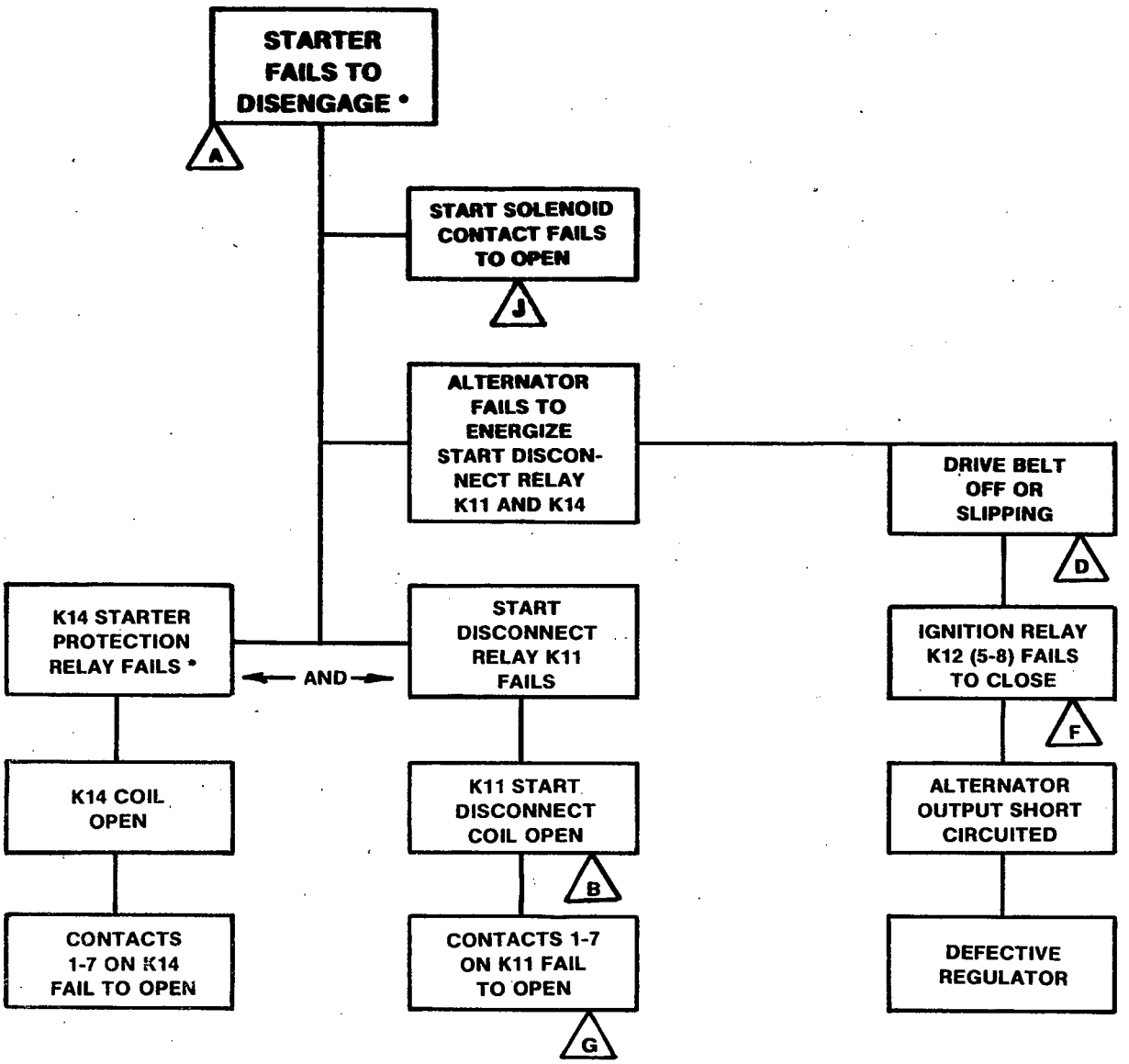
TABLE D. SYNOPSIS



ITEM NO.	TABLE E. STARTER FAILS TO DISENGAGE OR TRIES TO RE-ENGAGE WHILE RUNNING	YES	NO	PROCEDURE
1.	Does starter continue to run after engine starts?	2	—	
2.	Does charge ammeter show a charging current while running?	4	3	
3.	Is charging alternator belt on and driving alternator properly?	4	—	
4.	Does start disconnect relay K11 and starter protection relay K14 pick up when engine starts?	5	10	
5.	Does voltage from ground to K13* coil terminal drop to zero when K11 relay picks up?	6	9	
6.	Does voltage at starter terminal drop to zero when K13* drops out?	7	8	
7.	Check for faulty starter.	—	—	
8.	Start solenoid contacts may be welded — replace K13* solenoid.	—	—	
9.	Check K11 and K14 contacts (1-7) to make sure they open when relay picks up.	—	—	
10.	Does voltage across K11 terminals (A-B) build up to battery voltage?	11	12	
11.	Replace start disconnect relay K11 or starter protection relay K14. Coil may be open.	—	—	
12.	Does relay K12 (5-8) close to bring battery voltage to alternator regulator?	13	14	
13.	Check for faulty alternator, regulator or shorted alternator output.	—	—	
14.	Check K12 ignition relay for dirty contact or broken wire.	—	—	

* **NOTE:** On EK, EM and EN series, start solenoid is mounted on the engine, rather than the control, and is designated K6.

TABLE E. SYNOPSIS



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

* - K14 starter protection relay was added to units beginning with the Specs shown below. This relay prevents starter engagement when unit is running.

SERIES	SPEC	SERIES	SPEC	SERIES	SPEC	SERIES	SPEC
EK-EM	D	DEH	D	DYC	B	WA	F
EN	A	DEF	F	DYD	A	WE	B
KB-KR	P	DEG	D	DYG		WB	H
DDA-MDDA	A	DFE	H	(150-175 kW)	A		
DDB	A	DYA	C	DYJ	A		

QUESTION AND ANSWER TROUBLESHOOTING GUIDE

FOR UNITS WITH 5 FAULT LAMPS

To correct a particular problem, answer the question "yes" or "no", then proceed to the next step given in whichever column question was answered.

ITEM NO.	TABLE F. ENGINE FAILS TO CRANK	YES	NO	PROCEDURE
1.	When switch is put into "run" position, does engine crank?	—	2	
2.	Is battery connected correctly and is voltage normal?	3	—	
3.	Does one of the following fault lamps light? (Choose one of the following:) Overspeed? High Engine Temperature? Low Oil Pressure? Overcrank?	— 30 25 27 29	4 — — — —	
4.	Does relay K13* (start solenoid) pick up?	22	5	
5.	Does ignition relay K12 pick up?	11	6	
6.	Is voltage from ground terminal to center terminal of run-stop-remote switch equal to battery voltage?	8	7	
7.	Switch is in "stop" position or defective.	—	—	
8.	Is voltage from ground terminal to ignition relay K12 terminal "B" equal to battery voltage?	13	9	
9.	Jumper battery positive from center terminal of run-stop-remote switch to terminal "B" of relay K12. Does engine crank?	10	—	M
10.	Remove jumper and replace engine monitor printed circuit board.	—	—	
11.	Is voltage from ground to terminal 26 on TB11 equal to battery voltage?	15	12	
12.	Does contact ignition relay K12 (4-7) close?	14	13	
13.	Clean socket connection. Coil may be open. Replace ignition relay K12.	—	—	
14.	Clean relay contacts or replace relay and check wiring.	—	—	

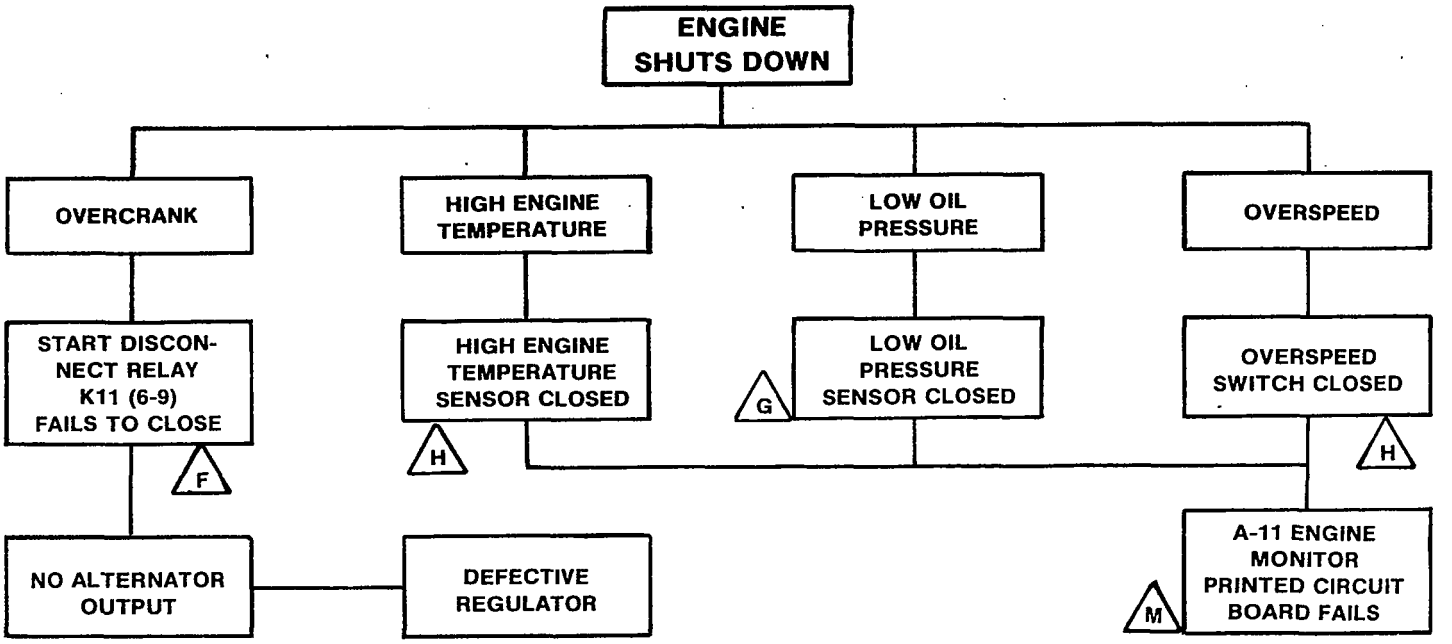
* **NOTE:** On EK, EM and EN series, start solenoid relay is mounted on the engine, rather than in the control, and is designated K6.

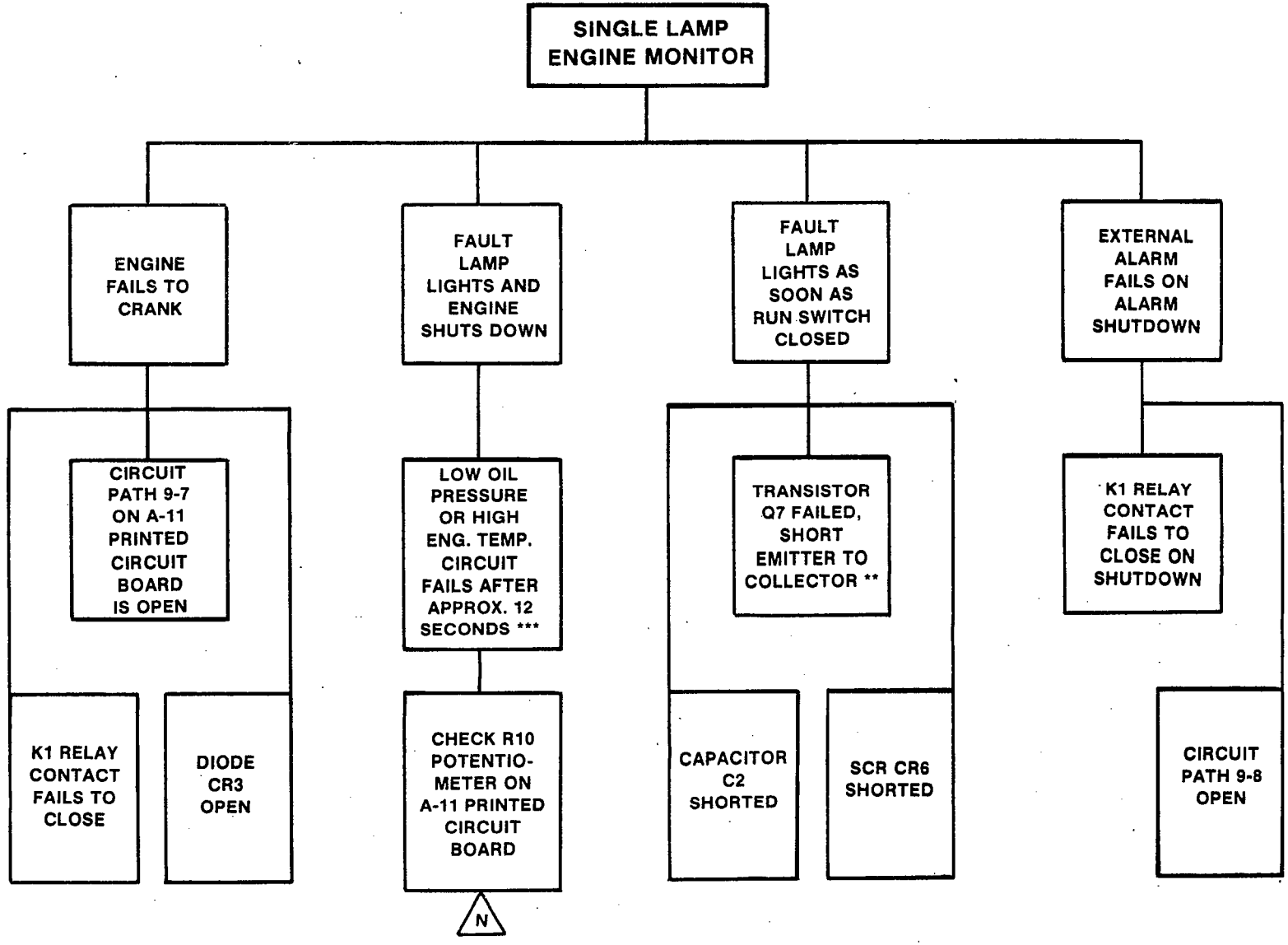
ITEM NO.	TABLE F. ENGINE FAILS TO CRANK (continued)	YES	NO	PROCEDURE
15.	Is voltage from ground to K11 terminal 1 equal to battery voltage?	17	16	
16.	Clean relay contact K11 (1-7) and check wiring. Replace relay K11 if necessary.	—	—	
17.	Does voltage from ground to coil terminal of K13* start solenoid equal battery voltage?	18	19	
18.	Does voltage from ground to TB11-22 equal battery voltage?	22	21	
19.	Jumper from K13* coil terminal to K11 terminal 1. Does relay K13* start solenoid pick up?	20	21	
20.	Replace cycle cranker and check printed circuit connection.	—	—	
21.	Replace K13* start solenoid.	—	—	
22.	Does voltage from ground to starter coil terminal equal battery voltage?	23	24	
23.	Replace starter.	—	—	
24.	Check wiring between TB11 terminal 22 and starter. Some units have an automatic resetting circuit breaker in this circuit.	—	—	
25.	Remove lead from TB11-31. Reset by switching to "stop", then back to "run". Does engine crank OK?	26	29	
26.	Inspect for bare wires and shorts to ground. Replace engine temperature sensor.	—	—	
27.	Are relay contacts K11 (8-5) open?	29	28	
28.	Replace relay and reset by switching to "stop", then back to "run". Does engine crank OK?	—	29	
29.	Replace engine monitor printed circuit board.	—	—	
30.	Remove lead from TB11-29. Reset by switching to "stop", then back to "run". Does engine crank when switched to run?	31	29	
31.	Replace the lead to TB11-29 when engine is running. Does overspeed lamp light and engine stop?	32	33	
32.	Check for defective overspeed switch or bare wires grounding terminal TB11-29.	—	—	
33.	Stop and start engine several times. Works OK?	—	34	
34.	Replace engine monitor printed circuit board.	—	—	

* **NOTE:** On EK, EM and EN series, start solenoid is mounted on the engine, rather than the control, and is designated K6.

ITEM NO.	TABLE G. ENGINE SHUTS DOWN AFTER RUNNING A SHORT TIME	YES	NO	PROCEDURE
1.	Does low oil pressure lamp light and plant stop after running about 12 seconds?	3	2	
2.	Does overcrank lamp light and plant stop after running about 1 minute?	5	—	
3.	Remove wire from terminal TB11-30. Reset alarm by switching to "stop", then back to "run". Does engine run OK? (Replace wire after test.)	4	—	
4.	Engine is either not pumping oil properly or oil pressure sensor is defective.	—	—	
5.	Does relay K11 pick up after engine starts?	6	9	
6.	Jumper relay K11 contacts (6-9) after engine starts. Does engine continue to run OK? (Remove jumper after test.)	7	8	
7.	Replace relay K11.	—	—	
8.	Replace engine monitor printed circuit board.	—	—	
9.	Does charge ammeter show a charging current while running?	10	12	
10.	Does battery voltage appear across K11 coil terminal (A-B) when engine runs?	7	11	
11.	Check for an open circuit in wiring or a loose connection from alternator "AUX" terminal to K11 coil circuit.	—	—	
12.	Check alternator and regulator output; replace if necessary.	—	—	

TABLE G. SYNOPSIS

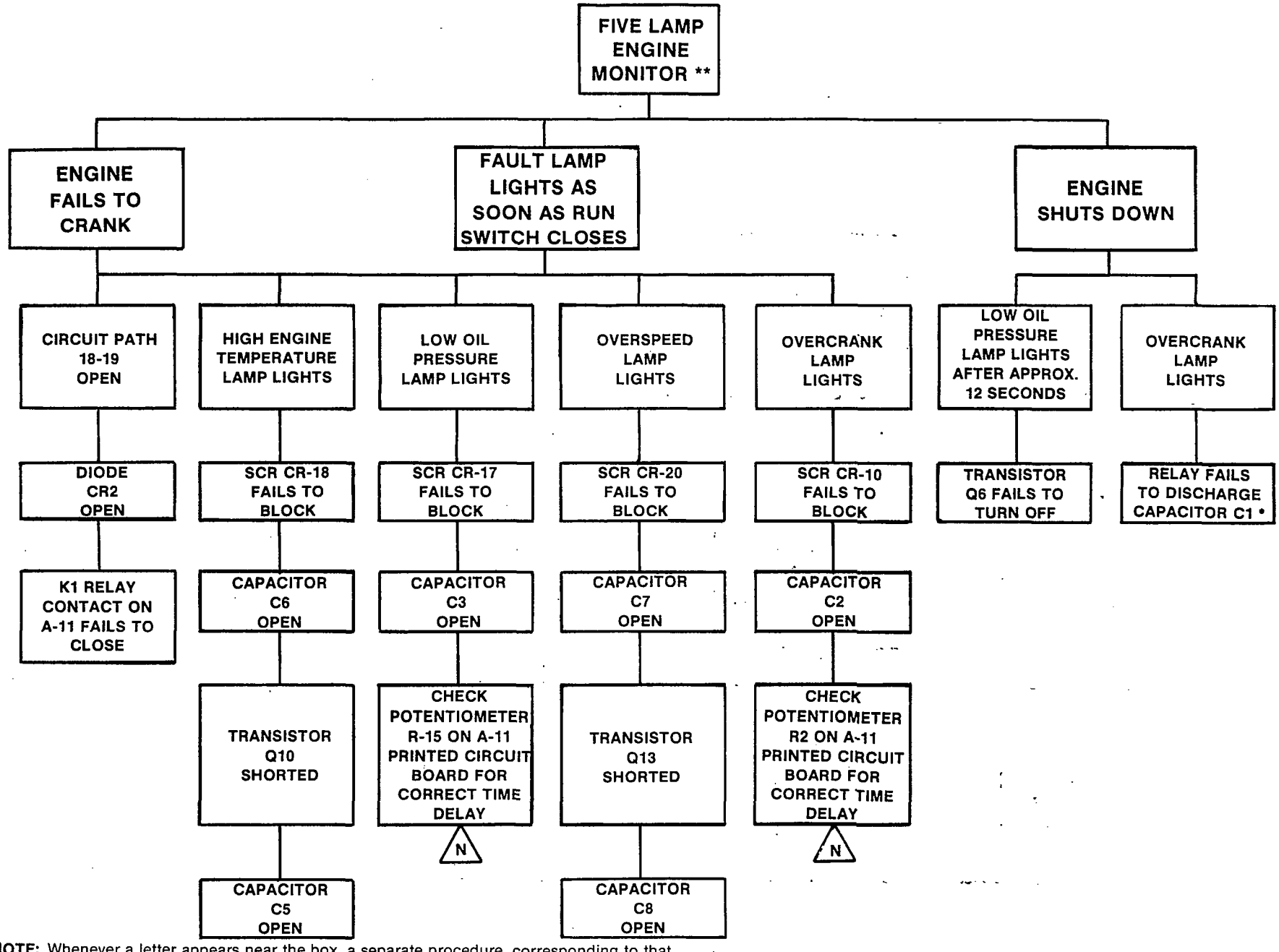




NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section

** - With switch in run position, check for voltage across R9 (27-ohms). A voltage of 0.5 to 1.0 will turn on SCR CR6. If voltage is present, remove TB11 terminal 29. If voltage is still present, check transistors Q7 for short-emitter to collector.

*** - Remove TB11 terminal 30 and 31. If engine still shuts down, remove transistor Q8. If this prevents shutdown — replace Q8.



NOTE: Whenever a letter appears near the box, a separate procedure, corresponding to that *letter, is given at the end of this section.*

* - Capacitor C1 must be discharged when engine starts to prevent an overcrank shutdown. Check relay contact that connects to terminal 16 of engine monitor.

** - See typical wiring diagram.

ADJUSTMENTS AND PROCEDURES

[A]

CAUTION **If starter fails to disengage, the engine may drive starter to unsafe speeds that could cause starter rotor windings to separate.**

[B]

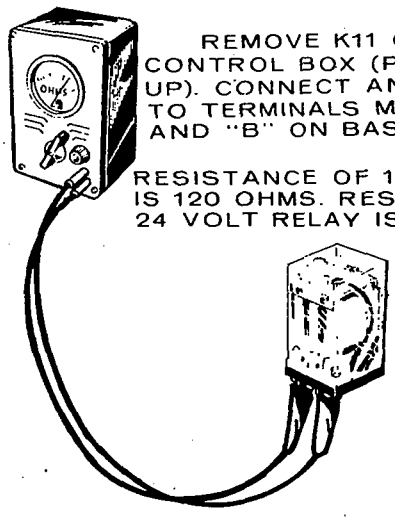


FIGURE 29. TESTING K11 AND K12 RELAYS

[C]

When connecting battery cables, terminal will spark if connection is reversed.

Unit will not crank with reversed cables or loose connections.

DC alternator will overheat and will probably burn up.

A reverse battery connection will show a maximum positive charge on the DC ammeter.

On dry charged batteries, no voltage is present until electrolyte is added.

[D]

See operator's manual for alternator belt tension adjustment.

[E]

Check for voltage from starter terminals to ground. Voltage should be present at both terminals when solenoid is energized for cranking.

[F]

Inspect contacts for dirt particles, obstructions or insulating film. Clean, using low pressure compressed air and bond paper. Check relay socket.

[G]

Contacts are normally closed when engine is not running. Contacts must open when engine is running normal.

[H]

Contacts are normally open; contacts close for alarm condition only. (Overspeed switch may have to be reset manually.)

[J]

Contacts may have welded closed or plunger may be stuck. Remove solenoid from circuit to test for proper operation.

[K]

Inspect printed circuit board paths that supply voltage to relay K12. (Between terminals 18-19 of 300-0681; between terminals 7-9 of 300-0679.)

[L]

Remove cycle cranker printed circuit board and jumper terminal 2-3 to by-pass cycle cranker circuit.

[M]

In an extreme emergency, engine may be operated without any safeties by removing engine monitor printed circuit board and jumping terminals 7-9. (It may be easier to jump from center contact of Run-Stop switch to terminal "B" on K12 relay; see Figure 30.)

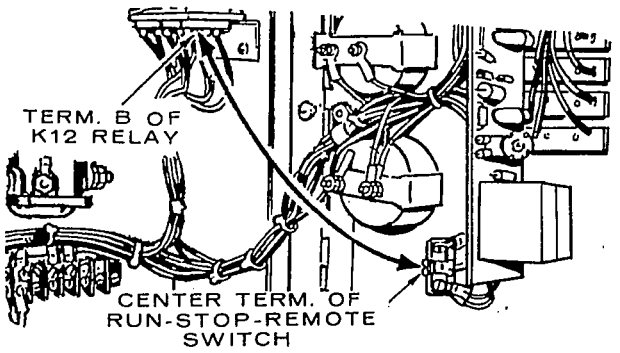


FIGURE 30. EMERGENCY STARTING

[N]

ADJUSTING LOW OIL PRESSURE TIME DELAY ON ENGINE MONITOR PRINTED CIRCUIT BOARD

Units With Single Fault Lamp: Potentiometer R10 on A-11 printed circuit board is factory adjusted for 12-1/2 seconds (±2-1/2 seconds). To lengthen delay, use a screwdriver and turn potentiometer clockwise. To shorten delay, turn potentiometer counterclockwise. Refer to Figure 31.

Units With Five Fault Lamps: Potentiometer R15 on A-11 printed circuit board is factory adjusted for 12-1/2 seconds (±2-1/2 seconds). To lengthen delay, use a screwdriver and turn clockwise; to shorten delay, turn counterclockwise. See Figure 32.

ADJUSTING OVERCRANK TIME DELAY ON ENGINE MONITOR PRINTED CIRCUIT BOARD

Units With Single Fault Lamp: Potentiometer R4 on A-11 printed circuit board is factory adjusted for 75 seconds (±5 seconds). To increase delay, use a screwdriver and turn R4 clockwise; to shorten delay, turn counterclockwise. See Figure 31.

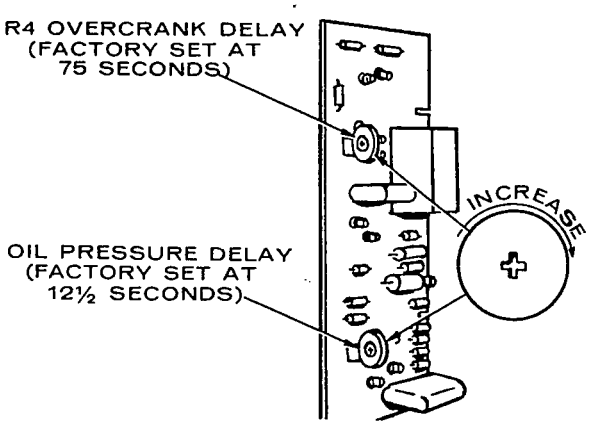


FIGURE 31. ADJUSTING TIME DELAYS ON SINGLE LAMP ENGINE MONITOR

Units With Five Fault Lamps: Potentiometer R2 on A-11 printed circuit board is factory adjusted for 75 seconds (±5 seconds). To lengthen delay, use a screwdriver and turn R2 clockwise; to shorten delay, turn counterclockwise. See Figure 32.

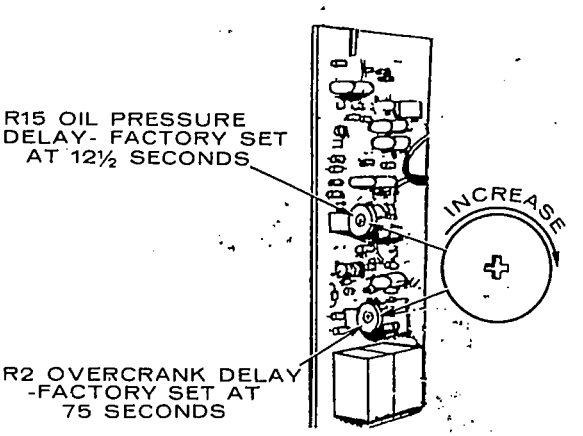


FIGURE 32. ADJUSTING TIME DELAYS ON FIVE LAMP ENGINE MONITOR

ADJUSTING OPTIONAL CYCLE CRANKER

The optional cycle cranker is factory set for 15 seconds crank time and 10 seconds rest time. To lengthen crank time, turn potentiometer R4 clockwise; to shorten crank time, turn counterclockwise. To lengthen rest time, turn potentiometer R1 clockwise; to shorten, turn counterclockwise. See Figure 33.

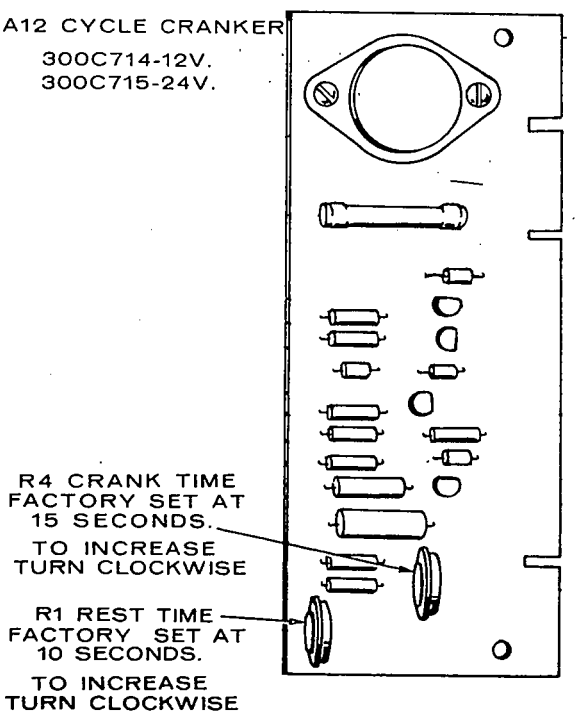


FIGURE 33. OPTIONAL CYCLE CRANKER ADJUSTMENTS

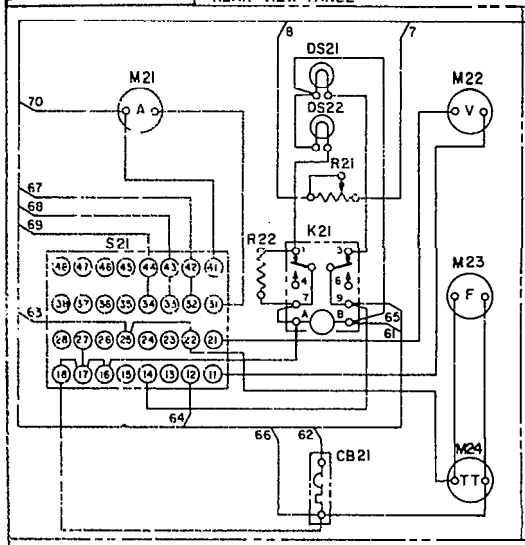
WIRING DIAGRAMS

		PAGE
612-4173	100-175 kW Brushless Exciter	54
612-3919	30-90 kW Static Exciter	55
625-1007	VR21 Brushless Exciter	56
625-0987	VR21 Static Exciter	57
612-4350	30-50 kW Controls - Single Light	58
612-4353	30-90 kW Controls - Five Light	59
300-0679	Engine Control Monitor - 12 V	60
300-0680	Engine Control Monitor - 24 V	61
300-0681	Engine Control Monitor - 12 V. Five Light	62
300-0682	Engine Control Monitor - 24 V. Five Light	63
300-0714	Cycle Cranker - 12 V	64
625-1036	Tap Switch	65
612-5300	25-90 kW Brushless 15R; 515R	66
612-5301	25-180 kW Brushless, Full Meter Panel	67
612-5302	25-45 kW-3R Brushless 120/240 V. 1 Phase	68
612-5303	25-45 kW - 3R Brushless 120/240 V. 1 Phase, Full Meter Panel	69
612-5304	25-90 kW 9XR Brushless 347/600V	70
612-5305	25-180 kW - 9XR Brushless 347/600V. Full Meter Panel	71
612-5310	Generator Set Engine Control, 12V Ignition; EK, EM, EN	72
612-5311	Generator Set Engine Control, 12 V Ignition; EK, EM, EN	73
612-5312	Generator Set Engine Control, 12V Ignition; KR, WA	74
612-5313	Generator Set Engine Control, 12 V Ignition; KR, WA	75

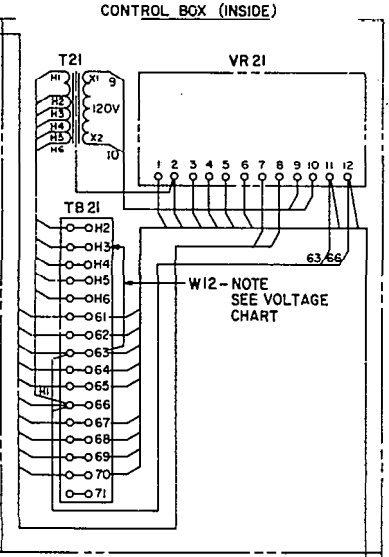
612C4173

WIRING DIAGRAM

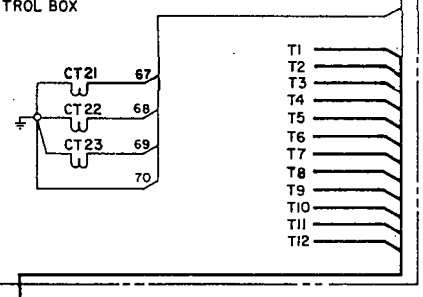
REAR VIEW PANEL



CONTROL BOX (INSIDE)



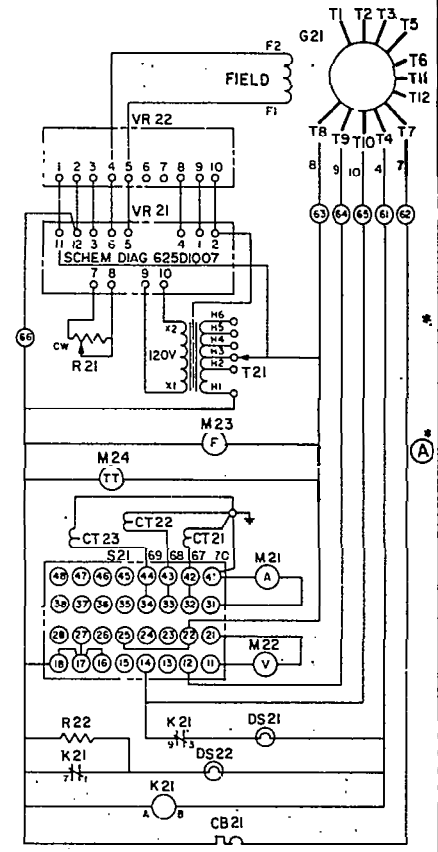
HOUSING-CONTROL BOX



S21

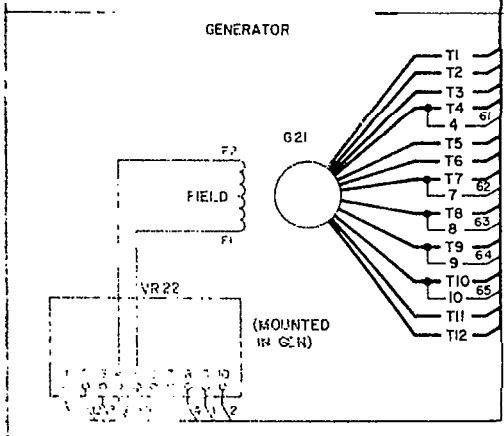
POSITION	CONTACTS CLOSED			
L1-L2 3Φ	11-18	21-25	31-32	41-43-44
L2-L3 3Φ	11-12	21-25	31-33	41-42-44
L3-L1 3Φ	11-12	21-27	31-34	41-42-43
L1-LO 3Φ	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L1-L2 1Φ	11-16	21-22	31-32	41-43-44
L1-L2 1Φ	11-16	21-22	31-33	41-42-44

SCHEMATIC DIAGRAM



NOTE:
CONNECT LEAD W12 FROM TERMINAL TB21-63 TO TB21-(H_) PER VOLTAGE CHART BELOW

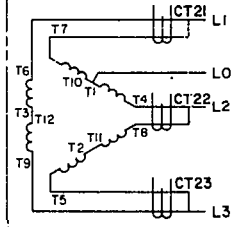
GENERATOR



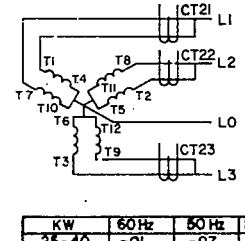
VOLTAGE CONNECTIONS

3 PHASE

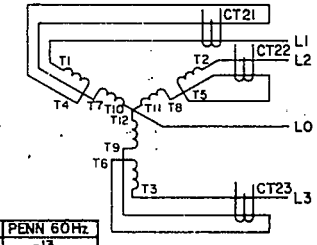
115/230V, 50 Hz, (H6)
120/240V, 60 Hz, (H5)



110/190V, 50 Hz, (H3)
115/200V, 50 Hz, (H4)
120/208V, 60 Hz, (H3)
127/220V, 60 Hz, (H4)
139/240V, 60 Hz, (H5)

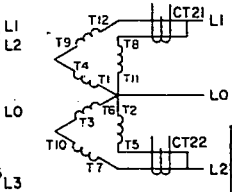


220/380V, 50 Hz, (H3)
234/400V, 50 Hz, (H4)
240/416V, 60 Hz, (H3)
254/440V, 60 Hz, (H4)
277/480V, 60 Hz, (H5)



1 PHASE

115/230V, 50 Hz, (H6)
120/240V, 60 Hz, (H5)



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

KW	60 Hz	50 Hz	PENN 60 Hz
25-40	-01	-07	-13
41-45	-02	-08	-14
46-60	-03	-09	-15
61-100	-04	-10	-16
101-125	-05	-11	-17
126-175	-06	-12	-18

PARTS LIST

REF. DES.	PART NO	QTY	DESCRIPTION
CB21	320B431	1	CIRCUIT BREAKER, 2 AMP
	320P307	1	LOCK-CKT BRKR HANDLE (PENN STATE)
CT21-23	302B743	1	TRANSFORMER ASSY-CUR (25-40KW)
	302B744	1	TRANSFORMER ASSY-CUR (41-45KW)
	302B745	1	TRANSFORMER ASSY-CUR (46-60KW)
	302B746	1	TRANSFORMER ASSY-CUR (61-100KW)
	302B747	1	TRANSFORMER ASSY-CUR (101-125KW)
	302B748	1	TRANSFORMER ASSY-CUR (126-175KW)
DS21	322A131	1	LIGHT-UPPER SCALE
DS22	322A130	1	LIGHT-LOWER SCALE
G21		1	GENERATOR
K21	307B1061	1	RELAY-VOLTAGE SELECTOR
	301B3244	1	BRACKET-RELAY MTG
M21	302B719	1	AMMETER-AC 0-75,0-150AMP (25-40KW)
	302B720	1	AMMETER-AC 0-100,0-200AMP (41-45KW)
	302B721	1	AMMETER-AC 0-150,0-300AMP (46-60KW)
	302B722	1	AMMETER-AC 0-200,0-400AMP (61-100KW)
	302B723	1	AMMETER-AC 0-250,0-500AMP (101-125KW)
	302B724	1	AMMETER-AC 0-375,0-750AMP (126-175KW)
	307P1157	1	SPRING-RELAY HOLDDOWN (K21)
M22	302B718	1	VOLTMETER-AC, 0-300, 0-600
M23	302B221	1	METER-FREQUENCY (60 Hz)
	302B256	1	METER-FREQUENCY (50 Hz)
M24	302B466	1	METER-RUNNING TIME (60Hz)
	302B469	1	METER-RUNNING TIME - (50Hz)
R21	303P170	1	RHEOSTAT-VOLTAGE ADJ 35K 25W
	303P32	1	KNOB-RHEOSTAT
R22	350-556(REF)	1	RESISTOR 47000, 1/2 WATT
S21	308B284	1	SWITCH-VOLT & AMMETER
	303-76	1	KNOB
			612C4173
T21	315D342	1	TRANSFORMER-VOLT REF
TB21	332A1242	1	MARKER-STRIP
VR21	332D1268	1	BOARD ASSY-PC VOLTAGE RGLTR
VR22	305D491(REF)	1	CHASSIS ASSY-VOLTAGE RGLTR
W11	338D525	1	WIRING HARNESS
W12	336A1913	1	LEAD ASSY
	301C3170	1	PANEL-GEN CONTROL
	301D3158	1	CONTROL BOX
	402A70	4	DAMPENER-VIBRATION
	337-49	1	STRAP-BOND
	508P1	4	GROMMET-RUBBER
	98C2169	1	SILKSCREEN-CONTROL PANEL AC
	545A23	1	PARTS LIST-AC CONT HDW

REV.	DESCRIPTION	DATE
A	ADDED 307P1157	12-8-70
	SUPERSEDES SAME DWG NO DATED 4-1-70	

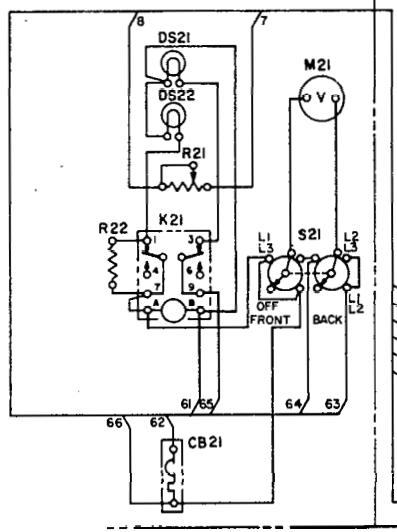
Onan

25-90 KW-15R/9484 100-175KW-15R/1 BRUSHLESS	DATE 12-16-70	BY J W D	CHK'D
3PH, 50/60 Hz 12 W RECONNECTABLE	NAME CONTROL-GEN SET AC (WIRING DIAGRAM)		
	DWG NO 612C4173		

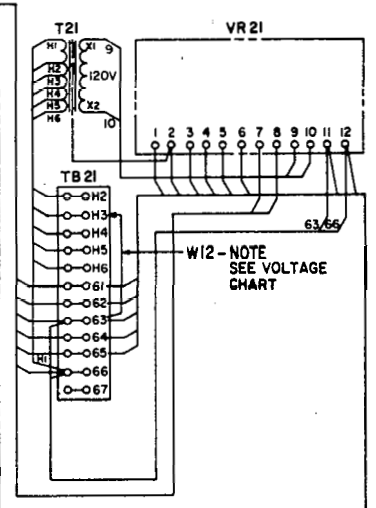
612C3919

WIRING DIAGRAM

REAR VIEW PANEL



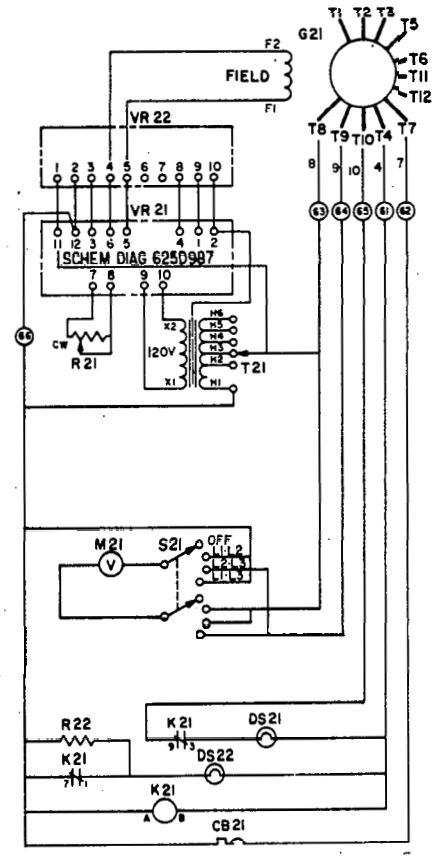
CONTROL BOX (INSIDE)



HOUSING - CONTROL BOX

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

SCHEMATIC DIAGRAM

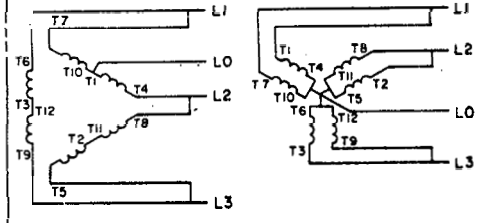


NOTE-
CONNECT LEAD W12 FROM
TERMINAL TB21-63 TO TB21-(H_)
PER VOLTAGE CHART BELOW

VOLTAGE CONNECTIONS

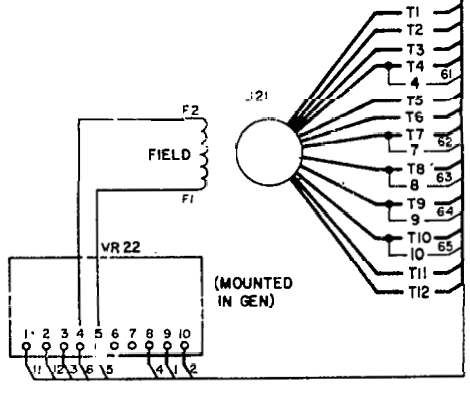
3 PHASE

115/230V, 50 Hz, (H6) 120/240V, 60 Hz, (H5)	110/190V, 50 Hz, (H3) 115/200V, 50 Hz, (H4) 120/208V, 60 Hz, (H3) 127/220V, 60 Hz, (H4) 139/240V, 60 Hz, (H5)	220/380V, 50 Hz, (H3) 234/400V, 50 Hz, (H4) 240/416V, 60 Hz, (H3) 254/440V, 60 Hz, (H4) 277/480V, 60 Hz, (H5)



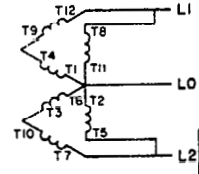
NOTE-
UNLESS OTHERWISE NOTED,
ALL COMPONENTS ARE SHOWN
IN THE DE-ENERGIZED
POSITION

GENERATOR



1 PHASE

115/230V, 50 Hz, (H6)
120/240V, 60 Hz, (H5)



PARTS LIST

REF. DES.	PART NO.	QTY	DESCRIPTION
CB21	320B2	1	CIRCUIT BREAKER, 15AMP (25-40KW)
	320B18	1	CIRCUIT BREAKER, 20AMP (41-90KW)
	320P307	1	LOCK-CKT BRKR HANDLE (PENN STATE)
DS21	322A131	1	LIGHT-UPPER SCALE
DS22	322A130	1	LIGHT-LOWER SCALE
G21		1	GENERATOR
K21	307B1061	1	RELAY-VOLTAGE SELECTOR
	301B3244	1	BRACKET-RELAY MTG
M21	302B718	1	VOLTMETER-AC, 0-300, 0-600
R21	303P170	1	RHEOSTAT-VOLTAGE ADJ 35K 25W
	303P32	1	KNOB-RHEOSTAT
R22	350-556(REF)	1	RESISTOR-47000, 1/2 WATT
S21	308A12	1	SWITCH-VOLTMETER
	303-76	1	KNOB
			612C3919
T21	315D342	1	TRANSFORMER-VOLT REF
TB21	332A1248	1	MARKER-STRIP
VR21	332D1264	1	BOARD ASSY-PC VOLTAGE RGLTR
VR22	305D489(REF)	1	CHASSIS ASSY-V RGLTR (25-60KW)
	305D483(REF)	1	CHASSIS ASSY-V RGLTR (61-90KW)
W11	338D524	1	WIRING HARNESS
W12	336A1913	1	LEAD ASSY
	301C3168	1	PANEL-GEN CONTROL
	301D3158	1	CONTROL BOX
	402A70	4	DAMPENER-VIBRATION
	337-49	1	STRAP-BOND
	508P1	4	GROMMET-RUBBER
	98C2169	1	SILKSCREEN-CONTROL PANEL AC
	545A22	1	PARTS LIST-AC CONT HDW

KW		PENN STATE
25-40	-01	-03
41-90	-02	-04

SUPERSEDES SAME DWG NO. DATED 5-21-70

Onan

DWN 1-4-71 | BY J.W.D. | CHK Jim Vint | APP

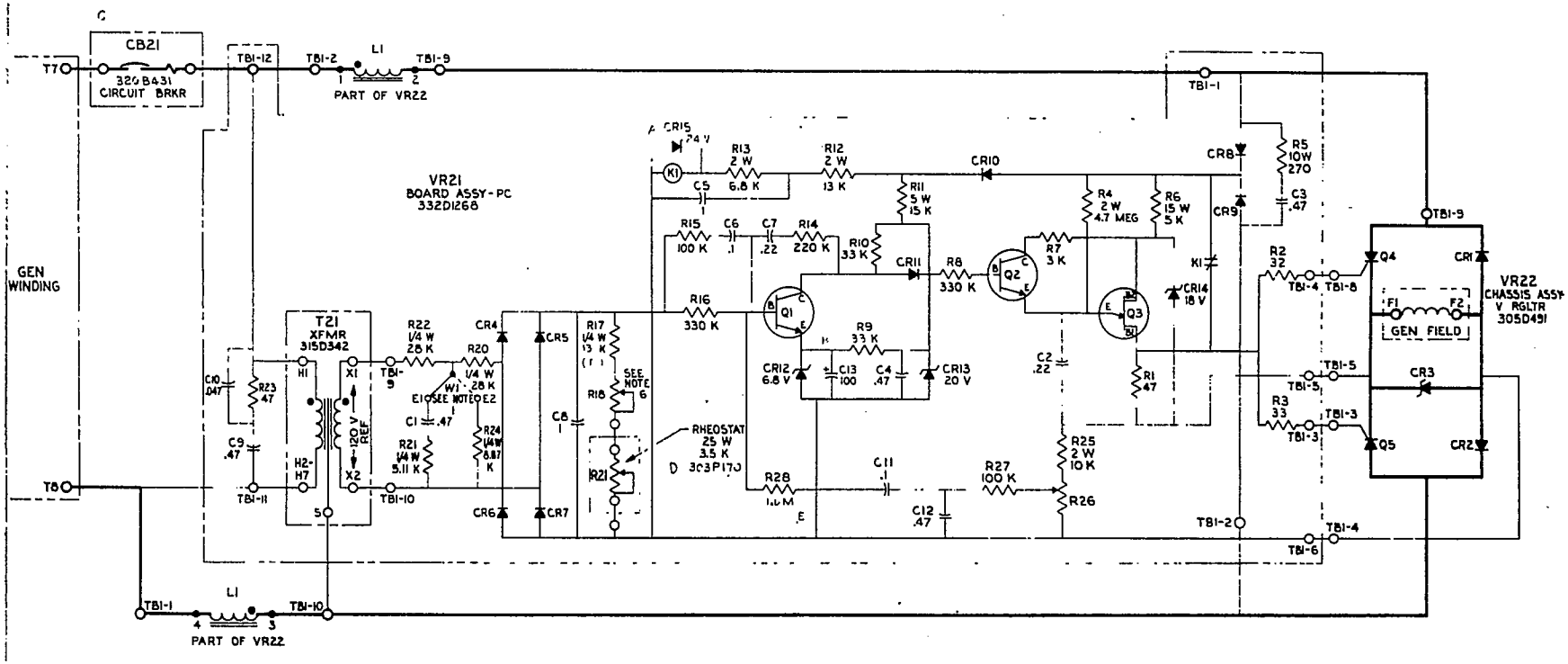
25-90KW-15R/1
STATIC

3PH, 50/60 Hz
12 W RECONNECTABLE

CONTROL-GEN SET AC
(WIRING DIAGRAM)

DWG NO. 612C3919

625D1007

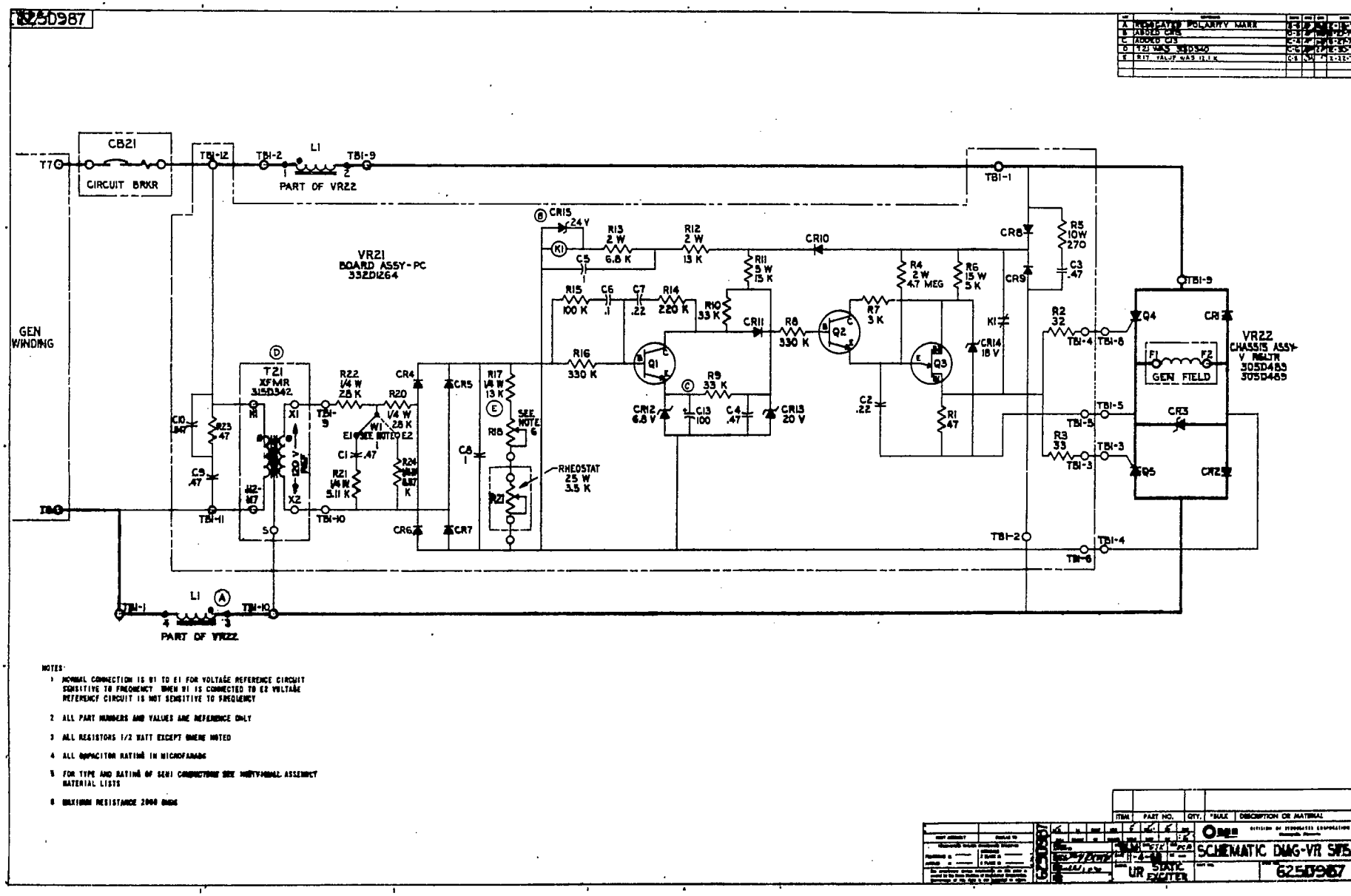


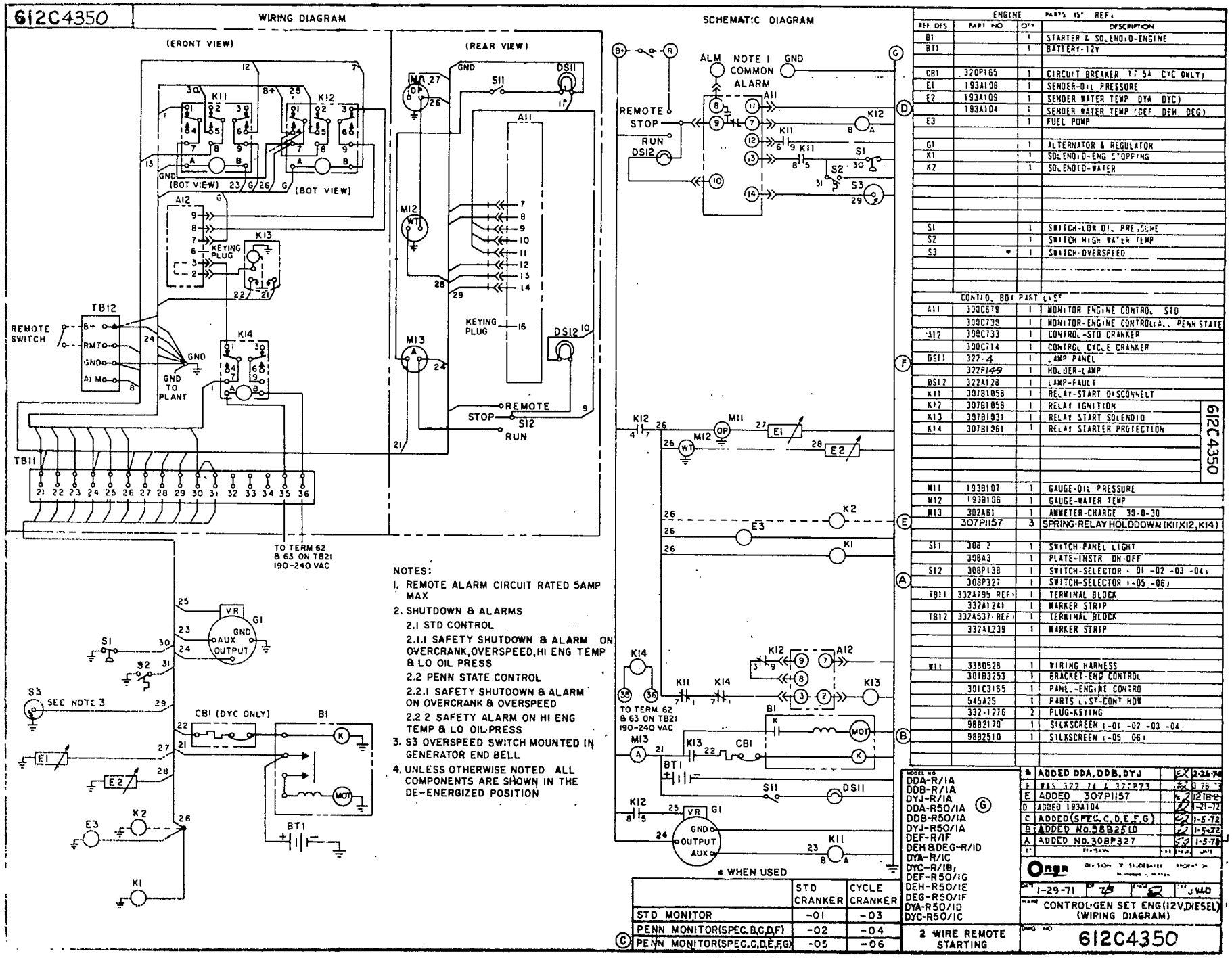
NOTES

1. NORMAL CONNECTION IS W1 TO E1 FOR VOLTAGE REFERENCE CIRCUIT SENSITIVE TO FREQUENCY. WHEN W1 IS CONNECTED TO E2 VOLTAGE REFERENCE CIRCUIT IS NOT SENSITIVE TO FREQUENCY
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
6. MAXIMUM RESISTANCE 2000 OHMS

ITEM	PART NO.	QTY	SCALE	DESCRIPTION OR MATERIAL

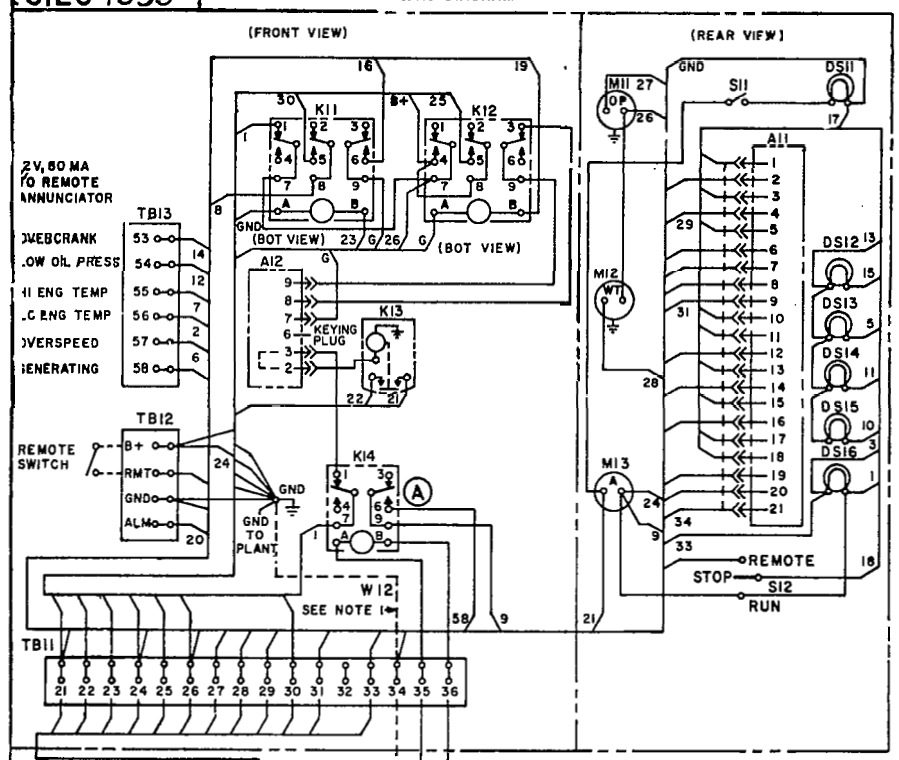
SCHEMATIC DIAG-VR SYS
UR BRUSHLESS EXCITER
625D1007

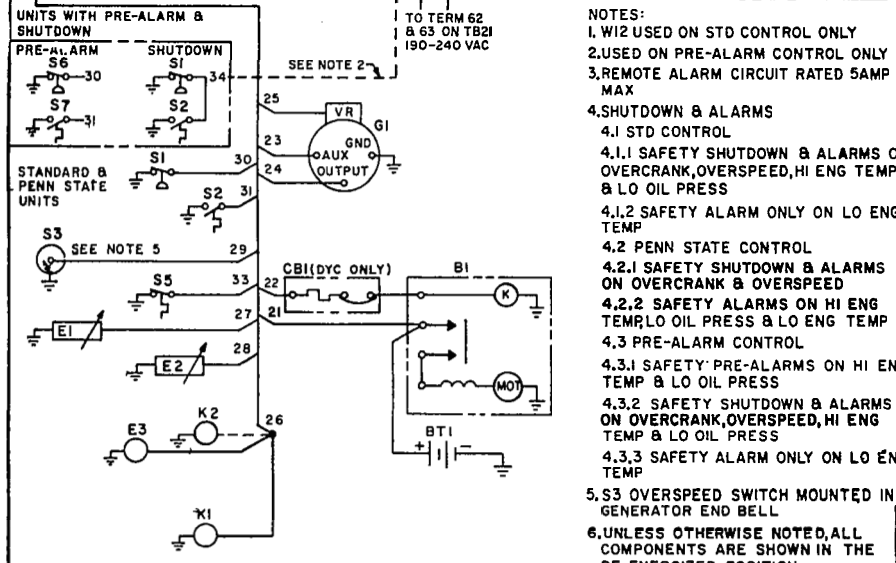




612C4353

WIRING DIAGRAM



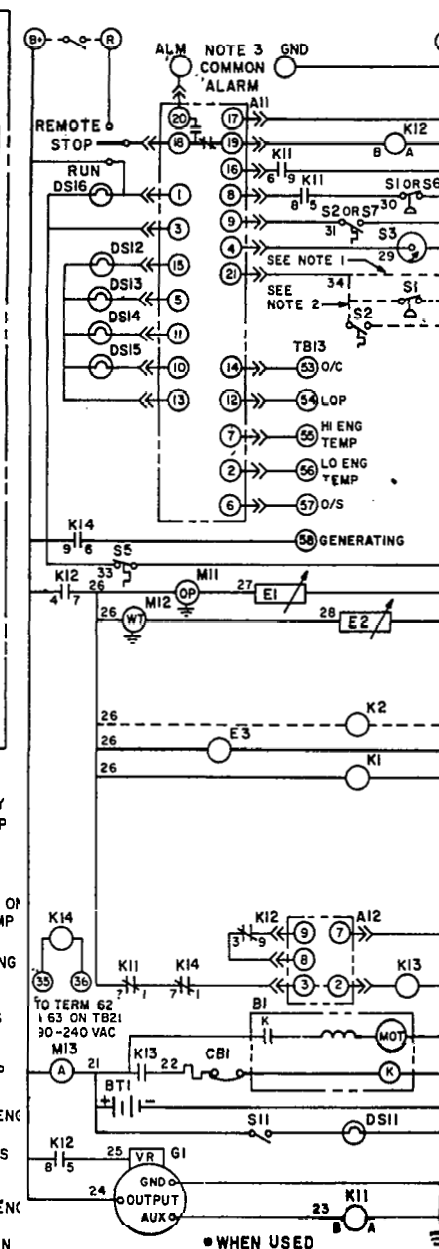


NOTES:

1. WI2 USED ON STD CONTROL ONLY
2. USED ON PRE-ALARM CONTROL ONLY
3. REMOTE ALARM CIRCUIT RATED 5AMP MAX
4. SHUTDOWN & ALARMS
   - 4.1 STD CONTROL
   - 4.1.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.1.2 SAFETY ALARM ONLY ON LO ENG TEMP
   - 4.2 PENN STATE CONTROL
   - 4.2.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK & OVERSPEED
   - 4.2.2 SAFETY ALARMS ON HI ENG TEMP, LO OIL PRESS & LO ENG TEMP
   - 4.3 PRE-ALARM CONTROL
   - 4.3.1 SAFETY PRE-ALARMS ON HI ENG TEMP & LO OIL PRESS
   - 4.3.2 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.3.3 SAFETY ALARM ONLY ON LO ENG TEMP
5. S3 OVERSPEED SWITCH MOUNTED IN GENERATOR END BELL
6. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

(H) ADDED DDA, DDB, DYJ 2-26-71

SCHEMATIC DIAGRAM



* WHEN USED

	STD CRANKER	CYCLE CRANK
STD CONTROL	-01	-03
PRE-ALARM & PENN STATE (SPEC. B & D,F)	-02	-04
(D) PENN STATE (SPEC. C,D,E,F,G)	-05	-06

ENGINE PARTS LIST (REF)

REF. DES.	PART NO.	QTY	DESCRIPTION
B1		1	STARTER & SOLENOID-ENGINE
BT1		1	BATTERY-12V
CB1	320P165	1	CIRCUIT BREAKER, 17.5 AMP(DYC ONLY)
E1	193A108	1	SENDER-OIL PRESSURE
E2	193A109	1	SENDER-WATER TEMP (DYA, DYC)
	193A104	1	SENDER-WATER TEMP (DEF, DEH, DEG)
E3		1	FUEL PUMP
G1		1	ALTERNATOR & REGULATOR
K1		1	SOLENOID-ENG STOPPING
K2		1	SOLENOID-WATER
S1		1	SWITCH-LOW OIL PRESSURE
S2		1	SWITCH-HIGH WATER TEMP
S3		1	SWITCH-OVERSPEED
S5		1	SWITCH-LOW WATER TEMP
S6		1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S7		1	SWITCH-HIGH WATER TEMP (PRE-ALARM)

CONTROL BOX PARTS LIST

AII	300D681	1	MONITOR-ENGINE CONTROL
AI2	309A733	1	CONTROL-STD CRANKER
	300C714	1	CONTROL-CYCLE CRANKER
	332-1276	1	PLUG-KEYING
DSI1	322-4	1	LAMP-PANEL
	322P149	1	HOLDER-LAMP
DSI2	322A107	1	LAMP-OVERCRANK
DSI3	322A111	1	LAMP-OVER PEED
DSI4	322A108	1	LAMP-LOW OIL PRESS
DSI5	322A109	1	LAMP-HI ENG TEMP
DSI6	322A110	1	LAMP-LO ENG TEMP
KII	307B1058	1	RELAY-START DISCONNECT
K12	307B1058	1	RELAY-IGNITION
K13	307B1031	1	RELAY-START SOLENOID
K14	307B1061	1	RELAY-STARTER PROTECTION
MII	193B107	1	GAUGE-OIL PRESSURE
MI2	193B108	1	GAUGE-WATER TEMP
MI3	302A61	1	AMMETER-CHARGE 30-0-30
SII	308-2	1	SWITCH-PANEL LIGHT
	308A3	1	PLATE-INSTR ON OFF
SI2	308P138	1	SWITCH-SELECTOR(-01,-02,-03,-04)
TBII	332A795(REF)	1	TERMINAL BLOCK
	332A1241	1	MARKER STRIP
TBI2	332A537(REF)	1	TERMINAL BLOCK
	332A1239	1	MARKER STRIP
TBI3	332A699(REF)	1	TERMINAL BLOCK
	332A1240	1	MARKER STRIP
WII	338D534	1	WIRING HARNESS
WI2	336A1918	1	LEAD ASSY (STD CONT ONLY)
	545A26	1	PARTS LIST-CONT HOW (ENG)
	301D3253	1	BRACKET-ENG CONTROL
	301C3267	1	PANEL-ENG CONTROL
	98B2170	1	SILKSCREEN (-01 -02 -03 -04)
	98B2510	1	SILKSCREEN (-05 -06)
	308P327	1	SWITCH-SELECTOR (-05 -06)
(F)	307P157	3	SPRING-RELAY HOLDDOWN(KII,KI2,KI4)

612C4353

MODELS:
DDA-R/9222A
DDB-R/9222A
DYJ-R/9222A
DDA-R50/9222A
DDB-R50/9222A
DYJ-R50/9222A
DEF-R/9222F
DEH & DEG-R/9222D
DYA-R/9222C
DYC-R/9222B
DEF-R50/9222G
DEH-R50/9222E
DEG-R50/9222F
DYA-R50/9222D
DYC-R50/9222C

2 WIRE REMOTE STARTING

LET	REVISION	CHK	DATE
G	WAS 322-74 & 322P73		9-28-71
F	ADDED 307P157		12-18-71
E	ADDED 193A104		1-21-72
D	ADDED (SPEC. C, D, E, F, G)		1-5-72
C	ADDED No. 98B2510		1-5-72
B	ADDED No. 308P327		1-5-72
A	ADDED "GEN" CIRCUIT		9-29-71

Onan — DIVISION OF STUDEBAKER CORPORATION

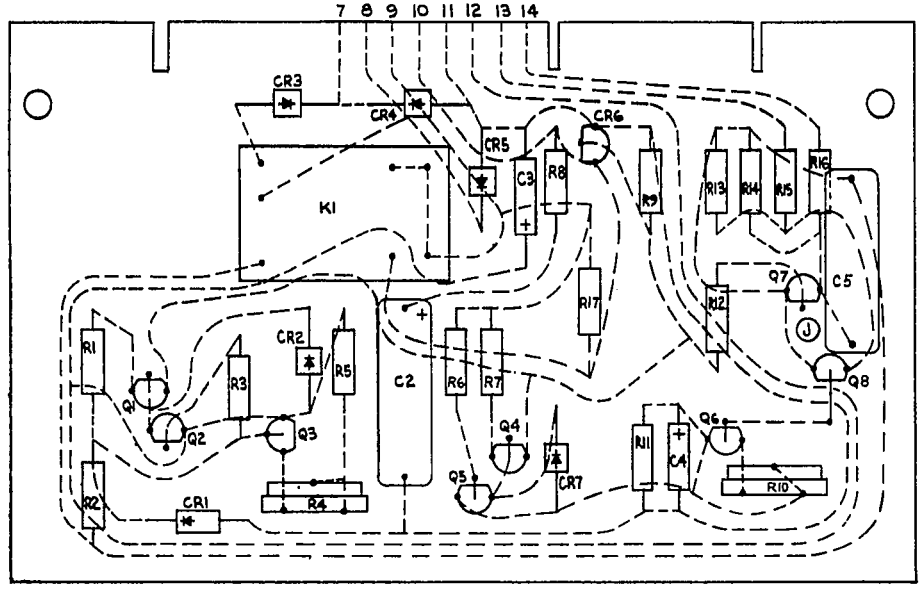
DATE 2-2-71 | DR. JS | CHKD. EJ | CKD. J.W.D.

NAME: CONTROL-GEN SET ENG(12V,DIESEL) (WIRING DIAGRAM)

DWG. NO. 612C4353

300C679

LET	REVISIONS	ZONE	ENG	CHK	DATE
A	NO. 350-576 WAS QTY 3	2-B	JV	WB	2-11-70
B	NO. 303A169 WAS QTY 1	2-B	JV	WB	2-11-70
C	ADDED RESISTOR NO. 350-971	2-B	JV	WB	2-11-70
D	ADDED NOTE 3	2-C	JV	WB	2-11-70
E	NO. 355P5 WAS QTY 1	2-A	JV	WB	2-11-70
F	WAS NO. 350-483	2-B	JV	WB	3-4-70
C	R17 WAS 350-971	2-B	JV	WB	5-1-70
G	R3 (ITEM 15) WAS 350-552	2-C	JV	WB	5-1-70
H	C1 (ITEM 3) REMOVED WAS 356A38	2-A	[illegible]	CP	10-1-70
J	REVISED CIRCUIT (Q7 & C5)	3-C	[illegible]	CP	11-5-70
A	WAS 350-576	2-B	[illegible]	CP	11-6-72
K	CR6 WAS 364A11	2-B	[illegible]		3-22-74

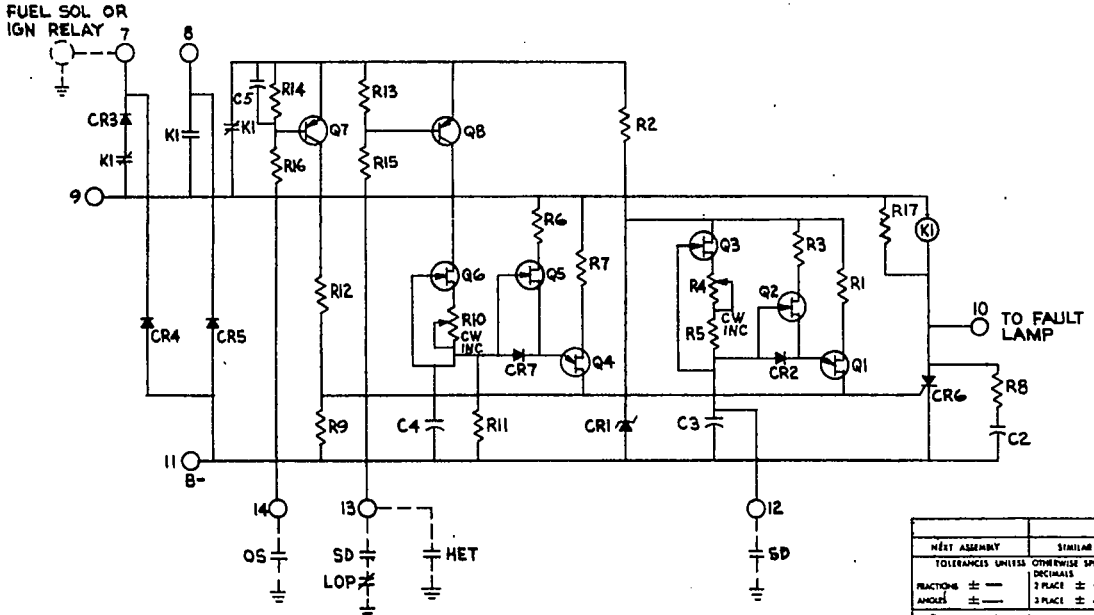


NOTES:

1. SOLDER PER SOLDERING PROCESS MIL-S-6872 USING SOLDER, ITEM 23.
2. SOLDER JOINTS AND OR COMPONENT LEADS SHALL NOT PROJECT MORE THAN 3/16 BEYOND SURFACE OF BOARD.
3. (D) FACTORY ADJUST POTENTIOMETER R13 FOR 12.5 ± 2.5 SECONDS LOP DELAY. FACTORY ADJUST POTENTIOMETER R4 FOR 75 ± 10 SECONDS OVERCRANK DELAY.

300C679

	REF DES	ITEM	PART NO.	QTY.	*BULK	DESCRIPTION OR MATERIAL
(G)	R3	26	350-548	1		RESISTOR 10KΩ
(C)	R17	25	350-1128	1		RESISTOR 220 Ω
		24	98A2160	1		SILKSCREEN-PC BD (ENG MON)
		23	*880-12	10Z		SOLDER-SN60
	R15,R16	22	350-540	2		RESISTOR 2.2KΩ
	R12,13,14	21	350-529	3		RESISTOR 270Ω
(F)	R11	20	350-584	1		RESISTOR 10 MEGΩ
	R9	19	350-517	1		RESISTOR 27Ω
	R8	18	350-505	1		RESISTOR 2.7Ω
(A)	R5	17	350-572	1		RESISTOR 1 MEGΩ
(B)	R4,R10	16	303A169	2		POTENTIOMETER 3.5 MEGΩ
	R6	15	350-552	1		RESISTOR 22KΩ
	R2	14	350-526	1		RESISTOR 150Ω
	R1,R7	13	350-536	2		RESISTOR 100Ω
	Q7,Q8	12	362A8	2		TRANSISTOR-SILICON (PNP) 2N3792
	Q2,3,5,6	11	362A25	4		TRANSISTOR-FLD EFFECT 2N5457
	Q1,Q4	10	361A3	2		TRANSISTOR 2N4871
(K)	CR6	9	364A17	1		RECTIFIER-GATE CONT
	CR2,3,4,5,7	8	357A4	5		RECTIFIER-DIODE
	CR1	7	359A27	1		DIODE-ZENER 7.5V
	C4	6	356A30	1		CAPACITOR 1MFD
	C3	5	356A40	1		CAPACITOR 10MFD
(E)	C2,5	4	355P5	2		CAPACITOR .22MFD
(H)						
	K1	2	307A1039	1		RELAY
		1	332D1246	1		PRINTED CIRCUIT BOARD

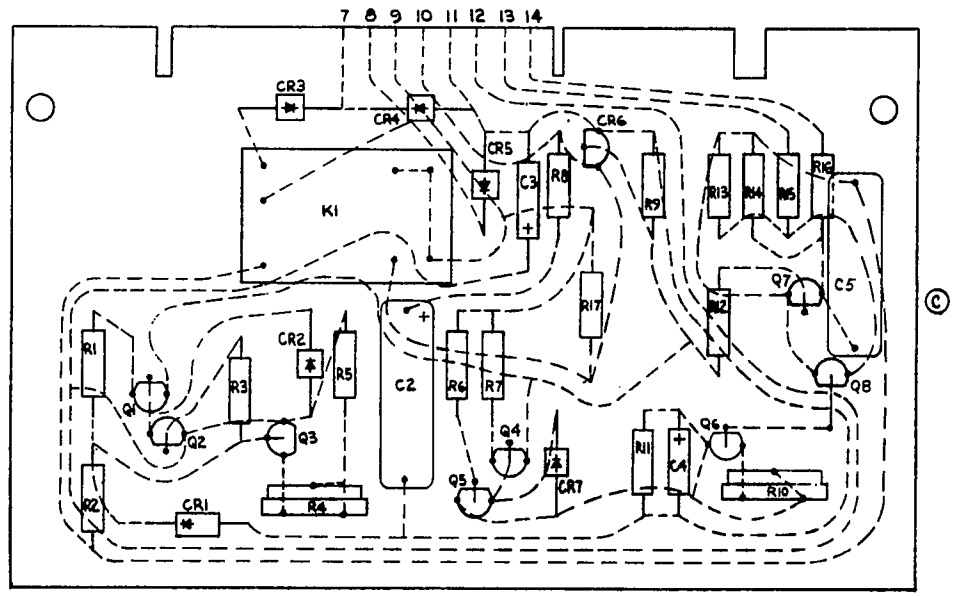


NEXT ASSEMBLY		SIMILAR TO	ME	SA	COST	HSG	TP	SD RELAY	CO	PLR	Ongn DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota		
			MEL	CRANE	CE	PUNCH	WELD	MISC	QC	K			
TOLERANCES UNLESS OTHERWISE SPECIFIED			DESIGN APPROVED JV 11-17-69			DR RLH	ENG Jim Ward	CHK WB			MONITOR-ENG CONTROL ... (12V)		
FRACTIONS ± —	DECIMALS 2 PLACE ± —		SAMPLE RELEASE			DATE 11-12-69		SC 2/1					
ANGLES ± —	3 PLACE ± —		PROD RELEASE JV 11-17-69			MODEL UR SERIES					PATT NO	DWG NO 300C679	
The proprietary design information on this print is owned by the Onan Division of Studebaker Corporation. Conveyance of this right is not intended to others			SH PLY FROM										

60

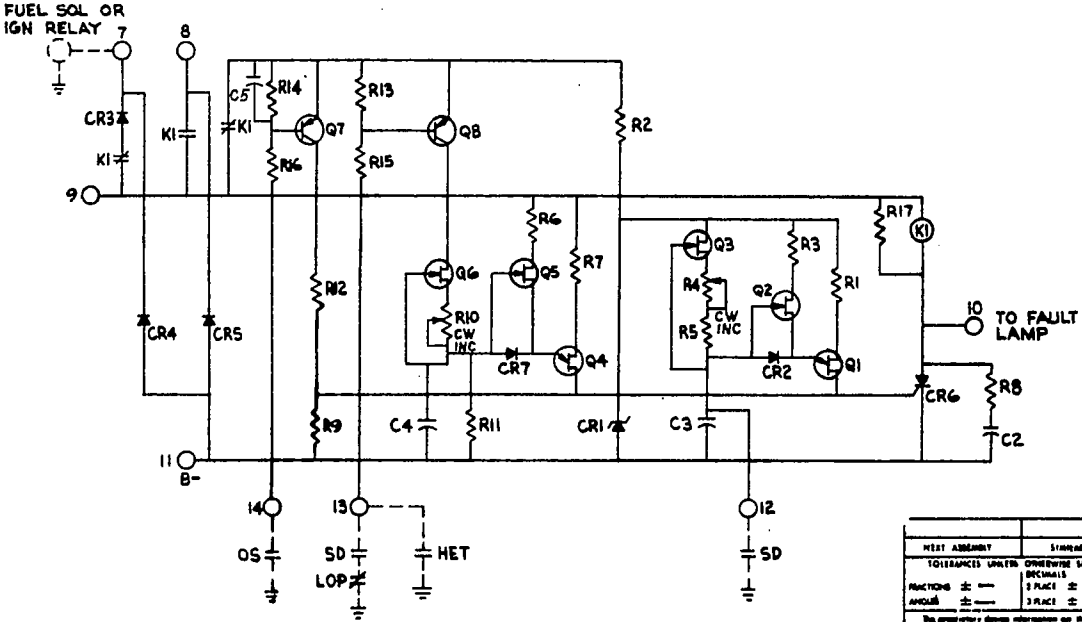
300C680

LET	REVISIONS	ZONE	ENG	TRD	DATE
A	R3 (ITEM 15) WAS 350-552	2-C	JV		5-1-70
B	C1 (ITEM 3) REMOVED WAS 356A38	2-A		CP	10-1-70
C	REVISED CIRCUIT (Q1 & C5)	3-C		CP	11-3-70
D	ITEM 2 WAS 307A1039	2-A	JV	CP	11-10-70
E	ITEM 11 WAS QTY 4	2-B	JV	CP	3-26-71
F	ITEM 28 WAS 362A25	2-C	JV	CP	
G	ITEM 16 WAS QTY 2	2-B	JV	CP	
H	ITEM 29 WAS 303A1A9	2-C	JV	CP	
J	ITEM 17 (R5) WAS 350-576 2.2 MEG Ω	2-B		CP	11-15-72
K	CR6 WAS 364A11	2-A	JV	WB	3-22-74



NOTES:

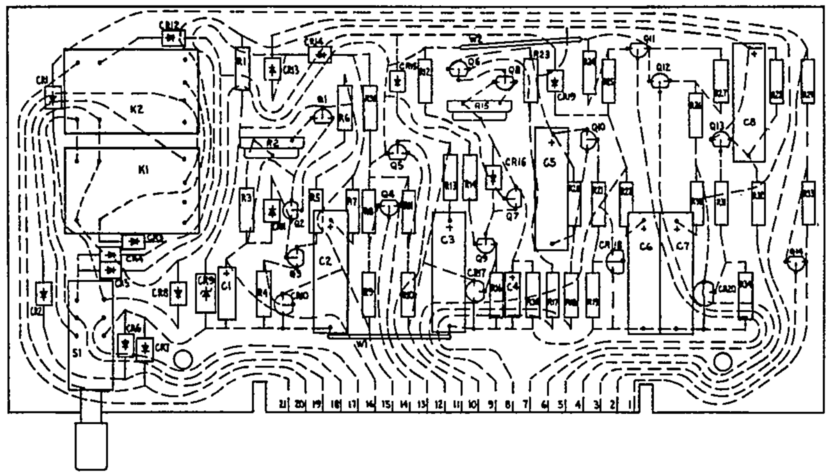
1. SOLDER PER SOLDERING PROCESS MIL-S-6872 USING SOLDER, ITEM 23
2. SOLDER JOINTS AND/OR COMPONENT LEADS SHALL NOT PROJECT MORE THAN 3/16 BEYOND SURFACE OF BOARD.
3. SET R4 FOR AN OVERCRANK TIME DELAY OF 75±5 SECONDS
4. LOW OIL PRESS TIME DELAY SHOULD BE 12.5±2.5 SECONDS



H	R10	29	303A182	1	POTENTIOMETER	1.0 MEG OHM
F	Q5,6	28	362A31	2	TRANSISTOR-FLD EFFECT	2N5716
A	R3	27	350P548	1	RESISTOR 10KΩ	0897003
	R17	26	350-980	1	RESISTOR 510Ω, 2 W	
	R12	25	350-380	1	RESISTOR 510Ω, ½ W	
		24	98A2245	1	SILKSCREEN-PC BD (ENG MON)	
		23	*880-12	10Z	SOLDER-SN60	
	R15,R16	22	350-544	2	RESISTOR	4.7KΩ
	R13,14	21	350-529	2	RESISTOR	270Ω
	R11	20	350-587	1	RESISTOR	1MEGΩ
	R9	18	350-517	1	RESISTOR	27Ω
	R8	18	350-505	1	RESISTOR	2.7Ω
J	R5	17	350-572	1	RESISTOR	1.0 MEGΩ
G	R4	16	303A189	1	POTENTIOMETER	3.5 MEGΩ
	R6	15	350-552	1	RESISTOR	22KΩ
	R2	14	350-534	1	RESISTOR	680Ω
	R1,R7	13	350-538	2	RESISTOR	1600Ω
	Q7,Q8	12	382A27	2	TRANSISTOR-SILICON (PNP)	2N5366
E	Q2,3	11	362A25	2	TRANSISTOR-FLD EFFECT	2N5457
	Q1,Q4	10	361A3	2	TRANSISTOR	2N4871
K	CR6	9	364A17	1	RECTIFIER-GATE CONT	
	CR2,3,4,5,7	8	357A4	5	RECTIFIER-DIODE	
	CR1	7	359A27	1	DIODE-ZENER 7.5V	
	C4	6	356A30	1	CAPACITOR 1MFD	
	C3	5	356A40	1	CAPACITOR 10MFD	
	C2,5	4	355P5	2	CAPACITOR .22MFD	
B						
D	K1	2	307A1076	1	RELAY	
		1	33201306	1	PRINTED CIRCUIT BOARD	
	REF DES	ITEM	PART NO.	QTY.	*BULK DESCRIPTION OR MATERIAL	

NEXT ASSEMBLY | STANDARD BD
TOLERANCES UNLESS OTHERWISE SPECIFIED: DECIMALS 2 PLACE ±, 3 PLACE ±; FRACTIONS ±; ANGLES ±
APPROVED: JV 4-1-70
DR CJP 2-13-70
CK WJB
SC 2/1
MODEL: UR SERIES
PART NO.
DWG NO 300C680
Ongan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota
MONITOR-ENGINE CONTROL (24V)

LTR	REVISIONS
A	SUPLOS DWG SAME NO. DATED 11/16/69
B	CR10,17,18,&20 WAS 364A11



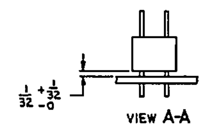
NOTES.

1 SOLDER PER SOLDERING PROCESS MIL-S-6872 USING SOLDER ITEM 25

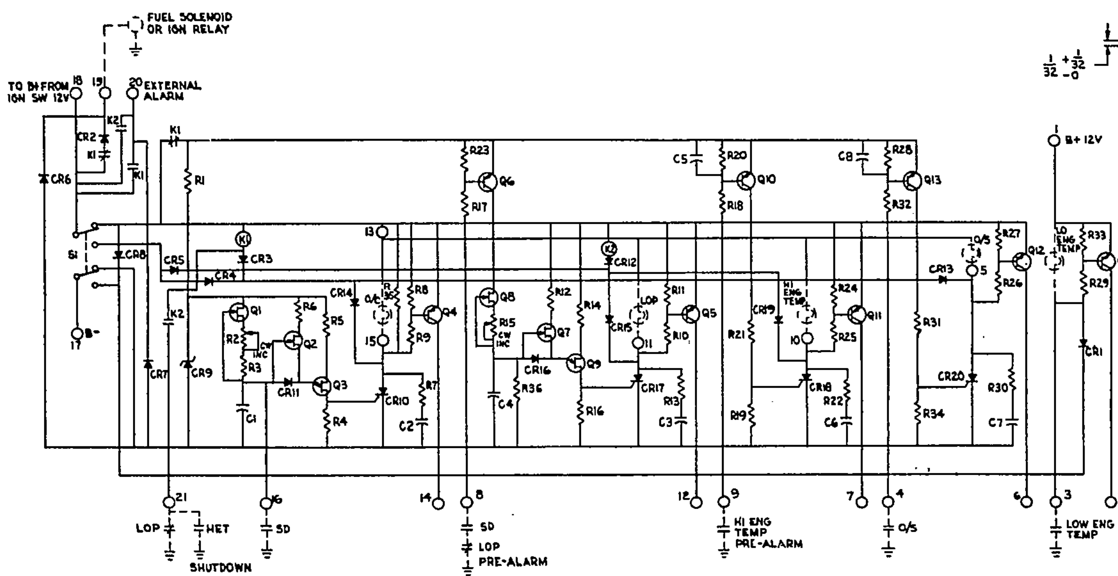
2 SOLDER JOINTS AND OR COMPONENT LEADS SHALL NOT PROJECT MORE THAN 3.16 BEYOND SURFACE OF BOARD

3 SET R2 FOR AN OVERCRANK TIME DELAY OF 75 ± 5 SECONDS

4 OIL PRESS TIME DELAY SHOULD BE 12.5 ± 2.5 SECONDS



VIEW A-A



REF DES	ITEM	PART NO.	QTY.	*BULK DESCRIPTION OR MATERIAL
R6	28	350P548	1	RESISTOR 10KΩ
R36	27	350-584	1	RESISTOR 10 MEG Ω
R35	26	350-1128	1	RESISTOR 220 Ω
	25	*880-17	0.1OZ	SOLDER
	24	98A2158	1	SILKSCREEN
W2	23	*334P738	1.25"	WIRE-MAGNET
W1	22	*334P738	1.25"	WIRE-MAGNET
S1	21	308A280	1	SWITCH-PUSH BUTTON
R8 10 17.18.25.26.29.32	20	350-540	8	RESISTOR 2.2KΩ
R9,11,20,21,23,24,27,28,31,33	19	350-529	10	RESISTOR 270Ω
R7.13.22.30	18	350-505	4	RESISTOR 2.7Ω
R12	17	350-552	1	RESISTOR 22KΩ
R5 14	16	350-538	2	RESISTOR 1000Ω
R4.16.19.34	15	350-517	4	RESISTOR 27Ω
R3	14	350-572	1	RESISTOR 1 MEG Ω
R2.15	13	303A169	2	POTENTIOMETER 3.5 MEG OHM
R1	12	350-526	1	RESISTOR 150Ω
Q4,5.6.10 11.12 13.14	11	362A8	8	TRANSISTOR-SILICON (PNP) 2N3702
Q3,9	10	361A3	2	TRANSISTOR 2N4871
Q1 2.7.8	9	362A25	4	TRANSISTOR-FLD EFFECT 2N5457
K1,K2	8	307A1039	2	RELAY
(B) CR10.17.18,20	7	364A17	4	RECTIFIER-GATE CONT
CR8	6	359A27	1	DIODE-ZENER 7.5V
CR1,2,3,4,5,6,7,9, 11,12,13,14,15,16,19	5	357A4	15	RECTIFIER-DIODE
C4	4	350A30	1	CAPACITOR 1.0MFD
C2 3 5.6.7.8	3	355P5	6	CAPACITOR 22MFD
C1	2	358A40	1	CAPACITOR 10MFD
	1	332D1231	1	PRINTED CIRCUIT BOARD

Onan DIVISION OF STUDEBAKER CORPORATION

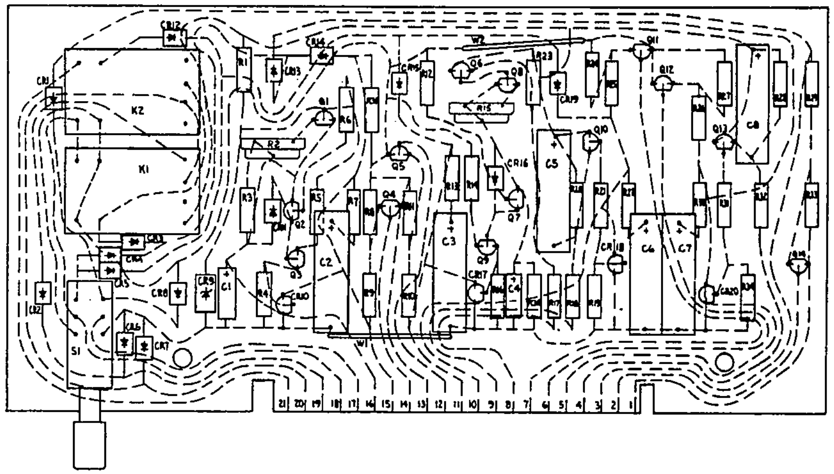
MONITOR-ENG CONTROL (12V)

11-8-73 2/1 UR

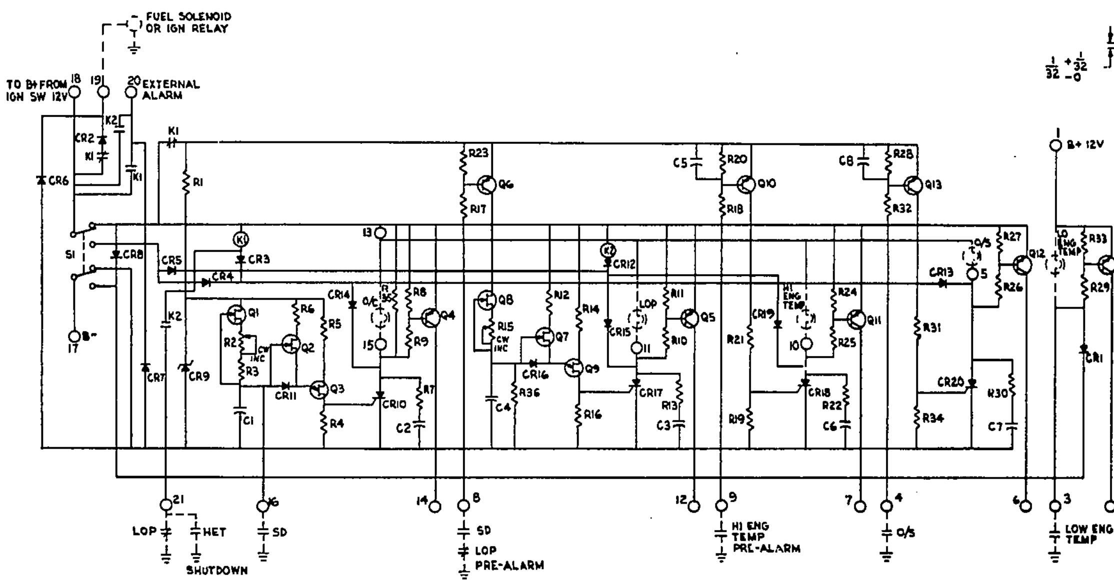
300-0681 D

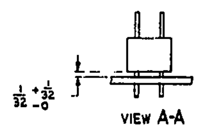
300-0682

LTR	DESCRIPTION				
A	SUPSDS DWG SAME NO DATED 3/24/70				
B	CR10,17,18,&20 WAS 364A11				
C	REVISED NUMBER, WAS 38A2285				



NOTES
1 SOLDER PER SOLDERING PROCESS MIL-S-6872 USING SOLDER ITEM 25
2 SOLDER JOINTS AND OR COMPONENT LEADS SHALL NOT PROJECT MORE THAN 3 16 BEYOND SURFACE OF BOARD
3 SET R2 FOR AN OVERCRANK TIME DELAY OF 75 ± 5 SECONDS
4 OIL PRESS TIME DELAY SHOULD BE 12.5 ± 2.5 SECONDS





REF DES	ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL
R10,25,26	32	350-389	3	RESISTOR - 1.2 KΩ, 1/2 W. 10%
R15	31	303A182	1	POTENTIOMETER 1.0 MEG OHM
Q7,8	30	362A31	2	TRANSISTOR-FLD EFFECT 2N5716
R21,R31	29	350-380	2	RESISTOR 510Ω 1/2 W
R6	28	350P548	1	RESISTOR 10KΩ
R36	27	350-687	1	RESISTOR 10 MEG Ω
R35	26	350-980	1	RESISTOR 510 Ω
	25	*880-12	0102	SOLDER
	24	98A2258	1	SILKSCREEN
W2	23	*334P742	1.375"	WIRE
W1	22	*334P742	1.375"	WIRE
S1	21	308A280	1	SWITCH-PUSH BUTTON
R9 17 18. 28.32	20	350-544	6	RESISTOR 4.7KΩ
R8,11,20, 23,24,27,28, 33	19	350-529	8	RESISTOR 270Ω
R7 13 22 30	18	350-505	4	RESISTOR 2.7Ω
R12	17	350-552	1	RESISTOR 22KΩ
R5 14	16	350-536	2	RESISTOR 1000Ω
R4 16 19,34	15	350-517	4	RESISTOR 27Ω
R3	14	350-572	1	RESISTOR 1 MEG Ω
R2	13	303A188	1	POTENTIOMETER 3.5 MEG OHM
R1	12	350-534	1	RESISTOR 680 Ω
Q4,5 6 10 11 12 13,14	11	382A27	8	TRANSISTOR-SILICON (PNP) 2N5366
Q3,9	10	361A3	2	TRANSISTOR 2N4871
Q1 2	9	382A25	2	TRANSISTOR-FLD EFFECT 2N5457
K1,K2	8	307A1076	2	RELAY 24V
CR10,17,18,20	7	384A17	4	RECTIFIER-GATE CONT
CR9	6	358A27	1	DIODE-ZENER 7.5V
CR1 2 3 4 5 6 7 8 11 13 14 15 16 19	5	357A4	15	RECTIFIER-DIODE
C4	4	356A30	1	CAPACITOR 1.0MFD
C2 3 5 6 7 8	3	355P5	6	CAPACITOR 22MFD
C1	2	358A40	1	CAPACITOR 10MFD
	1	332D1913	1	PRINTED CIRCUIT BOARD

*BULK

Onan — DIVISION OF STUDEBAKER CORPORATION

EE · W/B · 11-8-73 · 2/1 · UR

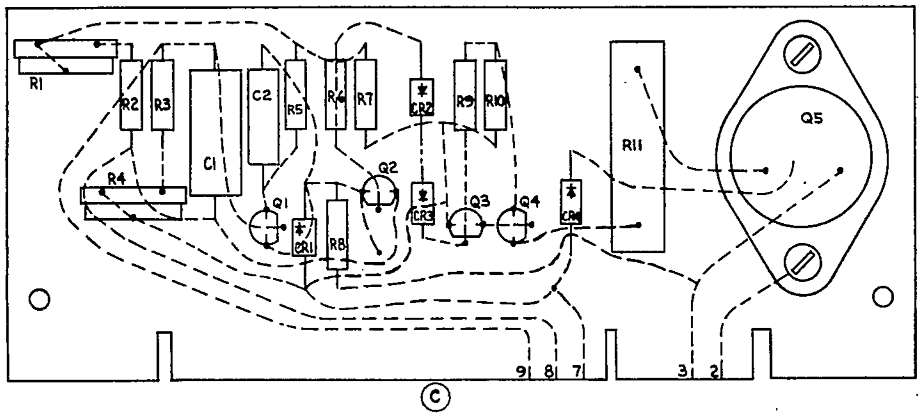
REF 300-0651

MONITOR-ENG CONTROL (24V)

300-0682 D

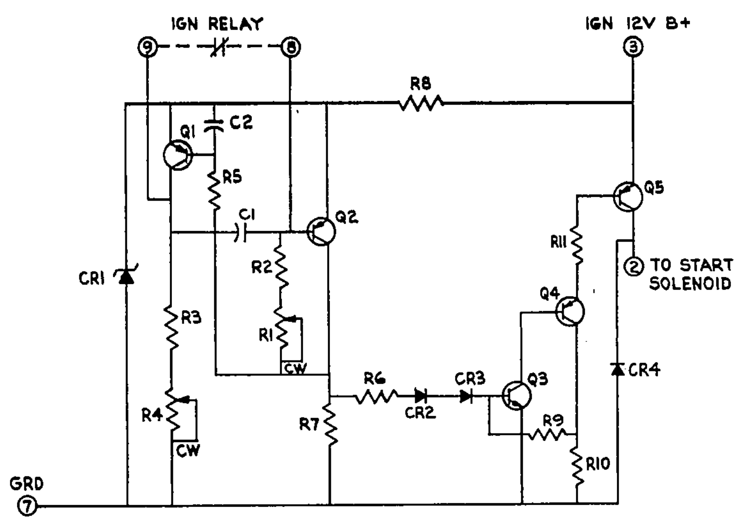
300C714

LTR	REVISIONS	ZONE	ENG	CKR	DATE
A	ITEM 10 WAS 350-562	2-B	JV	WB	1-30-70
B	ADDED NOTE 3	2-C	JV	WB	1-30-70
C	ADDED ITEM 23, 355P10	2-B	JV	WB	3-6-70
B	REVISED NOTE 3	2-C	JV	WB	4-9-70
C	MOVED CR3 & CR4 & PATHS IN PICTORIAL	4-C		WB	11-15-72



NOTES:

1. SOLDER PER SOLDERING PROCESS MIL-S-6872 USING SOLDER, ITEM 21.
2. SOLDER JOINTS AND/OR COMPONENT LEADS SHALL NOT PROJECT MORE THAN 3/16 BEYOND SURFACE OF BOARD.
3. (B) FACTORY ADJUST POT R1 FOR 10±2 SECONDS REST TIME. FACTORY ADJUST POT R4 FOR 15±2 SECONDS CRANK TIME.

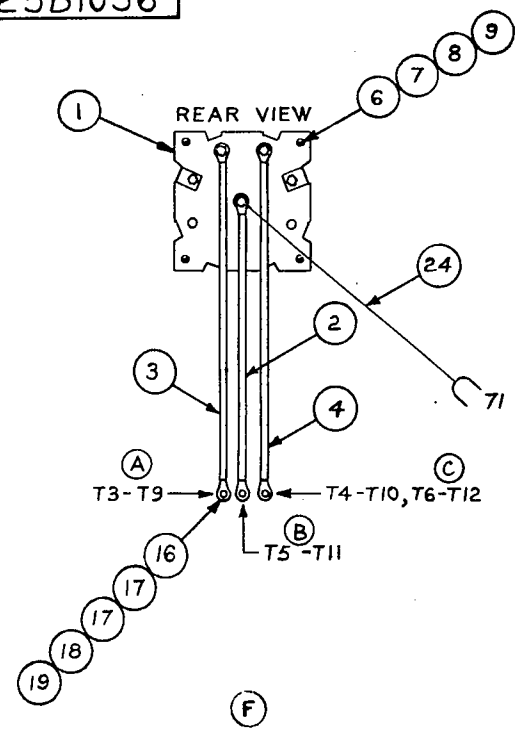


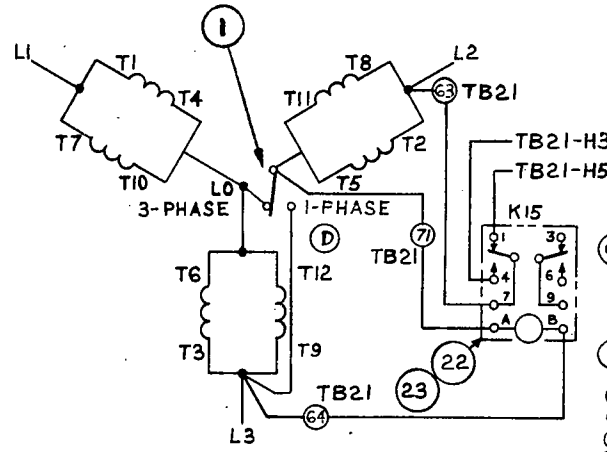
300C714

REF DES	ITEM	PART NO.	QTY.	*BULK DESCRIPTION OR MATERIAL
C2	23	355P10	1	CAPACITOR-DIELECTRIC .0022 MFD 100V (C)
	22	98A2186	1	SILKSCREEN-CYCLE CRANK
	21	*880-12	10Z	SOLDER
H3	20	860-6	2	NUT-HMS 6-32
H2	19	853-3	2	WASHER-ET LK #6
H1	18	812-61	2	SCREW-RHM 6-32 X 3/8 LG
R11	17	352A152	1	RESISTOR-FIXED 5W 25Ω
R10	16	350-500	1	RESISTOR-FIXED CMPSN 1.0Ω
R8	15	350-526	1	RESISTOR-FIXED 150Ω
R7	14	350-546	1	RESISTOR-FIXED CMPSN 6.8KΩ
R6	13	350-420	1	RESISTOR-FIXED CMPSN 24KΩ
R5	12	350-558	1	RESISTOR-FIXED CMPSN 68KΩ
R3,R9	11	350P548	2	RESISTOR-FIXED CMPSN 10KΩ
R2	10	350-560	1	RESISTOR-FIXED CMPSN 100KΩ (A)
R1,R4	9	303A171	2	POTENTIOMETER 100KΩ
Q5	8	362A19	1	TRANSISTOR-POWER 2N3813
Q4	7	362A26	1	TRANSISTOR-SIGNAL MPS6533
Q3	6	362-17	1	TRANSISTOR MPS2925
Q1,Q2	5	362A8	2	TRANSISTOR-SIGNAL 2N3702
CR2,3,4	4	357A4	3	RECTIFIER-DIODE
CR1	3	359A27	1	DIODE-ZENER 7.5 VOLTS
C1	2	356A39	1	CAPACITOR-ELECTROLYTIC 100MFD
	1	33201275	1	PRINTED CIRCUIT BOARD

NEXT ASSEMBLY	SIMILAR TO	Onan — DIVISION OF STUDEBAKER CORPORATION, Minneapolis, Minnesota	
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ± —, ANGLES ± —; DECIMALS 2 PLACE ± —, 3 PLACE ± —	DESIGN APPROVED: DR R.L.H.; ENG J.M. Vint; CKR WJB; DATE 11-4-69; K 2/1	CONTROL-CYCLE CRANKER	
The proprietary design information on this print is owned by the Onan Division of Studebaker Corporation. Conveyance of this right is not extended to others	PROD RELEASE J.V. 11-4-69	MODEL UR SERIES	12 VOLT
		DWG NO 300C714	

625B1036

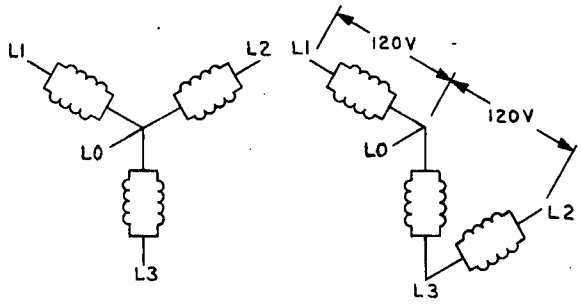




PARTS LIST			
ITEM	PART NO.	QTY	DESCRIPTION
1	308-152	1	SWITCH TAP 200 AMP
2	336A1919	1	LEAD ASSEMBLY-TAP SW
3	336A1920	1	LEAD ASSEMBLY-TAP SW
4	336A1921	1	LEAD ASSEMBLY-TAP SW
5	301C3283	1	CONTROL BOX-TAP SWITCH
6	812-153	4	SCREW-RHSM 1/4-20 1 LG
7	850-40	4	WASHER-LK
8	526-52	4	WASHER-FLAT
9	526-54	4	WASHER-FLAT
10	301B3284	1	COVER-TAP SW CONT BOX
11	405B1840	1	PANEL-REAR HSG ACCESS (-01)
12	508-9	1	GROMMET-RUBBER
13	813-97	8	SCREW-RHSM 10-32 5/16 LG
14	850-30	8	WASHER-LK
15	508A115	2	GROMMET-RUBBER
16	800-28	5	SCREW-HHC 5/16-18 1 LG
17	526-22	10	WASHER-FLAT
18	850-45	5	WASHER-LK
19	862-15	5	NUT-HEX
20	98B2247	1	SILKSCREEN-TAP SW (SILKSCREENED IN SHPG)
21	898-867	6"	SLEEVING-INSULATION
22	323A819	1	SOCKET ASSY
23	307B1143	1	RELAY-VOLTAGE SELECTOR
24	336A2087	1	LEAD ASSEMBLY-TAP SW
25	405B2160	1	PANEL-REAR HSG ACCESS (-02)

(E) NOTES:
1. REMOVE JUMPER W12 BETWEEN TB21-63 & TB21-H3. MOUNT VOLTAGE SELECTOR RELAY K15 IN CONTROL BOX AND WIRE AS SHOWN. RELAY WILL ENERGIZE ON 120/208V 3Ø CIRCUIT COMPLETING CONNECTION BETWEEN TB21-63 & TB21-H3. RELAY WILL REMAIN DE-ENERGIZED ON 120/240, 1Ø CIRCUIT COMPLETING CONNECTION BETWEEN TB21-63 & TB21-H5.

(F) EQUIVALENT CIRCUIT



LET.	REVISION	CKD	DATE
N	ADDED DYJ & DDB	JV	3-15-74
M	ADDED No.405B2160	JV	3-15-74
L	SILKSCREENED IN SHIPPING ADDEL	TH CP	10-4-71
K	ADDED No.336A2087	CP	5-6-71
H	WAS No.307B1061	CP	5-6-71
J	ADDED No.323A819	CP	3-16-71
H	ADDED No.307B1061	CP	3-16-71
G	WAS PT No.508A101 CA	CP	1-5-71
F	ADDED EQUIV CIRCUIT	JV	11-13-70
E	ADDED NOTE	JV	7-22-70
D	MOVED SW FROM L3 TO L2	JV	7-22-70
C	WAS T5 & T11	JV	7-22-70
B	WAS T6 & T12	JV	7-22-70
A	WAS T2 & T8	JV	7-22-70

(N) -02 MODEL NO. DYJ & DDB

-01 MODEL NO EK & EM, DEH & DEF, DDA UR SERIES (HSD)

120/208V, 3 PH, 4W.
120/240V, 1PH, 3W.

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE 3-3-70 | DR CIP. | CKD Jim V... WJB

NAME WD-TAP SWITCH

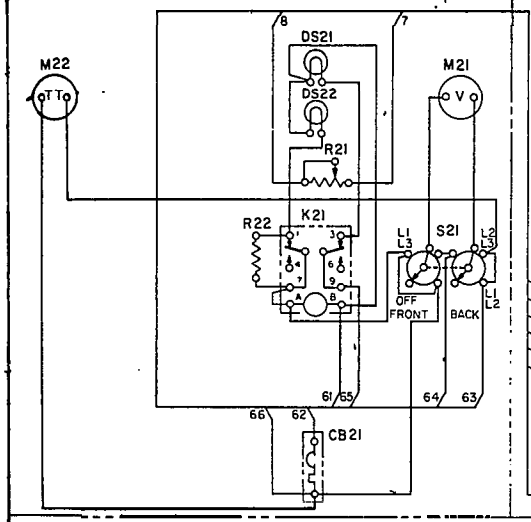
DWG. NO. 625B1036

625B1036

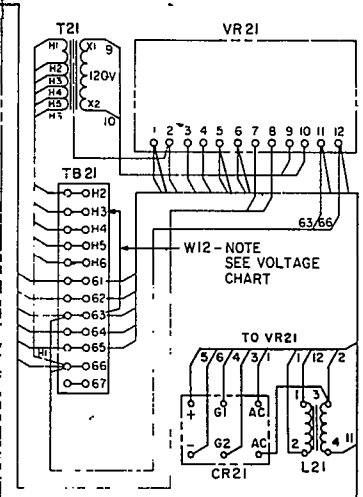
612-5300

WIRING DIAGRAM

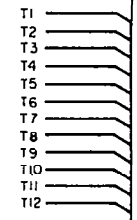
REAR VIEW PANEL



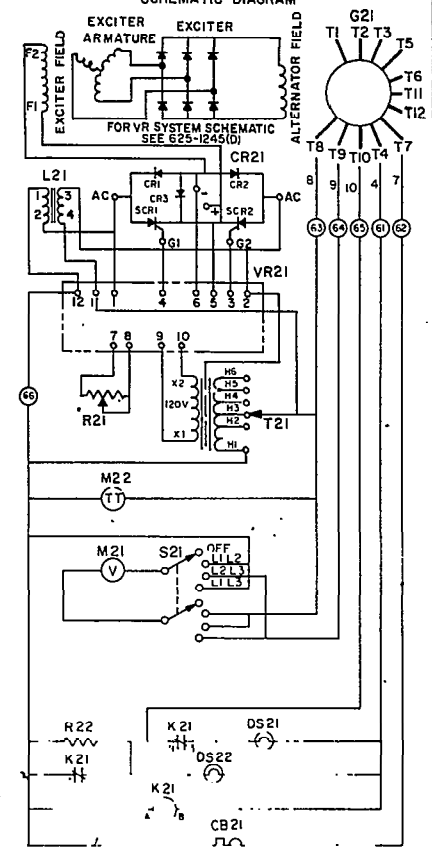
CONTROL BOX (INSIDE)



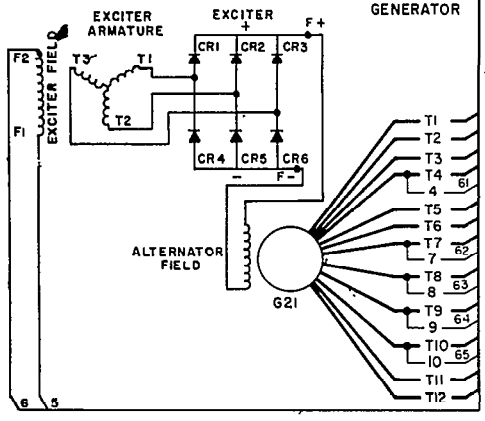
HOUSING - CONTROL BOX



SCHEMATIC DIAGRAM



GENERATOR



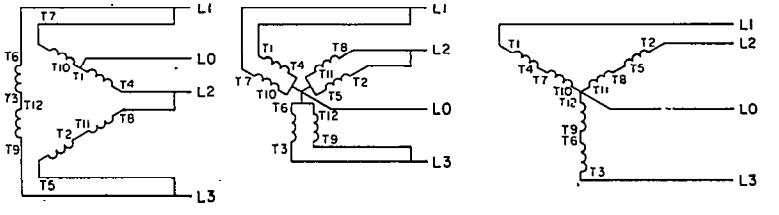
NOTE
CONNECT LEAD W12 FROM TERMINAL TB21-63 TO TB21-(H_) PER VOLTAGE CHART BELOW

VOLTAGE CONNECTIONS

3 PHASE

110/220V, 50 Hz, (H6)		
515R 115/230V, 50 Hz, (H6)		
15R 120/240V, 60 Hz, (H5)		
127/220V, 50 Hz, (H5)	515R	254/440V, 50 Hz, (H5)
120/208V, 50 Hz, (H4)		240/416 V, 50 Hz, (H4)
110/190V, 50 Hz, (H3)		220/380V, 50 Hz, (H3)
115/200V, 50 Hz, (H4)		230/400V, 50 Hz, (H4)
120/208V, 60 Hz, (H3)	15R	240/416 V, 60 Hz, (H3)
127/220V, 60 Hz, (H4)		254/440V, 60 Hz, (H4)
139/240V, 60 Hz, (H5)		277/480V, 60 Hz, (H5)

1 PHASE
110/220V, 50 Hz, (H6)
515R 115/230V, 50 Hz, (H6)
15R 120/240V, 60 Hz, (H5)



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

60 Hz	PENN 60 Hz	50 Hz
-01	-02	-03

PARTS LIST

REF. DES.	PART NO	QTY	DESCRIPTION
CB21	320B431	1	CIRCUIT BREAKER, 2 AMP
	320P307	1	LOCK-CKT BRKR HANDLE (PEI
CR21	305C524	1	RECTIFIER BRIDGE
DS21	322A131	1	LIGHT-UPPER SCALE
DS22	322A130	1	LIGHT-LOWER SCALE
G21		1	GENERATOR
K21	307B1061	1	RELAY-VOLTAGE SELECTOR
	301B3244	1	BRACKET - RELAY MTG
	307P1157	1	SPRING-RELAY HOLDDOWN
L21	315B384	1	REACTOR ASSY COMM
M21	302B718	1	VOLTMETER-AC, 0-300, 0-600
M22	302P466	1	METER-RUNNING TIME (60Hz)
	302P469	1	METER-RUNNING TIME (50 Hz)
R21	303P170	1	RHEOSTAT-VOLTAGE ADJ 35K, 25W
	303P32	1	KNOB-RHEOSTAT
R22	350-556(REF)	1	RESISTOR-47,000, 1/2 WATT
S21	308A12	1	SWITCH-VOLTMETER
	303-76	1	KNOB
			612-5300
T21	315C431	1	TRANSFORMER-VOLT REF
TB21	332A1248	1	MARKER-STRIP
VR21	332D1956	1	BOARD ASSY-PC VOLTAGE RGLTR
	338D764	1	WIRING HARNESS
W12	336A1913	1	LEAD ASSY
	301C3274	1	PANEL-GEN CONTROL
	301D3158	1	CONTROL BOX
	402A70	4	DAMPENER-VIBRATION
	337-49	1	STRAP-BOND
	508P1	4	GROMMET-RUBBER
	98C2169	1	SILKSCREEN-CONTROL PANEL AC
	545A22	1	PARTS LIST-AC CONT HDW

Onan

1-13-77	JC		CDR

MODEL NO.
25-90KW-15R/1
25-90KW-515R/1
BRUSHLESS
3PH, 50/60 Hz,
12 RECONNECTABLE

NAME: CONTROL-GEN SET AC (WIRING DIAGRAM)

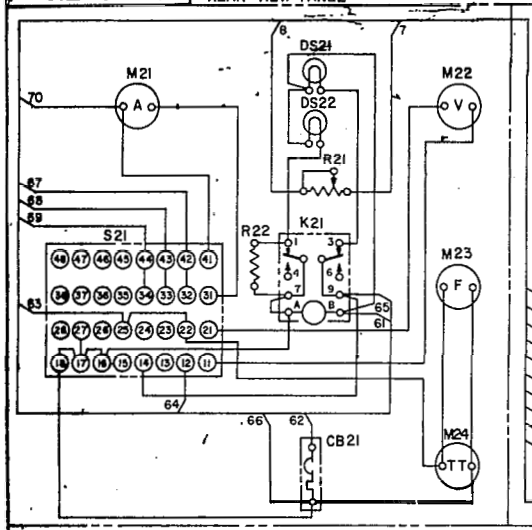
DWG NO. 612-5300

SIZE C

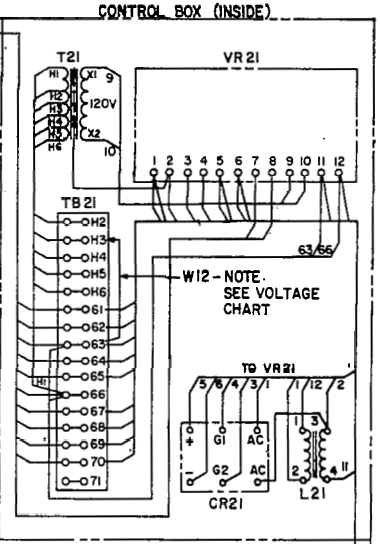
612-5301

WIRING DIAGRAM

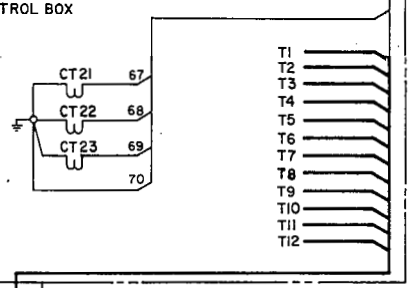
REAR VIEW PANEL



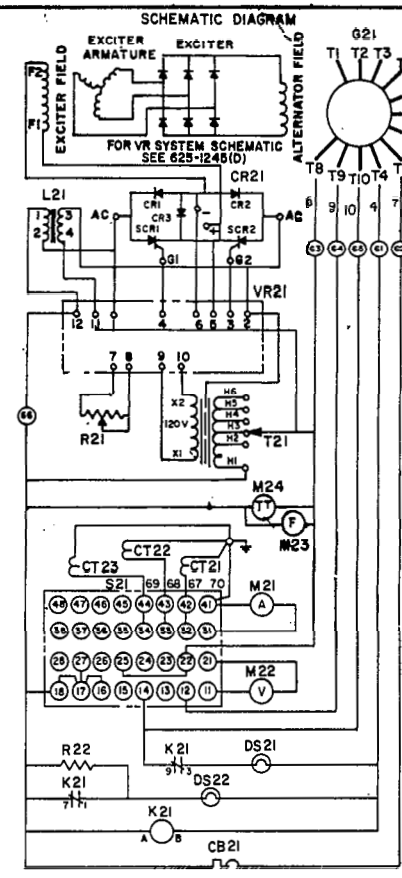
CONTROL BOX (INSIDE)



HOUSING-CONTROL BOX



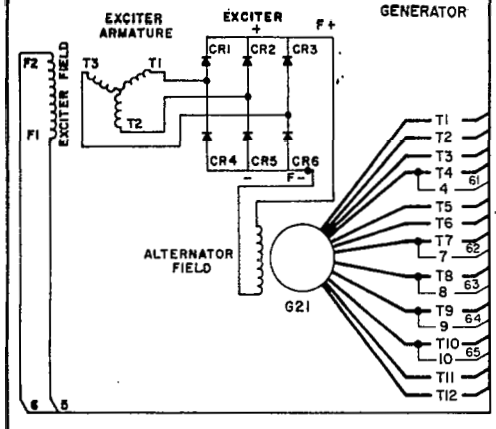
SCHEMATIC DIAGRAM



·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-LO 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

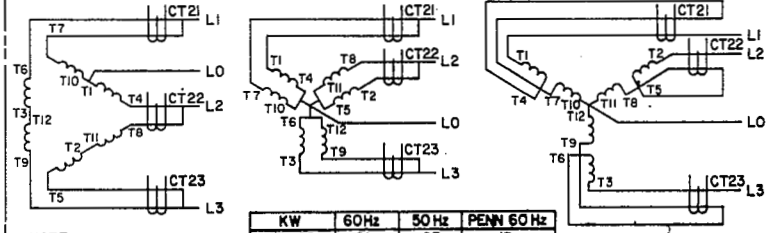
GENERATOR



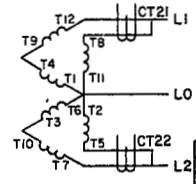
NOTE:
CONNECT LEAD W12 FROM TERMINAL TB21-63 TO TB21-(H_) PER VOLTAGE CHART BELOW.

VOLTAGE CONNECTIONS
3 PHASE

110/220V, 50 Hz, (H6)	515R	254/440V, 50 Hz, (H5)
515R 115/230V, 50 Hz, (H6)		240/416 V, 50 Hz, (H4)
15R 120/240V, 60 Hz, (H5)		220/380V, 50 Hz, (H3)
127/220V, 50 Hz, (H5)		230/400V, 50 Hz, (H4)
120/208V, 50 Hz, (H4)		240/416 V, 60 Hz, (H3)
110/190V, 50 Hz, (H3)	15R	254/440V, 60 Hz, (H4)
115/200V, 50 Hz, (H4)		277/480 V, 60 Hz, (H5)
120/208V, 60 Hz, (H3)		
127/220 V, 60 Hz, (H4)		
139/240V, 60 Hz, (H5)		



1 PHASE
110/220V, 50 Hz, (H6)
515R 115/230V, 50 Hz, (H6)
15R 120/240V, 60 Hz, (H5)



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

KW	60Hz	50Hz	PENN 60Hz
25-40	-01	-07	-13
41-45	-02	-08	-14
46-60	-03	-09	-15
61-100	-04	-10	-16
101-125	-05	-11	-17
126-180	-06	-12	-18

PARTS LIST

REF. DES.	PART NO.	QTY.	DESCRIPTION
CB21	320B431	1	CIRCUIT BREAKER, 2 AMP
	320P307	1	LOCK-CKT BRKR HANDLE (PENN STATE)
CT21-23	302B743	1	TRANSFORMER ASSY-CUR (25-40KW)
	302B744	1	TRANSFORMER ASSY-CUR (41-45KW)
	302B745	1	TRANSFORMER ASSY-CUR (46-60KW)
	302B746	1	TRANSFORMER ASSY-CUR (61-100KW)
	302B747	1	TRANSFORMER ASSY-CUR (101-125KW)
	302B748	1	TRANSFORMER ASSY-CUR (126-180KW)
CR21	305C524	1	RECTIFIER BRIDGE
DS21	322A131	1	LIGHT-UPPER SCALE
DS22	322A130	1	LIGHT-LOWER SCALE
G21		1	GENERATOR
K21	307B1061	1	RELAY-VOLTAGE SELECTOR
	301B3244	1	BRACKET-RELAY MTG
M21	302B719	1	AMMETER-AC 0-75,0-150A (25-40KW)
	302B720	1	AMMETER-AC 0-100,0-200A (41-45KW)
	302B721	1	AMMETER-AC 0-150,0-300A (46-60KW)
	302B722	1	AMMETER-AC 0-200,0-400A (61-100KW)
	302B723	1	AMMETER-AC 0-250,0-500A (101-125KW)
	302B724	1	AMMETER-AC 0-375,0-750A (126-180KW)
M22	302B718	1	VOLTMETER-AC, 0-300, 0-600
M23	302B221	1	METER-FREQUENCY (60 Hz)
	302B256	1	METER-FREQUENCY (50 Hz)
M24	302B466	1	METER-RUNNING TIME (60Hz)
	302B469	1	METER-RUNNING TIME (50Hz)
R21	303P170	1	RHEOSTAT-VOLTAGE ADJ 35K, 25W
	303P32	1	KNOB-RHEOSTAT
R22	350-556(REF)	1	RESISTOR-47000, 1/2 WATT
S21	308B284	1	SWITCH-VOLT & AMMETER
	303-76	1	KNOB
			612-5301
T21	315D431	1	TRANSFORMER-VOLT REF
TB21	338A1242	1	MARKER-STRIP
	307P157	1	SPRING-RELAY HOLDDOWN (K21)
L21	315B384	1	REACTOR ASSY COMM
VR21	332D1956	1	BOARD ASSY-PC VOLTAGE RGLTR
	338D730	1	WIRING HARNESS
W12	336A1913	1	LEAD ASSY
	301C3170	1	PANEL-GEN CONTROL
	301D3158	1	CONTROL BOX
	402A70	4	DAMPENER-VIBRATION
	337-49	1	STRAP-BOND
	508P1	4	GROMMET-RUBBER
	98C2169	1	SILKSCREEN-CONTROL PANEL AC
	545A23	1	PARTS LIST-AC CONT HDW

LET	REVISION	CHK. ENGR.	DATE

Onan — DIVISION OF STUDEBAKER CORPORATION, Minneapolis, Minnesota

DATE 1-13-77 | BY JC | ENGR. | CHK. CDR

NAME CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG. NO. 612-5301 REV.

MODEL NO.
25-90KW-15R/14
25-90KW-515R/14
100-180KW-15R/1
100-180KW-515R/1
BRUSHLESS

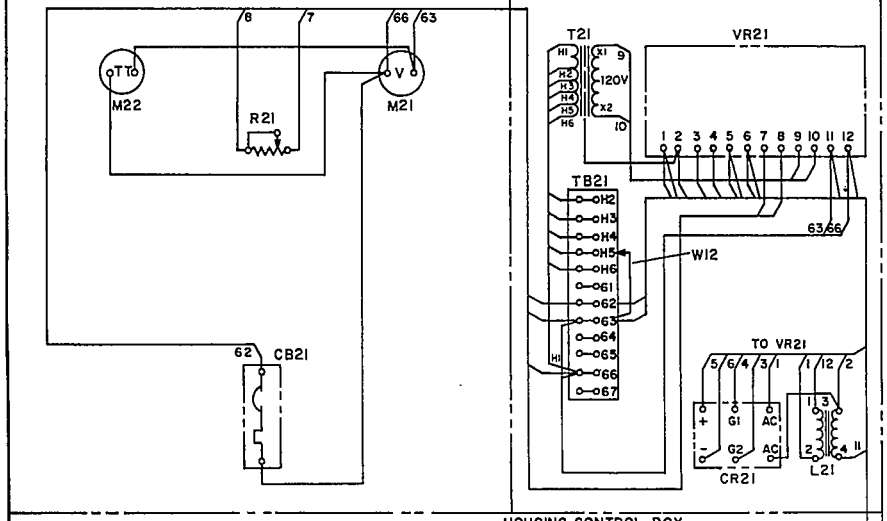
3PH, 50/60 Hz, 12 W RECONNECTABLE

612-5302

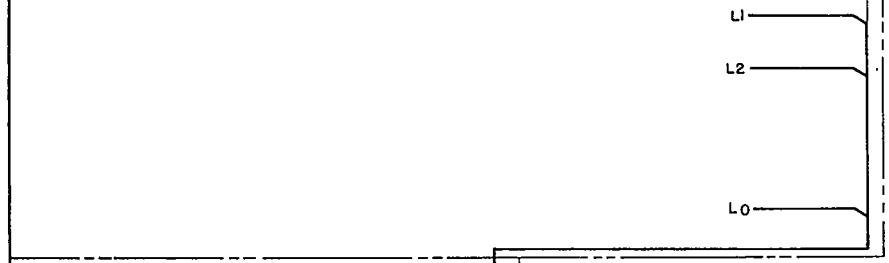
WIRING DIAGRAM

REAR VIEW PANEL

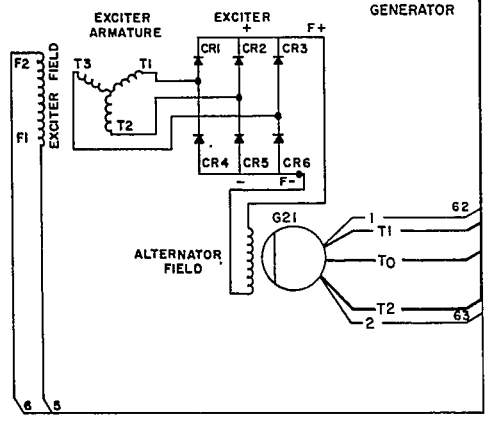
CONTROL BOX (INSIDE)



HOUSING-CONTROL BOX

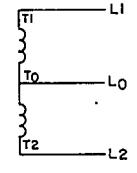


GENERATOR

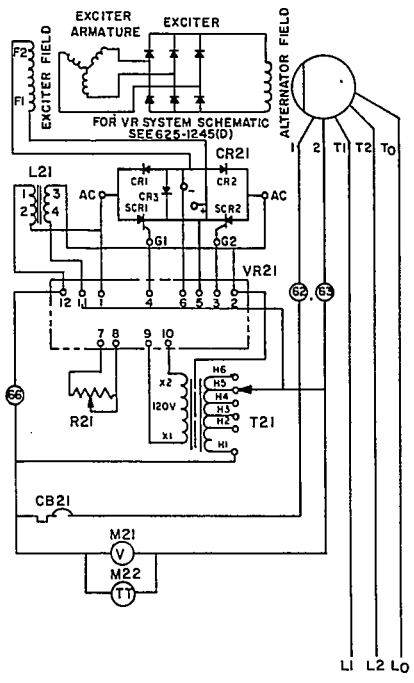


VOLTAGE CONNECTION

120/240 V



SCHEMATIC DIAGRAM



AC CONTROL PARTS LIST

REF. DES	PART NO	CHG NO	Q'TY	DESCRIPTION
CB21	320-0431	B	1	CIRCUIT BREAKER, 2A
	320-0307	P	1	LOCK-CKT BRKR HANDLE(PENN STATE)
CR21	305-0524	C	1	RECTIFIER BRIDGE
G21			1	GENERATOR
L21	315-0384	B	1	REACTOR ASSY COMM
M21	302-0421	P	1	VOLTMETER-AC, 0-300V
M22	302-0466	P	1	METER-RUNNING TIME
R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K, 25W
	303-0032	P	1	KNOB-RHEOSTAT
T21	315-0431	D	1	TRANSFORMER-VOLT REF
TB21	332-1242	B	1	MARKER STRIP
VR21	332-1956	D	1	BOARD ASSY-PC VOLTAGE RGLTR
	338-0765	D	1	WIRING HARNESS
W12	336-1913	A	1	LEAD ASSY
	301-3822	C	1	PANEL-GEN CONTROL
	301-3158	D	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	4	GROMMET-RUBBER
	545-0021	A	1	PARTS LIST-AC CONT HDW
	98-2169	C	1	SILKSCREEN-CONTROL PANEL AC

612-5302

-01	STD
-02	PENN STATE

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

LET	REVISION	CKD	ENGR	DATE

Onan DIVISION OF STUDEBAKER CORPORATION

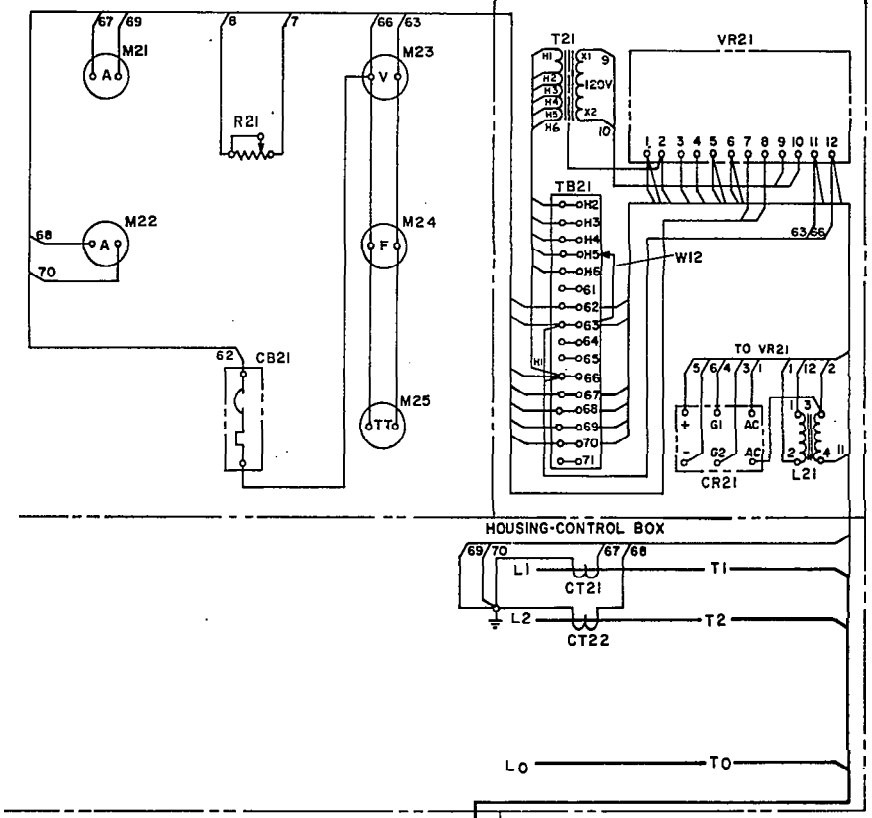
MODEL NO	DATE 1-13-77	BY JC	CHKD EL
25-45KW-3R/1 BRUSHLESS	NAME CONTROL-GEN SET AC (WIRING DIAGRAM)		
120/240V, 1PH, 3W., 60Hz	DWG NO 612-5302		DWG SIZE C

12-5303

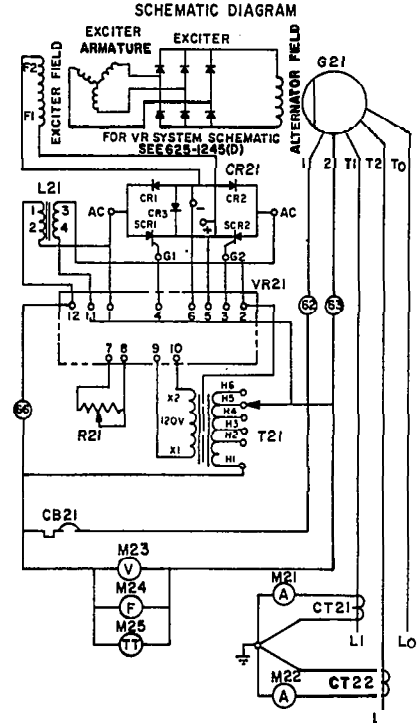
WIRING DIAGRAM

REAR VIEW PANEL

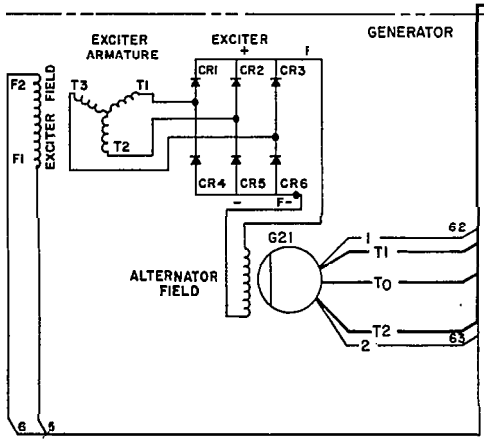
CONTROL BOX (INSIDE)



SCHEMATIC DIAGRAM

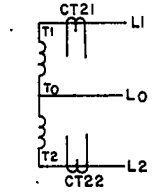


GENERATOR



VOLTAGE CONNECTION

120/240 V



AC CONTROL PARTS LIST

REF. DES.	PART NO.	DWG NO.	QTY.	DESCRIPTION
CB21	320-0431	B	1	CIRCUIT BREAKER, 2A
	320-0307	P	1	LOCK-CKT BRKR HANDLE(PENN STATE)
CR21	305-0524	C	1	RECTIFIER BRIDGE
CT21,22	302-0739	B	1	TRANSFORMER ASSY-CUR
G21			1	GENERATOR
L21	315-0384	B	1	REACTOR ASSY COMM
M21,22	302-0412	P	2	AMMETER-AC, 0-250 AMP
M23	302-0421	P	1	VOLTMETER-AC, 0-300V
M24	302-0221	B	1	METER-FREQUENCY
M25	302-0466	P	1	METER-RUNNING TIME
R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K, 25W
	303-0032	P	1	KNOB-RHEOSTAT
T21	315-0431	D	1	TRANSFORMER-VOLT REF
TB21	*332-1242*	*B*	*1*	*MARKER STRIP*
VR21	332-1956	D	1	BOARD ASSY-PC VOLTAGE RGLTR
	338-0735	D	1	WIRING HARNESS
W12	336-1913	A	1	LEAD ASSY
	301-3169	C	1	PANEL-GEN CONTROL
	301-3158	D	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	4	GROMMET-RUBBER
	545-0021	A	1	PARTS LIST-AC CONT HOW
	98-2169	C	1	SILKSCREEN-CONTROL PANEL AC

612-5303

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

STD	PENN STATE
-01	-02

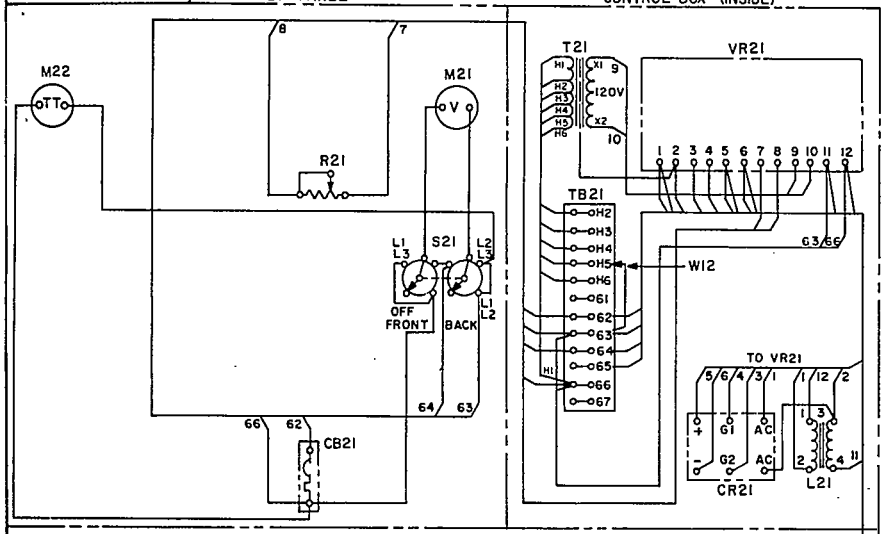
Onan

MODEL NO.	DATE	BY	CHK'D	APP'D
25-45KW-3R/14 BRUSHLESS	1-13-77	JC	EK	CDR
120/240V, 1PH, 3W., 60Hz	CONTROL-GEN SET AC (WIRING DIAGRAM)			
	DWG NO. 612-5303			DWG SIZE C

612-5304

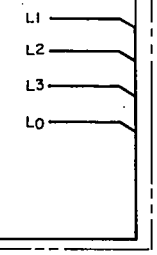
WIRING DIAGRAM

REAR VIEW PANEL

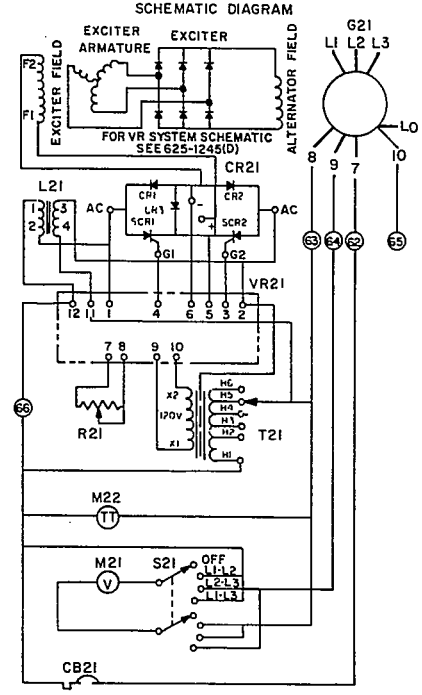


CONTROL BOX (INSIDE)

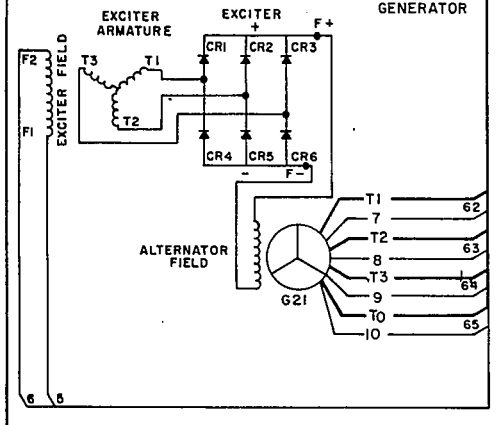
HOUSING-CONTROL BOX



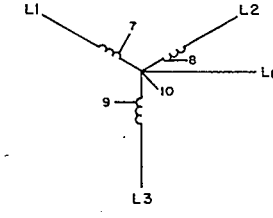
SCHEMATIC DIAGRAM



GENERATOR



VOLTAGE CONNECTION
3 PHASE, 347/600V



60 Hz	PENN 60 Hz
-01	-02

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

AC CONTROL PARTS LIST

REF DES	PART NO	DWG NO	QTY	DESCRIPTION
CB21	320-0431	B	1	CIRCUIT BREAKER, 2 AMP
CR21	305-0524	C	1	RECTIFIER BRIDGE
	320-0307	P	1	LOCK-CKT BRKR HANDLE (PENN STATE)
G21			1	GENERATOR
L21	315-0384	B	1	REACTOR ASSY COMM
M21	302-0779	B	1	VOLTMETER-AC, 0-750V (0-300V INPUT)
M22	302-0466	P	1	METER-RUNNING TIME
R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K, 25W
	303-0032	P	1	KNOB-RHEOSTAT
S21	308-0012	A	1	SWITCH-VOLTMETER SELECTOR
	303-0076	-	1	KNOB
T21	315-0431	D	1	TRANSFORMER-VOLT REF
TB21	332-1248	B	1	MARKER STRIP
VR21	332-1956	D	1	BOARD ASSY-PC VOLTAGE REGULATOR
	338-0766	D	1	WIRING HARNESS
W12	336-1913	A	1	LEAD ASSY
	301-3821	C	1	PANEL-GEN CONTROL
	301-3158	D	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	4	GROMMET-RUBBER
	98-2281	C	1	SILKSCREEN-CONTROL PANEL AC
	545-0022	A	1	PARTS LIST-AC CONT HDW

612-5304

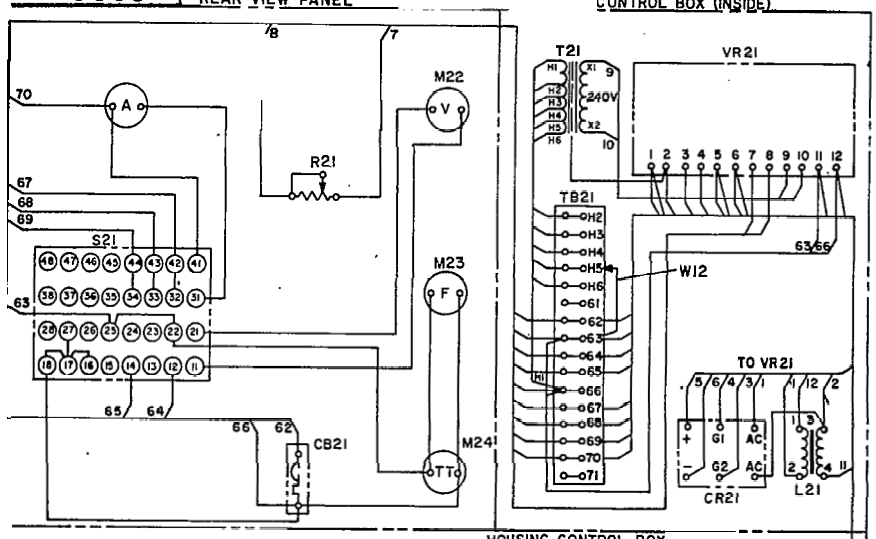
LET				
Onan				
25-90KW-9XR/1	1-13-77	JC	EK	CDR
BRUSHLESS	CONTROL-GEN SET AC (WIRING DIAGRAM)			
347/600V, 3PH, 4W., 60Hz	612-5304			DWG SIZE C

612-5305

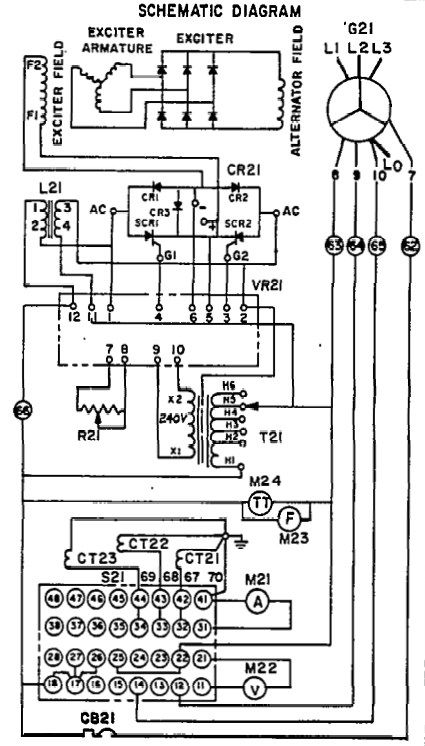
WIRING DIAGRAM

REAR VIEW PANEL

CONTROL BOX (INSIDE)



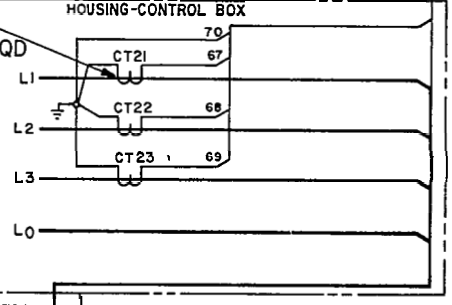
SCHEMATIC DIAGRAM



HOUSING-CONTROL BOX

NOTE
PRI TURNS REQD

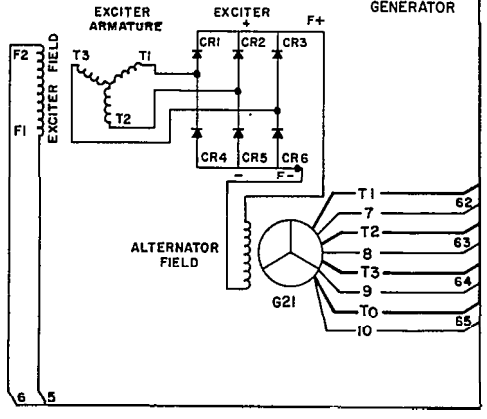
25-35 KW	3
36-70 KW	2
71-180 KW	1



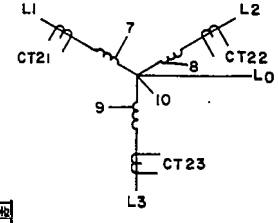
S2I

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	41-42-45
L1-L0 3ø	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L2-L0 1ø	11-16	21-22	31-32	41-43-44
L2-L0 1ø	11-16	21-22	31-33	41-42-44

GENERATOR



VOLTAGE CONNECTION
3 PHASE, 347/600V, 60 Hz



KW	60H	PENN 60Hz
25-35	-01	-07
36-55	-02	-08
56-70	-03	-09
71-110	-04	-10
111-145	-05	-11
146-180	-06	-12

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

AC CONTROL PARTS LIST

REF. DES.	PART NO.	DWG NO	QTY	DESCRIPTION
CB2I	320-0431	B	1	CIRCUIT BREAKER, 2 AMP
CR2I	305-0524	C	1	RECTIFIER BRIDGE
CT2I-23	302-0775	B	1	TRANSFORMER ASSY-CUR (25-35 KW)
	302-0776	B	1	TRANSFORMER ASSY-CUR (36-55 KW)
	302-0777	B	1	TRANSFORMER ASSY-CUR (56-70 KW)
	302-0743	B	1	TRANSFORMER ASSY-CUR (71-110 KW)
	302-0744	B	1	TRANSFORMER ASSY-CUR (111 -145 KW)
	302-0778	B	1	TRANSFORMER ASSY-CUR (146-180 KW)
	320-0307	P	1	LOCK-CKT BRKR HANDLE (PENN STATE)
G2I			1	GENERATOR
L2I	315-0384	B	1	REACTOR ASSY COMM
M2I	302-0405	P	1	AMMETER-AC 0-50AMP (25-35 KW)
	302-0406	P	1	AMMETER-AC 0-75AMP (36-55 KW)
	302-0408	P	1	AMMETER-AC 0-100AMP (56-70 KW)
	302-0410	P	1	AMMETER-AC 0-150AMP (71-110 KW)
	302-0411	P	1	AMMETER-AC 0-200AMP (111 -145 KW)
	302-0412	P	1	AMMETER-AC 0-250AMP (146-180 KW)
M22	302-0779	P	1	VOLTMETER-AC, 0-750V (300V MOVEMENT)
M23	302-0221	B	1	METER-FREQUENCY (240)
M24	302-0466	P	1	METER-RUNNING TIME (240V)
R2I	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K, 25W
	303-0032	P	1	KNOB
S2I	308-0284	B	1	SWITCH-VOLT & AMMETER
	303-0076	-	1	KNOB
T2I	315-0431	D	1	TRANSFORMER-VOLT REF
TB2I	332-1242	B	1	MARKER STRIP
VR2I	332-1956	D	1	BOARD ASSY-PC VOLTAGE REGLTR
	338-0759	D	1	WIRING HARNESS
W12	336-1913	A	1	LEAD ASSY
	301-3342	C	1	PANEL-GEN CONTROL
	301-3158	C	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	1	GROMMET-RUBBER
	545-0023	A	1	PARTS LIST-AC CONT HDW
	98-2281	C	1	SILKSCREEN-CONTROL PANEL AC

612-5305

REV	REVISION	CHK'D	DATE
A	KW RANGES REVISED	EZ	8-19-77

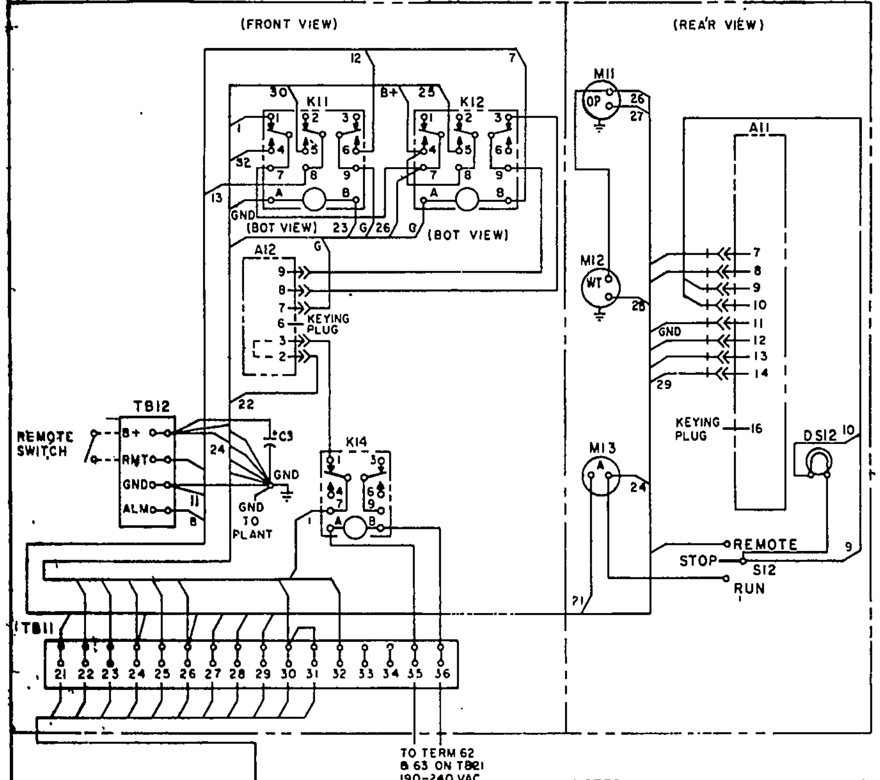
Onan

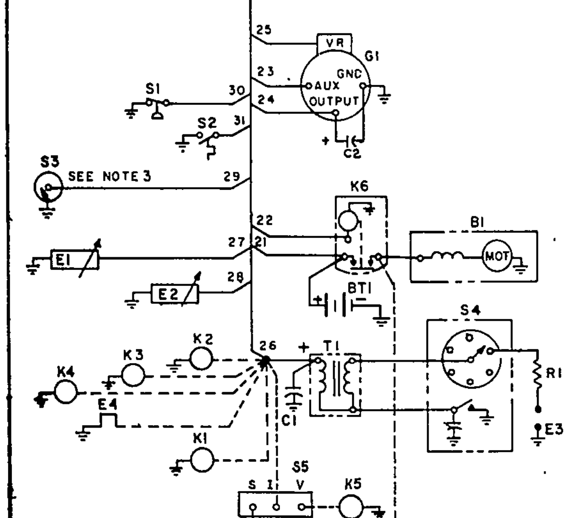
MODEL NO	25-90KW-9XR/14 100-180KW-9XR/1	DATE	1-13-77
	BRUSHLESS	BY	JC
	347/600V, 3PH, 4W., 60 Hz	ENGR	EZ
		CHK'D	CDR
NAME	CONTROL-GEN SET AC (WIRING DIAGRAM)		
DWG NO	612-5305	SIZE	C

612C5310

WIRING DIAGRAM

(FRONT VIEW)   (REAR VIEW)

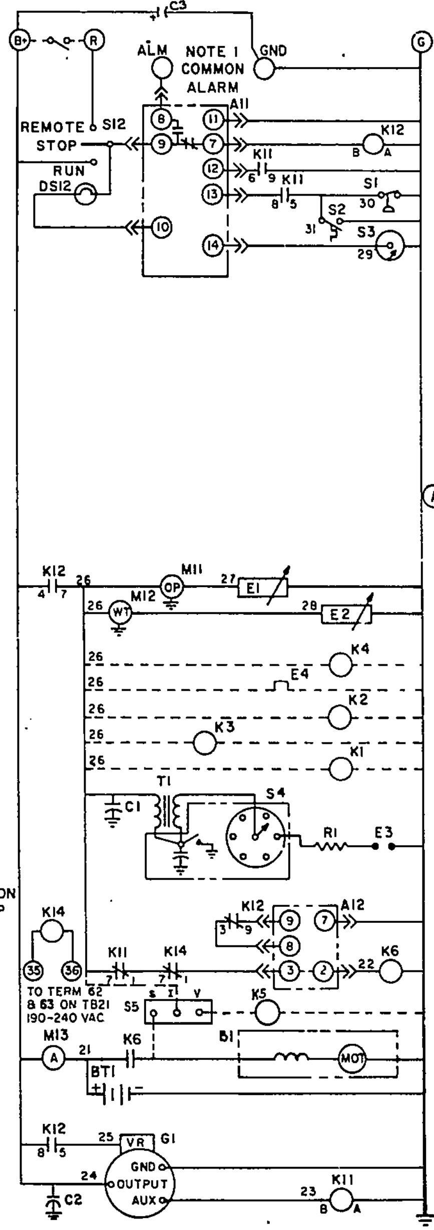




NOTES:

1. REMOTE ALARM CIRCUIT RATED 5AMP MAX
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. S3 OVERSPEED SWITCH MOUNTED IN GENERATOR END BELL
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

SCHEMATIC DIAGRAM



ENGINE PARTS LIST (REF)

REF. DES	PART NO	QTY	DESCRIPTION
B1		1	STARTER ENGINE
BT1		1	BATTERY-12V
C1		1	CAPACITOR-BYPASS 0.1 UF
C2		1	CAPACITOR-BY-PASS, 0.5 UF
E1	193A244	1	SENDER-OIL PRESSURE
E2	193B246	1	SENDER-WATER TEMP
E3		6	SPARK PLUGS
E4		1	CHOKE-ELECTRIC
K5		1	SOLENOID-FUEL
G1		1	ALTERNATOR & REGULATOR
K1		1	SOLENOID-ANTI DIESELING
K2		1	SOLENOID-GAS
K3		1	SOLENOID-VAT TANK OR FUEL
K4		1	SOLENOID-WATER
K6			RELAY-START SOLENOID
R1		6	RESISTOR-SPARK PLUG
S1		1	SWITCH-LOW OIL PRESSURE
S2		1	SWITCH-HIGH WATER TEMP
S3		1	SWITCH-OVERSPEED
S4		1	DISTRIBUTOR ASSY
S5		1	SWITCH-VACUUM
T1		1	COIL-IGNITION
	CONTROL BOX	PART	LIST
A11	300C679	1	MONITOR-ENGINE CONTROL (STD)
	300C730	1	MONITOR-ENGINE CONTROL (ALL PENN STATE)
A12	300C733	1	CONTROL-STD CRANKER
	300C714	1	CONTROL-CYCLE CRANKER
C3	356A0079	1	CAPACITOR ASSY
	356A0072 (REF)	1	CAPACITOR, (4000 MFD @ 30VDC)
DS12	322A128	1	LAMP-FAULT
K11	307B1058	1	RELAY-START DISCONNECT
K12	307B1058	1	RELAY-IGNITION
K14	307B1061	1	RELAY-STARTER PROTECTION
M11	193B243	1	GAUGE-OIL PRESSURE
M12	193B245	1	GAUGE-WATER TEMP
M13	302A61	1	AMMETER-CHARGE 30-0-30
	307P1157	3	SPRING-RELAY HOLDDOWN (K11, K12, K14)
S12	308P138	1	SWITCH-SELECTOR (-01, 03)
	308P327	1	SWITCH-SELECTOR (-02, 04)
1B11	332A795 (REF)	1	TERMINAL BLOCK
	332A1241	1	MARKER STRIP
1B12	332A537 (REF)	1	TERMINAL BLOCK
	332A1239	1	MARKER STRIP
	338D1064	1	WIRING HARNESS
	301D3253	1	BRACKET ENG CONTROL
	301C3165	1	PANEL ENGINE CONTROL
	545A24	1	PARTS LIST-CONT HOW
	332-1276	2	PLUG KEYING
	98B2170	1	SILKSCREEN (-01, -03)
	98B2510	1	SILKSCREEN (-02, -04)

WHEN USED

	STD CRANKER	CYCLE CRANKER
STD MONITOR	-01	-03
PENN MONITOR	-02	-04

MODEL NO: EK & EM-R/1J; EK & EM-R30,31,131/1J; EN-R/1B; EN-R30,31,131/1B

2 WIRE REMOTE STARTING

LTR	REVISION	CKD	APPD	DATE
A	ADDED C3	EE	S/H	1-14-76

Onan

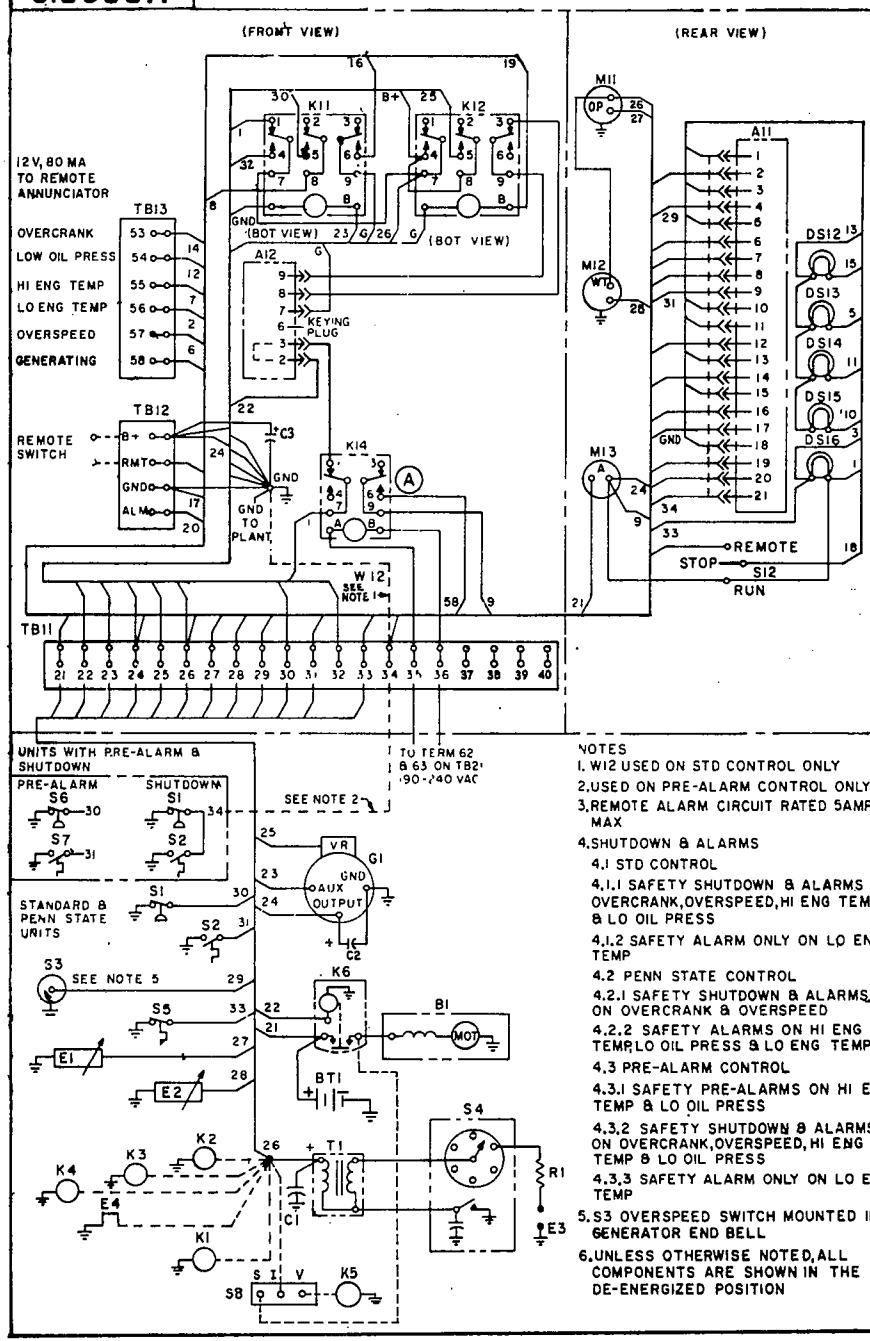
DATE 1-17-77 DR JC CKD ER APPD CDR

NAME CONTROL-GEN SET ENG (12V IGN) (WIRING DIAGRAM)

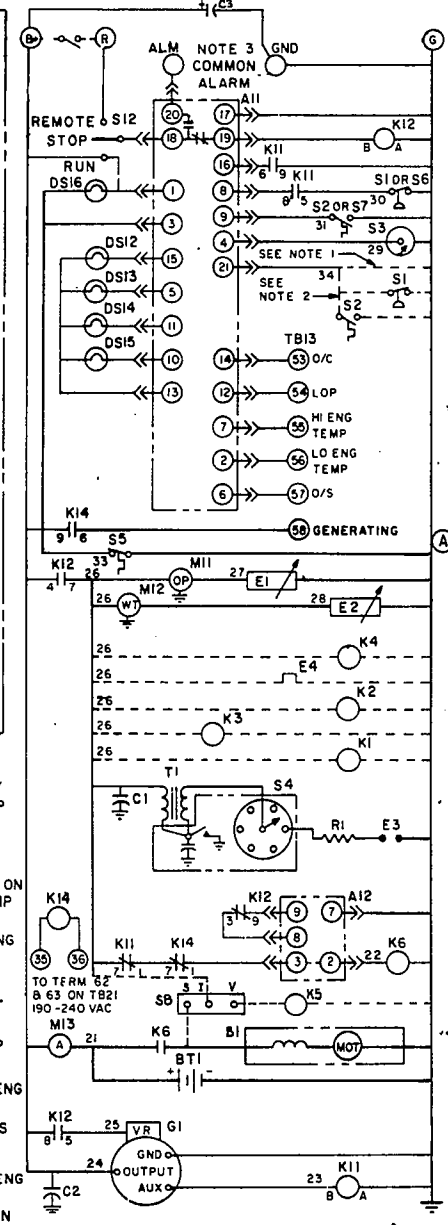
DWG NO 612C5310

612C5311

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES

1. W12 USED ON STD CONTROL ONLY
2. USED ON PRE-ALARM CONTROL ONLY
3. REMOTE ALARM CIRCUIT RATED 5AMP MAX
4. SHUTDOWN & ALARMS
   - 4.1 STD CONTROL
   - 4.1.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.1.2 SAFETY ALARM ONLY ON LO ENG TEMP
   - 4.2 PENN STATE CONTROL
   - 4.2.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK & OVERSPEED
   - 4.2.2 SAFETY ALARMS ON HI ENG TEMP, LO OIL PRESS & LO ENG TEMP
   - 4.3 PRE-ALARM CONTROL
   - 4.3.1 SAFETY PRE-ALARMS ON HI ENG TEMP & LO OIL PRESS
   - 4.3.2 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.3.3 SAFETY ALARM ONLY ON LO ENG TEMP
5. S3 OVERSPEED SWITCH MOUNTED IN GENERATOR END BELL
6. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

	STD CRANKER	CYCLE CRANKER
STD CONTROL	-01	-03
PRE-ALARM	-02	-04
PENN STATE	-05	-06

2 WIRE REMOTE STARTING

ENGINE PARTS LIST (REF)

REF. DES	PART NO.	QTY	DESCRIPTION
B1		1	STARTER ENGINE
BT1		1	BATTERY-12V
C1		1	CAPACITOR-BYPASS 0.1 UF
C2		1	CAPACITOR-BYPASS 0.5 UF
E1	193A244	1	SENDER-OIL PRESSURE
E2	193B246	1	SENDER-WATER TEMP
E3		6	SPARK PLUG
E4		1	CHOKE-ELECTRIC
K5		1	SOLENOID-FUEL
G1		1	ALTERNATOR & REGULATOR
K1		1	SOLENOID ANTI DIESELING
K2		1	SOLENOID GAS
K3		1	SOLENOID-GAS TANK OR FUEL
K4		1	SOLENOID WATER
K6		1	RELAY START SOLENOID
R1		6	RESISTOR-SPARK PLUG
S1		1	SWITCH-LOW OIL PRESSURE
S2		1	SWITCH-HIGH WATER TEMP
S3		1	SWITCH OVERSPEED
S4		1	DISTRIBUTOR ASSY
S5		1	SWITCH LOW WATER TEMP
S6		1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S7		1	SWITCH-HIGH WATER TEMP (PRE-ALARM)
S8		1	SWITCH-VACUUM
T1		1	COIL-IGNITION
	CONTROL BOX PARTS LIST		
A11	300D681	1	MONITOR ENGINE CONTROL
A12	300A733	1	CONTROL-STD CRANKER
	300C714	1	CONTROL-CYCLE CRANKER
	332-1276	1	PLUG KEYING
C3	356A0079	1	CAPACITOR ASSY
	356A0072(REF)	1	CAPACITOR (4000 MFD @ 30VDC)
DS12	322A107	1	LAMP-OVERCRANK
DS13	322A111	1	LAMP OVERSPEED
DS14	322A108	1	LAMP-LOW OIL PRESS
DS15	322A109	1	LAMP-HI ENG TEMP
DS16	322A110	1	LAMP LO ENG TEMP
K11	307B1058	1	RELAY-START DISCONNECT
K12	307B1058	1	RELAY-IGNITION
	307P1157	3	SPRING-RELAY HOLDDOWN (K11, K12, K14)
K14	307B1061	1	RELAY-STARTER PROTECTION
M11	193B243	1	GAUGE OIL PRESSURE
M12	193B245	1	GAUGE-WATER TEMP
M13	302A61	1	AMMETER-CHARGE 30-0-30
S12	308P138	1	SWITCH-SELECTOR (-01 -02 -03 -04)
TB11	332A1005(REF)	1	TERMINAL BLOCK
	332A1559	1	MARKER STRIP
TB12	332A537(REF)	1	TERMINAL BLOCK
	332A1239	1	MARKER STRIP
TB13	332A699(REF)	1	TERMINAL BLOCK
	332A1240	1	MARKER STRIP
	338D1067	1	WIRING HARNESS
W12	336A1918	1	LEAD ASSY (STD CONT ONLY)
	545A27	1	PARTS LIST-CONT HDW (ENG)
	301D3253	1	BRACKET-ENG CONTROL
	301C3267	1	PANEL-ENG CONTROL
	9882170	1	SILKSCREEN (-01 02 -03 -04)
	9882510	1	SILKSCREEN (-05 06)
	308P327	1	SWITCH SELECTOR (-05 -06)

* WHEN USED

REV	DESCRIPTION	BY	CHK	DATE
A	ADDED C3	EZ	SH	1-14-79

Onan

DRAWN 1-17-77 BY JC TRACED EZ CHK CDR

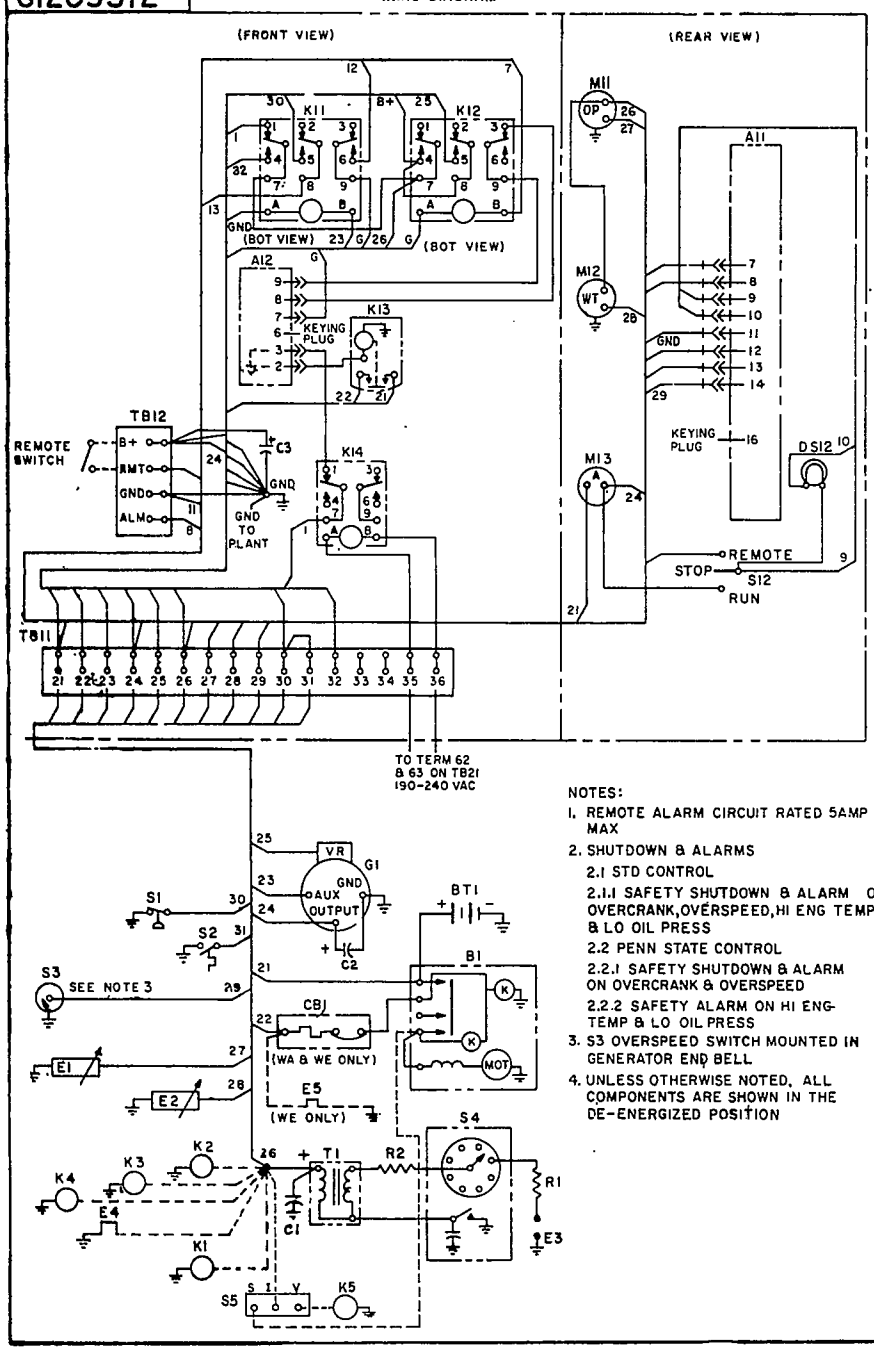
EK&EM-R/9222J
EK&EM-R30,31,131/9222J
EN-R/9222B
EN-R30,31,131/9222B

NAME CONTROL-GEN SET ENG (12V IGN) (WIRING DIAGRAM)

DWG NO. 612C5311

612C5312

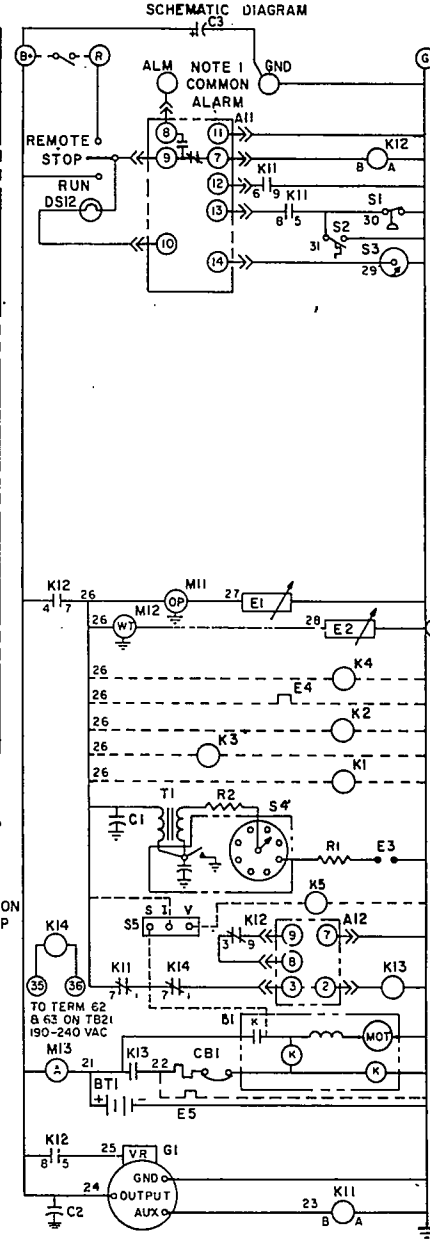
WIRING DIAGRAM



NOTES:

1. REMOTE ALARM CIRCUIT RATED 5AMP MAX
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. S3 OVERSPEED SWITCH MOUNTED IN GENERATOR END BELL
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

SCHEMATIC DIAGRAM



	STD CRANKER	CYCLE CRANKER
STD MONITOR	-01	-03
PENN MONITOR	-02	04

*WHEN USED

MODEL NO
KR-R/IT
WA-R/IK
KR-R30, 31, 131/IT
WA-R30, 31, 131/IK

2 WIRE REMOTE STARTING

REV	DESCRIPTION	BY	DATE
A	ADDED C3	JC	9/11-14-77

Onan

DATE 1-17-77 | BY JC | CHKD 22 | APP'D CDR

NAME CONTROL-GEN SET ENG(12V IGN) (WIRING DIAGRAM)

DWG NO 612C5312

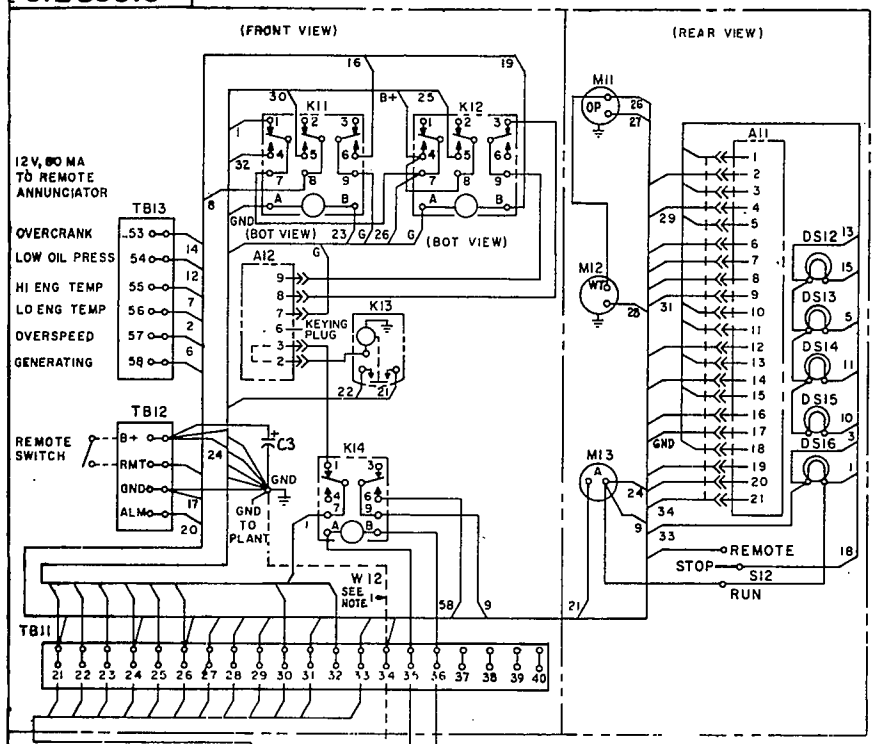
ENGINE PARTS LIST (REF)

REF. DES	PART NO	QTY	DESCRIPTION
B1		1	STARTER & SOLENOID-ENGINE
BT1		1	BATTERY-12V.
C1		1	CAPACITOR BYPASS 0.1 UF
CB1	320P165	1	CIRCUIT BREAKER 7.5A (WA & WE)
E1	193A244	1	SENDER-OIL PRESSURE
E2	193B246	1	SENDER-WATER TEMP
E3		8	SPARK PLUGS
E4		1	CHOKE-ELECTRIC (HEATER)
E5		1	SISSION CHOKE (WE)
G1		1	ALTERNATOR & REGULATOR
K1		1	SOLENOID-ANTI DIESELING
K2		1	SOLENOID-GAS
K3		1	SOLENOID-DAY TANK OR FUEL
K4		1	SOLENOID-WATER
R1		8	RESISTOR-SPARK PLUG
R2		1	RESISTOR-COIL
S1		1	SWITCH-LOW OIL PRESSURE
S2		1	SWITCH-HIGH WATER TEMP
S3		1	SWITCH-OVERSPEED
S4		1	DISTRIBUTOR ASSY
S5		1	SWITCH-VACUUM
T1		1	COIL-IGNITION
C2		1	CAPACITOR-BYPASS, 0.5 UF
K5		1	SOLENOID-FUEL
	CONTROL BOX	PART	LIST
A11	300C679	1	MONITOR-ENGINE CONTROL (STD)
	300C730	1	MONITOR-ENGINE CONTROL (PENN STATE)
A12	300C733	1	CONTROL-STD CRANKER
	300C714	1	CONTROL-CYCLE CRANKER
DS12	322A128	1	LAMP-FAULT
K11	307B1058	1	RELAY-START DISCONNECT
K12	307B1058	1	RELAY-IGNITION
K13	307B1031	1	RELAY-START SOLENOID
K14	307B1061	1	RELAY STARTER PROTECTION
C3	356A0079	1	CAPACITOR ASSY
	356A0078 (REF)	1	CAPACITOR (4000 MFD@30 VDC)
M11	1938243	1	GAUGE-OIL PRESSURE
M12	1938245	1	GAUGE-WATER TEMP
M13	302A61	1	AMMETER-CHARGE 30-0-30
S12	308P138	1	SWITCH-SELECTOR (-01, -03)
	308P327	1	SWITCH-SELECTOR (-02, -04)
TB11	332A795, REF	1	TERMINAL BLOCK
	332A1241	1	MARKER STRIP
TB12	332A537 (REF)	1	TERMINAL BLOCK
	332A1239	1	MARKER STRIP
	307P1157	3	SPRING-RELAY HOLDDOWN (K11, K12, K14)
	338D1065	1	WIRING HARNESS
	30103253	1	BRACKET-ENG CONTROL
	301C3165	1	PANEL-ENGINE CONTROL
	545A25	1	PARTS LIST CONT HDW
	332 1276	2	PLUG-KEYING
	98B2179	1	SILKSCREEN (-01, -03)
	98B2510	1	SILKSCREEN (-02, -04)

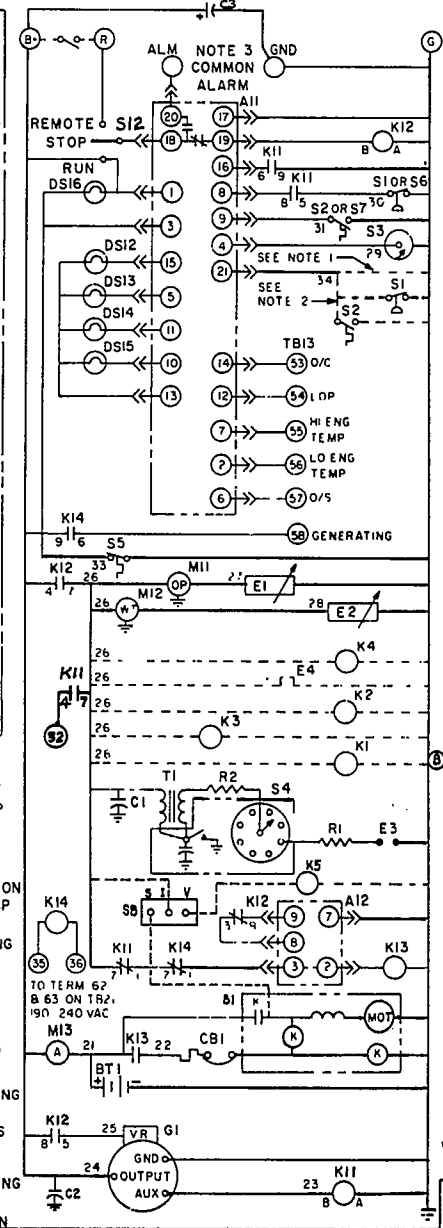
612C5312

612C5313

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. W12 USED ON STD CONTROL ONLY
2. USED ON PRE-ALARM CONTROL ONLY
3. REMOTE ALARM CIRCUIT RATED 5AMP MAX
4. SHUTDOWN & ALARMS
   - 4.1 STD CONTROL
   - 4.1.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.1.2 SAFETY ALARM ONLY ON LO ENG TEMP
   - 4.2 PENN STATE CONTROL
   - 4.2.1 SAFETY SHUTDOWN & ALARMS ON OVERCRANK & OVERSPEED
   - 4.2.2 SAFETY ALARMS ON HI ENG TEMP, LO OIL PRESS & LO ENG TEMP
   - 4.3 PRE-ALARM CONTROL
   - 4.3.1 SAFETY PRE-ALARMS ON HI ENG TEMP & LO OIL PRESS
   - 4.3.2 SAFETY SHUTDOWN & ALARMS ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 4.3.3 SAFETY ALARM ONLY ON LO ENG TEMP
5. S3 OVERSPEED SWITCH MOUNTED IN GENERATOR END BELL
6. UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

	STD CRANKER	CYCLE CRANKER
STD CONTROL	-01	-03
PRE-ALARM	-02	-04
PENN STATE	-05	-06

(A)

PARTS LIST (REF)

REF DES	PART NO	QTY	DESCRIPTION
BI		1	STARTER & SOLENOID-ENGINE
BII		1	BATTERY-12V
CI		*	CAPACITOR-BYPASS 0.1 UF
CBI	[illegible]	1	CIRCUIT BREAKER 17.5AMP (WA)
EI	1933A244	1	SENDER-OIL PRESSURE
E2	1938246	* 1	SENDER-WATER TEMP
E3		8	SPARK PLUG
E4		1	CHOKE-ELECTRIC (HEATER)
GI		1	ALTERNATOR & REGULATOR
KI		1	SOLENOID-ANTI-DIESELING
K2		1	SOLENOID-GAS
K3		1	SOLENOID-DAY TANK OR FUEL
K4		1	SOLENOID-WATER
RI		8	RESISTOR-SPARK PLUG
R2		1	RESISTOR-COIL
SI		1	SWITCH-LOW OIL PRESSURE
S2		1	SWITCH-HIGH WATER TEMP
S3		1	SWITCH-OVERSPEED
S4		1	DISTRIBUTOR ASST
S5		1	SWITCH-LOW WATER TEMP
S6		1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S7		1	SWITCH-HIGH WATER TEMP (PRE-ALARM)
S8		1	SWITCH-VACUUM
TI		1	COIL-IGNITION
C2		1	CAPACITOR-BYPASS 0.5UF
K5		1	SOLENOID-FUEL
	CONTROL BOX	PART	LIST
AII	300D681	1	MONITOR-ENGINE CONTROL
AI2	300A733	1	CONTROL-STD CRANKER
	300C714	1	CONTROL-CYCLE CRANKER
	332-1276	1	PLUG-KEYING
DSI2	3224107	1	LAMP-OVERCRANK
DSI3	3224111	1	LAMP-OVERSPEED
DSI4	3224108	1	LAMP-LOW OIL PRESS
DSI5	3224109	1	LAMP-HI ENG TEMP
DSI6	3224110	1	LAMP-LO ENG TEMP
KII	307B1058	1	RELAY-START DISCONNECT
KI2	307B1058	1	RELAY-IGNITION
KI3	307B1031	1	RELAY-START SOLENOID
KI4	307B1061	1	RELAY-STARTER PROTECTION
MII	1938243	1	GAUGE-OIL PRESSURE
MI2	1938245	1	GAUGE-WATER TEMP
MI3	302A61	1	AMMETER-CHARGE 30-0-30
C3	356A0079	1	CAPACITOR ASSY
	356A0072(*)	1	CAPACITOR (4000 MFD @ 30V DC)
SI2	308P138	1	SWITCH-SELECTOR (-01,-02,-03,-04)
TBII	332A1005(REF)	1	TERMINAL BLOCK
	332A1559	1	MARKER STRIP
TB'2	332A537-REF	1	TERMINAL BLOCK
	332A1239	1	MARKER STRIP
TB'3	332A699-REF	1	TERMINAL BLOCK
	332A1240	1	MARKER STRIP
	338D1066	1	WIRING HARNESS
WI2	336A1918	1	LEAD ASSY STD CONT ONLY
	545A26	1	PARTS LIST CONT HOW (ENG)
	301D3793	1	BRACKET ENG CONTROL
	301C3767	1	PANEL ENG CONTROL
	988Z170	-1	SILKSCREEN (-01,-02,-03,-04)
	988Z510	1	SILKSCREEN (-05,-06)
	308P337	1	SWITCH SELECTOR (-05,-06)
	307P1157	3	SPRING-RELAY HOLDDOWN (KII, KI2, KI4)

612C5313

(*) WHEN USED

B	ADDED C3
A	ADDED -05, -06

SH 1-14-76
62 1-26-77

MODEL NO
KR-R/9222T
WA-R/9222K
KR-R30,31,131/9222T
WA-R30,31,131/9222K

Onan

DATE 1-17-77 | BY JC | NO 62 | FILE CDR

NAME CONTROL-GEN SET ENG (12V IGN) (WIRING DIAGRAM)

2 WIRE REMOTE STARTING

DWG NO 612C5313

Onan

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