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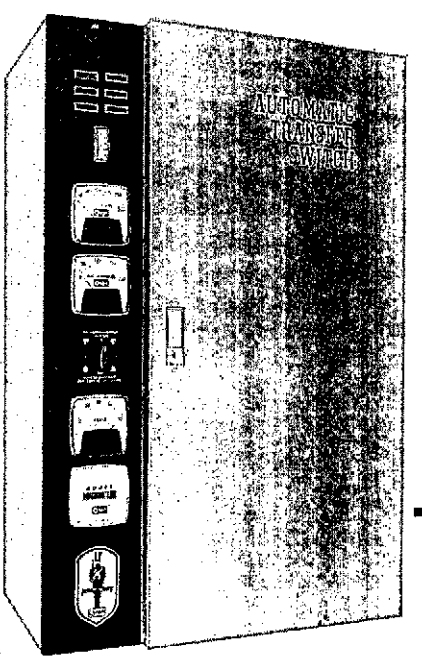
Power Generation

Onan

Service Manual

AT

Switch



30 through 400 Amperes

962-0500
SPEC A-C
8-79
Printed in U.S.A.

Cummins Power Generation

SAFETY PRECAUTIONS

This manual includes the following symbols to indicate potentially dangerous conditions to the operator or equipment. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

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

The automatic transfer switch has components with high voltages which present serious shock hazards. For this reason, read the following suggestions:

Keep the automatic transfer switch cabinet(s) closed and locked. Make sure authorized personnel only have the cabinet keys.

Always move the operation selector switch on the generator set or automatic transfer switch to "STOP," disconnect the starting batteries of the generator set, and remove AC line power to the automatic transfer switch before performing maintenance or adjustments (unless specified otherwise in the instructions—then only using extreme caution due to danger of shock hazard).

Before using the disconnect plug, if equipped, for deenergizing the control panel, be sure to place the operation selector switch on the generator set or automatic transfer to the "STOP" position. Neglect of this procedure results in set starting and energization of the transfer switch generator side.

Use rubber insulative mats placed on dry wood platforms over floors which are metal or concrete when working on any electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling any electrical equipment.

Jewelry is a good conductor of electricity and should be removed when working on the electrical equipment.

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

WARNING

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, A QUALIFIED ELECTRICIAN OR AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM INSTALLATION AND ALL SERVICE.

TABLE OF CONTENTS

GENERAL INFORMATION

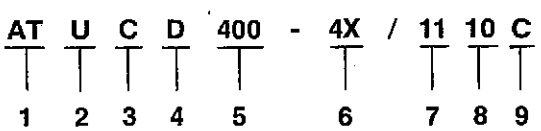
ONAN SERVICE MANUAL

This manual contains operation descriptions of typical AT transfer switches, modifications, adjustments, and troubleshooting procedures. Whenever troubleshooting or planning a repair for an AT automatic transfer switch, remember the generator set, automatic transfer switch and commercial power source are all interdependent. Decide which is the source of the problem and then repair using necessary and normal safety precautions. Note WARNING on inside the front cover of this service manual which states that ". . .a qualified electrician or an authorized service representative must perform all service."

Throughout the text, front of the automatic transfer switch is the door side. Determine left and right when facing the cabinet doors. Metric equivalents of U.S. customary units will appear in parentheses where applicable.

MODEL NUMBER SYSTEM

Following is a typical model number with explanations of the different parts.



1. Series Identification

2. Transfer Switch Type

U—3-pole transfer switch, UL listed
S—3-pole transfer switch,
special or CSA approved
N—4-pole, 3-phase switched neutral

3. Starting Circuit

C—2-wire, 24-volt
D—2-wire, 12-volt
E—3-wire, 12-volt

4. Transfer Switch and Cabinet Combinations

5. Current Rating (amperes)

6. Voltage Code

3 —120/240, 1-phase, 3-wire
4 —120/208, 3-phase, 4-wire
4X—277/480, 3-phase, 4-wire
5D—120/240, 3-phase, 4-wire delta
7 —220/380, 3-phase, 4-wire
9X—347/600, 3-phase, 4-wire

Voltage code with prefix "5" indicates 50 hertz; e.g. 53 indicates 50 hertz, 120/240 volts, 1-phase, 3-wire.

(continued on next page)

7. Control Accessory Group

GROUPS 10 THROUGH 15 AND 20 THROUGH 25 (SOLID-STATE, MODULAR TYPE)

ACCESSORY	GROUP					
	10	11	12	13	14	15
Standard Items*	X	X	X	X	X	X
Start-Stop Time Delay	P	X	X	X	X	P
Undervoltage Sensor (1 sensor on emergency side)	X	X	X	X	X	X
Transfer-Retransfer Time Delay	P	P	X	X	X	P
Battery Charger Module		X	X	X	X	P
Battery Voltage Sensor		W	W	W	X	P
Undervoltage Sensor (1 sensor/phase-normal side)	X	X	X	X	X	X
Overvoltage Sensor (1 sensor/phase-normal side)	W	W	W	W	X	P
Exerciser Clock		W	X	X	X	W
Manual Retransfer Switch	W	W	W	X	W	X
Preheat Time Delay (AT-E Only)	W	W	W	W	W	P

X = Supplied standard.
P = Plug-in module package available.
W = Wire-in package available.

* - Includes normal-test switch, with load — without load selector switch, disconnect plug, area protection terminals, overcrank lamp on AT-E only, and engine start-run signal.

GROUPS 51 THROUGH 55 (RELAY TYPE CONTROL GROUPS)

ACCESSORY	GROUP				
	51	52	53	54	55
Standard Items*	X	X	X	X	X
Start Time Delay	W	W	W	X	X
Transfer Time Delay	W	W	W	W	X
Retransfer Time Delay	W	X	X	X	X
Stop Time Delay	W	W	W	W	X
Exerciser Clock	W	W	X	X	X
Preheat Time Delay (AT-E Only)	W	W	W	W	W
Undervoltage Sensor (line)	W	W	W	W	W
Undervoltage Sensor (gen)	W	W	W	W	W
Overvoltage Sensor (line)	W	W	W	W	W
Overvoltage Sensor (gen)	W	W	W	W	W
Battery Charger - 2 Amp SCR Float	W	W	W	W	W
Battery Charger - 50 to 300 ma Trickle	W	W	W	W	W

X = Supplied standard.
W = Wire-in package available.

* - Includes voltage sensing relays, normal-test switch, disconnect plug, area protection terminals, engine start-run contacts; cranking limiter, overcrank lamp, and manual reset (AT-E only).

8. Meter-Lamp Combination:

ACCESSORY	GROUP																	
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
Charge Ammeter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Overcrank Lamp (AT-E only)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Normal-Emergency Lamps	W	X	W	X	W	X	W	X	W	X	W	X		X		X		X
Battery Voltage Lamps			X	X			X	X			X	X			X	X		
AC Voltmeter					X	X	X	X	X	X	X	X						
Frequency Meter									X	X	X	X						
Running Time Meter									X	X	X	X	X	X	X	X		

X = Supplied standard.

9. Specification Letter: Advances with production modification.

OPERATION DESCRIPTION

The detailed operation description following is intended as an aid in understanding and servicing the automatic transfer switch. It gives two operation descriptions, one for an AT with a solid-state, modular type control accessory panel (control panel groups 10 through 15 and 20 through 25) and one for an AT with a relay-type control accessory panel (control panel groups 51 through 55). The descriptions apply to typical models and might not directly relate to a model you are servicing.

Wiring diagrams referenced in the operation description appear at the end of this section. Note each one has three parts: a pictorial wiring diagram, a schematic, and a parts list.

Any model AT automatic transfer switch uses three schematic wiring diagrams. One covers the meter-lamp panel portion, one covers the control accessory panel portion, and one covers the transfer switch-cabinet portion. If you wish to follow the schematic wiring diagram as you read the operation description, you will have to use and follow all three schematic wiring diagrams referenced in the text. (Operation description is written using only the schematic portion of each schematic wiring diagram.)

AT'S WITH CONTROL ACCESSORY GROUPS 10-15 AND 20-25

NORMAL OPERATION

Under normal conditions the commercial line supplies the power to the load through the closed K2 contacts—lines A, B and C shown in the schematic diagram 626-0106. The closing coil CC of transfer switch K1 is originally energized from terminal A on the line side through: the closing coil CC, normally closed K1 contact CS, normally closed K2 contact IC, terminal W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626-0445) which connects to normally closed K4 contact (3-9) and back to Y terminal of disconnect plug P1. P1-Y connects to terminal Y of receptacle J1 (drawing 626-0106). J1-Y connects to line B on the line side of transfer switch K1. Once a mechanically-held transfer switch on line side is picked up by the commercial line, it is mechanically held in that position until the trip coil is energized.

The normal lamp DS11 on the meter-lamp panel lights to indicate the presence of normal line power. A circuit is completed from normal line A through TB7-11 (drawing 626-0164), through transformer T11 primary windings, TB7-10 (drawing 626-0106), contacts K2-IC, receptacle J1 terminal W, disconnect plug P1 terminal W (drawing 626-0445), contacts K4 (3-9), disconnect plug P1 terminal Y, receptacle J1 terminal Y (drawing 626-0106), to normal line B. The primary of transformer T11 (drawing 626-0164) induces a voltage in the secondary windings to light the "NORMAL" lamp DS11.

Battery Charging

The transfer switch line side K1 terminals A and B feed J1 receptacle terminals X and Y (drawing 626-0106) and P1 plug terminals X and Y (drawing 626-0445) to energize transformer T1 through fuse F1. Transformer T1 has three secondary terminals X1, X2 and X3. Terminals X1 and X2 supply approximately 20 volts output for 12-volt battery charging. Terminals X1 and X3 supply approximately 40 volts output for 24-volt battery charging.

For 12-volt battery charging, transformer terminal T1-X2 connects to resistor R1-2. Resistor terminal R1-1 connects to terminal 21 of battery charger plug-in module 6. Transformer terminal T1-X1 connects to terminal 15 of battery charger plug-in module 6. The battery charger module rectifies and regulates the DC output voltage to float-charge the cranking battery.

Positive output terminal 2 on module 6 supplies charging current through TB6-2 (drawing 626-0106), TB7-2 (drawing 626-0164) through the ammeter M11, TB7-1 (drawing 626-0106), TB6-1 (drawing 626-0445) to the B+ terminal on TB1 which connects to the positive terminal of the battery. Terminal 4 of plug-in module 6 connects to the ground terminal which in turn connects to the negative terminal of the battery. This battery charging module 6 has a rated output of 2 amperes maximum and is voltage regulated to float the battery continuously without damage to the battery.

POWER OUTAGE

When a power outage occurs (commercial power source), primary voltage to transformer T2 supplied from lines A and B, through terminals X and Y of the disconnect plug (drawing 626-0106), disappears. Voltage at terminals T2-X1 and T2-X2 goes to zero (drawing 626-0445). With zero input voltage to voltage sensor module 1, contacts 8-10 open to de-energize line interposing relay K3.

This completes a circuit to connect battery positive from the B+ terminal (TB1-B+) through voltage module 5 (18-16), through K3 (1-7) to terminal 9 of the start-stop time delay module 7. After a time delay, module 7 energizes relay K7 through start suppressor control 21 (16-20) and module 7 (21-2). Relay K7 (4-7) contacts close to connect B+ from TB1-B+ to the remote terminal TB1-RMT.

Two-Wire Starting

The battery positive on the remote terminal (RMT) signals the generator set to start.

Three-Wire Start

The B+ signal on the remote terminal feeds terminal 10 on the 2 to 3 wire start converter plug-in module 9. With battery positive on terminal 10, module 9 closes the circuit between terminals 15 and 4 grounding output terminal 3. It also opens the generator set stop circuit by removing ground from TB1-2. The generator set starts and runs.

The AC running time meter is energized whenever the generator set operates. Generator line A (drawing 626-0106) supplies power through TB7-6 (drawing 626-0164), to running time meter M12-1. Generator line B (drawing 626-0106) supplies power through TB7-7 (drawing 626-0164), to running time meter M12-2.

Emergency lamp DS12 (drawing 626-0164) lights to indicate generator power is available. Generator line A (drawing 626-0106) supplies power through TB7-6, TB6-6 (drawing 626-0445), contacts K4 (4-7), K3 (2-

8), TB6-8 (drawing 626-0106), TB7-8 (drawing 626-0164), through transformer T12 primary windings, back through TB7-12 (drawing 626-0106), through K1-IC, to generator line B. The primary of T12 (drawing 626-0164) induces a voltage in the secondary windings to light the "EMERGENCY" lamp DS12 on the meter-lamp panel.

Generator output to transfer switch K2 terminals A and B (drawing 626-0106) through TB7-6 and -7 (drawing 626-0445) energizes the primary winding of transformer T3. Transformer terminals X1 and X2 feed a nominal 40 volts into voltage sensor module 4 terminals 12 and 15. When output voltage exceeds the set point of the module, module 4 contacts (8-10) close the circuit through generator interposing relay K4 to terminal 12 of transfer-retransfer time delay module 8. Battery positive voltage feeds through terminal 16 and 18 of voltage regulator module 5 to terminal 21 of module 8. Module 8 delays closing of solid-state switch 8 (12-21) to energize relay K4.

Relay K4 completes a circuit from generator line A through TB7-6 (drawing 626-0106), TB6-6 (drawing 626-0445), is closed through K4-4 and -7, K3-2 and -8, TB6-8, TB7-8 (drawing 626-0106), K1 mechanically-held closed contact, to energize K1 trip coil (K1-TC). The K1 trip coil operates to release the mechanically-held mechanism and to close contacts K1-IC. Contacts K1-IC energize the K2 closing coil from generator side line B to close the main K2 contacts connecting the load to the generator side.

Momentary Power Outage

A very short duration power outage or dip on normal line voltage can drop relay K3 (drawing 626-0445). Contacts K3 (1-7) close to signal the start-stop time delay module 7 to start timing. However, if the voltage dip or power outage is shorter than the time delay and the start-up time of the generator set, normally-closed contacts K4 (2-8) will bypass any time delay in retransfer to re-energize relay K3 through the voltage sensors to keep the load on the normal line. Contacts K3 (1-7) open to reset the start-stop time delay.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normally-closed output terminal of the area protection equipment connects to TB1-4 and -5 (drawing 626-0445). A jumper between TB1-4 and -5 must be removed during wiring connections before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes the AC input voltage from voltage sensor module 1 (12-15). Voltage sensor module 1 opens the circuit through contacts (8-10). Line interposing relay K3 is de-energized as described under *Power Outage.*

When the area protection equipment closes the circuit between TB1-4 and -5 (drawing 626-0445) again, the voltage sensor module 1 closes a circuit through terminals 8 and 10 to pick up line interposing relay K3 again as described in *Restoration of Normal Line.*

RESTORATION OF NORMAL LINE

When normal line power returns, it energizes transformers T2, T4, and T5 (drawing 626-0445). Transformer output voltage from terminals X1 and X2 feeds voltage sensor modules 1, 2, and 3.

Modules 1, 2, and 3 contacts (8-10) close to complete the circuit from ground to relay K3 and to transfer-retransfer time delay module 8 terminal 8. Module 8 starts timing because it already has battery positive from auto-manual switch S3, contacts K6 (1-7), voltage module 5 (4-8), switch S1 (2-3), and from terminal TB1-B+.

When the time delay ends, module 8 connects B+ from terminal 2 to terminal 6 to pick up relay K3. Normally closed contacts K3 (1-7) open to remove battery positive from start-stop time delay module 7 which initiates the time delay in stop. Also, contacts K3 (6-9) close the circuit from plug P1 terminal W, receptacle J1-W (drawing 626-0106), to transfer switch contacts K2-IC, transfer switch contacts K1-CS, through the K1-CC closing coil to terminal A on the line side. Transfer switch K2 contacts open and K1 contacts close to connect the load to the line.

The generator set continues to run until the start-stop time delay (drawing 626-0445) times out to de-energize start relay K7. Contacts K7 (4-7) open to remove B+ from the remote (RMT) line. If the generator set is a 3-wire start, 2 to 3 wire converter module 9 removes ground from TB1 terminal 3 and puts ground on TB1 terminal 2 to stop the generator set.

SIMULATION OF POWER OUTAGE

To ensure that the equipment is ready to perform if an actual power outage occurs, the operator should periodically simulate a power outage. The Onan automatic transfer switch has two switches to provide a choice of testing or exercising the generator set with load or without load.

Without Load

To test the generator set without load, place selector switch S2 in the WITHOUT LOAD (closed) position (drawing 626-0445). Then place the test transfer switch in the TEST position to complete the circuit from the battery positive terminal through S1 (1-2) and S2 (2-3) to the remote (RMT) line. This signals the generator set to start and run unloaded as long as the switch is in the TEST position. To stop the generator set, return the test switch to the NORMAL position.

With Load

To test the generator set under actual operating conditions, set selector switch S2 to the WITH LOAD (open) position. Then move the test transfer switch S1 from NORMAL position to TEST position. Relay contacts K3 (1-7) close to energize start-stop time delay module 7. After the time delay ends, module 7 closes contacts (2-21) to energize relay K7. Contacts K7 (4-7) close to connect B+ to the remote terminal (TB1-RMT) which initiates engine cranking.

As the generator set comes up to speed, generator output voltage to transfer switch generator terminals A and B (drawing 626-0106) through TB6-6 and -7 (drawing 626-0445) energizes the primary of step-down transformer T3. Transformer T3 terminals X1 and X2 feed a nominal 40 volts into generator voltage sensor module 4 terminals 12 and 15. When this output voltage exceeds the set point of the voltage sensor module 4, module 4 contacts (8-10) close the circuit through generator interposing relay K4 coil to terminal 12 of transfer-retransfer time delay module 8. Battery positive voltage feeds through terminals 16 and 18 of the voltage regulator module 5 to module 8 terminal 21. Module 8 delays closing of the solid-state switch 8 (12-21) to energize relay K4. Once the time delay has completed, contacts K4 (4-7) close the circuit through K3 (2-8), TB6-8 (drawing 626-0106), TB7-8, K1 contact now held closed by the mechanically-held mechanism, to energize trip coil K1-TC. The circuit to relay K2 is also completed through the K1-IC transfer switch contacts. The transfer switch operates to open the K1 contacts removing the load from the normal line and closes the K2 contacts to connect the load to the generator side.

To end the test and retransfer the load back to the normal line move test switch S1 to NORMAL (drawing 626-0445). This connects battery positive from TB1-B+, S1 (2-3), M1 (4-5), voltage module 5 (4-8), contacts K6 (1-7), switch S3 (1-2), to transfer-retransfer time delay 8 terminal 2. Module 8 starts timing because it already has battery negative from modules 1, 2, and 3 contacts (8-10). When the time delay ends, module 8 connects B+ from terminal 2 to terminal 6 to pick up relay K3.

Relay contacts K3 (2-8) open, break the circuit through TB6-8 (drawing 626-0106) and TB7-8 to de-energize the K2 transfer switch coil. Relay contacts K3 (1-7) (drawing 626-0445) open to de-energize start-stop delay module 7 which initiates stopping. Relay contacts K3 (6-9) close the circuit through plug P1-W, receptacle J1-W (drawing 626-0106), K2-IC contacts and K1-CS contacts to energize the K1 closing coil. The K2 power contacts open to disconnect the generator from the load and K1 power contacts close to connect the load to the commercial power line. The mechanical latch on line side of the transfer switch locks the contacts closed and disconnects the K1 closing coil (CC). Start-stop time delay module 7 contacts (2-21) (drawing 626-0445) open after the time delay to de-energize start relay K7. Contacts K7 (4-7) open to remove B+ from the remote (RMT) terminal, signaling the generator set to stop.

AUXILIARY CONTACTS ON LINE SIDE AND GENERATOR SIDE

Small switches mounted on the transfer switch, actuated by the moving armature, provide dry contacts to indicate transfer switch position. Diagram 626-0106 shows the K1 auxiliary contacts S5 connecting to TB9 terminals 1, 2 and 3. The normally open contact connects to terminals 1 and 2 and the normally closed contact connects to terminals 2 and 3. The K2 auxiliary contacts S6 have a normally open contact connecting to terminal block TB9 terminals 4 and 5 and a normally closed contact connecting to terminals 5 and 6.

EXERCISER CLOCK

The exerciser clock starts and stops the generator set automatically for periodic test operations. Drawing 626-0445 shows the exerciser clock M1 motor circuit connected to stepdown transformer T1 terminals X4 and X5. Transformer T1 primary connects to the line side of the transfer switch through disconnect plug terminals X and Y.

The exerciser clock cam-operated switch contacts M1-3, -4 and -5 connect to test transfer switch S1 and selector switch S2. The M1 switch contacts are shown in the normal position with the contacts (3-5) open and contacts (4-5) closed. After the operator selects the mode, the exerciser clock automatically exercises the generator set.

Exercise Without Load

With switch S2 in the WITHOUT LOAD position, the exerciser clock closes contact M1 (3-5) to complete the circuit from B+ through switch contacts S1 (2-3), M1 (3-5), S2 (2-3) to the remote (RMT) terminal. The generator set starts and runs as previously described under *Test Without Load* until the exerciser clock contacts M1 (3-5) open at the end of the exercise period.

Exercise With Load

With selector switch S2 in the WITH LOAD position, exerciser clock contacts M1 (4-5) open the circuit to remove battery positive from line interposing relay K3. Relay K3 drops out the same as it does if there is a power outage and the generator set starts and runs as long as the exerciser clock contact remains open.

PREHEAT TIME DELAY

The preheat time delay is optional on AT-E automatic transfer switches. It provides time for operation of the diesel engine glow plugs before remote signal for engine cranking.

Relay K7 is energized by receiving battery positive through start-stop time delay module 7, the start

suppressor control 21, voltage module 5 (16-18), and from TB1-B+ (drawing 626-0445). Contacts K7 (4-7) close to connect battery positive to TB1-RMT and the 2 to 3 wire converter module 9. Module 9 connects ground to preheat time delay module 16 (terminal 5). Module 16 grounds TB1-H to complete the preheat circuit and grounds terminal 14 of module 9 to inhibit cranking during the preheat circuit period.

When the preheat time delay has ended, module 16 removes the inhibit ground circuit from module 9 (terminal 14). Module 9 connects battery ground to TB1-3 (start circuit and remove ground from TB1-2 (stop circuit). The generator set starts.

PUSH TO RETRANSFER AND SELECTOR SWITCHES

Some automatic transfer switch installations require that the generator set continue to supply power until a retransfer signal is manually initiated after restoration of normal power. Some installations also require a selector switch for choice of automatic retransfer or manually initiated retransfer through a push-to-retransfer switch. Drawing 626-0445 shows both the selector switch S3 and push-to-retransfer switch S4.

Manual Retransfer

With S3 selector switch in MANUAL position, relays K3 and K5 drop out on a voltage dip or a commercial power outage. If the normal line restores voltage before the generator set can build up voltage, normally closed contacts K4 (2-8) will re-energize relay K3 to keep the load on the line.

If normal line power stays off, the voltage sensor module 4 energizes relay K4 through bypass module 8 contacts (12-21). Relay contacts K4 (2-8) open and contacts K5 (4-7) remain open to prevent K3 from picking up when the undervoltage sensor modules 1, 2 and 3 close the circuit on normal power restoration.

To initiate a retransfer when line power returns, the operator must push retransfer switch S4 bypassing contacts K5 (6-9) to energize relay K5 through the voltage sensors. Contacts K5 (6-9) close to "seal in" relay K5, and contacts K5-4 and -7 close to energize relay K3 through automatic-manual switch contacts S3 (2-3) and voltage sensor modules 1, 2 and 3. Relay contacts K3 (2-8) open and contacts K3 (6-9) close to transfer the load from the generator set to the normal line. See *Restoration of Normal Line.* Contacts K3 (1-7) open to initiate the time delay in stop.

Automatic Position

With automatic-manual transfer selector switch S3 in the AUTOMATIC position, relay K3 will pick up on normal power restoration through switch contacts S3 (1-2), module 8 terminals 2 and 6, and voltage sensor modules 1, 2, and 3. Relay K3 picks up to open K3 (2-8) and close K3 (6-9) to transfer the load from the generator set to the normal line. See *Restoration of Normal Line.* Contacts K3 (1-7) open to initiate stopping of the generator set.

AC OVERVOLTAGE SENSOR

Overvoltage sensors monitor the commercial line and start the generator set in case the commercial line exceeds the set voltage. Drawing 626-0445 shows three voltage sensor modules 13, 14 and 15 monitoring a three-phase system. The solid state switches of all three voltage sensors connect in parallel so that if any one line voltage exceeds the voltage setting, the voltage sensor will close its circuit between terminals (8-10) to energize overvoltage relay K6. Contacts K6 (1-7) open to drop relay K3.

Contacts K3 (1-7) close to energize start-stop time delay module 7. Time delay module 7 contacts (2-21) close to energize start relay K7. Contacts K7 (4-7) close to energize the remote (RMT) line and start the generator set.

When the generator set comes up to speed and voltage, relay K4 closes contacts K4 (4-7) to energize the transfer switch through contacts K3 (2-8), TB6-8 (drawing 626-0106), TB7-8, relay coil K2, contact K1-IC to generator line B to transfer the load from line to the generator set. See *Power Outage.*

When the commercial line voltage returns to normal, the voltage sensor opens the circuit between terminals (8-10) to drop relay K6 (drawing 626-0445). Contacts K6 (1-7) close again to allow relay K3 to be energized through plug-in module 8 and the undervoltage sensors. See *Restoration of Normal Line.*

BATTERY VOLTAGE SENSOR

The battery voltage sensor, available in 12-volt or 24-volt versions, is a plug-in module with two relays mounted on the printed circuit board. The battery voltage sensor module 10 monitors the battery charging system. If the battery charger is exceeding a safe float voltage, it lights the high battery voltage lamp DS14. If the battery float charger fails to charge, the sensor lights the battery low voltage lamp DS13.

Drawing 626-0445 shows the ground lead connecting to module 10 terminal 12. The battery positive line connects to module 10 terminal 19. If the battery charger is exceeding the high battery voltage sensor setting, the sensor lights the high battery voltage lamp DS14 through a circuit from module 10 contact 21, TB6-3 (626-0106), TB7-3 (626-0164), DS14, TB7-5 (drawing 626-0106), TB6-5 to ground. Contacts connected to TB2 terminals 1 and 2 close (drawing 626-0445). Contacts connected to TB2 terminals 2 and 3 open. If the battery charger has failed to charge, the battery voltage will drop below the battery voltage sensor setting and it lights the low battery voltage lamp DS13, through a circuit from module 10 contact 17, TB6-4 (drawing 626-0106), TB7-4 (drawing 626-0164), DS13, TB7-5 (drawing 626-0106), and TB6-5 to ground. The battery voltage sensor closes the contacts connected to TB2 terminals 4 and 5 (drawing 626-0445) and opens the contacts connected to TB2 terminals 5 and 6 to indicate a low battery voltage condition.

AT'S WITH CONTROL PANEL GROUPS 51 THROUGH 55

NORMAL OPERATION

Under normal conditions, the commercial line supplies power to the load through the closed K1 contacts—lines A, B, and C shown in schematic 626-0106. The closing coil CC of transfer switch K1 is originally energized from terminal A on the line side through: the closing coil CC, normally closed K1 contact CS, normally closed K2 contacts IC, terminal W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626-0075) which connects to normally open K3 contacts (6-5) and back to Y terminal of disconnect plug P1. P1-Y connects to terminal Y of receptacle J1 (drawing 626-0106) which connects to line B on the line side of transfer switch K1. Once a mechanically-held transfer switch on line side is picked up by the commercial line, it is mechanically held in that position until the trip coil is energized.

The normal lamp DS11 on the meter-lamp panel lights to indicate the presence of normal line power. A circuit is completed from normal line A through TB7-11 (drawing 626-0164), through transformer T11 primary windings, TB7-10 (drawing 626-0106), contacts K2-IC, receptacle J1 terminal W, disconnect plug P1 terminal W (drawing 626-0075), contacts K3 (5-6), disconnect plug P1 terminal Y, receptacle J1 terminal Y (drawing 626-0106), to normal line B. The primary of transformer T11 (drawing 626-0164) induces a voltage in the secondary windings to light the "NORMAL" lamp DS11.

POWER OUTAGE

When a power outage occurs (normal line), voltage from lines B and C (drawing 626-0106) through disconnect plug terminals Y and Z disappears (drawing 626-0075). Relay K6 is de-energized and contacts K6 (3-5) open. Relay K3 is de-energized, contacts K3 (5-6) open and contacts K3 (1-3) close. Start time delay K7 is also de-energized.

Two-Wire Starting

Start time delay relay K7 begins its time delay. When the time delay ends, contacts K7 (1-5) close to connect battery positive from TB1-B+, through selector switch S2 (1-2), to the remote start terminal TB1-RMT. The generator set cranks and runs.

Three-Wire Starting

Start time delay relay K7 (drawing 626-0175) begins its time delay. When the time delay ends, contacts K7 (1-5) close to connect battery negative from TB1-1, through selector switch contacts S2 (1-5), M1 (4-5), K7 (1-5), K4 (2-1), K5 (1-2), to TB1-H and TB1-3. The generator set cranks and runs.

The AC running time meter is energized whenever the generator set operates. Generator lines A and B supply generator power through terminals TB-6 and -7 (drawing 626-0106), and to running time meter terminals M12-1 and -2.

Generator output voltage completes a circuit from the output line A (drawing 626-0106), TB6-6 (drawing 626-0075), TB6-11 and 12, relay K4, resistor R4, TB6-7 (drawing 626-0106), to generator output line B. Relay K4 is energized (drawing 626-0075) to close contacts K4 (3-4) and open contacts K4 (1-2) and K4 (5-6).

A circuit is now complete from TB6-6, through contacts K4 (3-4), transfer time delay K13, TB6-7 (drawing 626-0106), to generator line B. Transfer time delay K13 is energized and starts its time delay cycle (drawing 626-0075). When the time delay ends, transfer switch coil K1-TC is energized from generator line B (drawing 626-0106), through normally-open K1 contacts, TB7-8, TB6-8 (drawing 626-0075), closed K3 (1-3), K13 (1-5), closed K4 contacts (3-4), TB6-6, TB7-6 (drawing 626-0106), to generator line A. The K1 trip coil operates to release the mechanically held mechanism and to close contacts K1-IC. Contacts K1-IC complete the circuit to energize the K2 closing coil from generator side terminal B. Coil K2 then closes the main K2 contacts connecting the load to the generator side.

When transfer time delay K13 contacts close, they also complete a circuit from generator line B, closed contacts K1-IC, TB7-12 (drawing 626-0164), through the transformer T12 primary windings, through TB7-8 (drawing 626-0106), TB6-8 (drawing 626-0075), contacts K3 (1-3), K13 (1-5), K4 (3-4), TB6-6, TB7-6 (drawing 626-0106), to generator line A. This circuit through T12 primary windings (drawing 626-0164) induces a voltage in the transformer secondary windings to light the "EMERGENCY" lamp DS12.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normally-closed output terminal of the area protection equipment connects to terminals TB1-4 and -5 (see drawing 626-0075). A jumper between these two terminals must be removed before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes AC input voltage from relays K3 and K7. Relays K3 and K7 are de-energized as described under *Power Outage*.

When area protection equipment closes the circuit between TB1-4 and -5, relay K3 is energized as described under *Restoration of Normal Line*.

RESTORATION OF NORMAL LINE

When the normal line voltage returns, it completes a circuit from normal line B (drawing 626-0106), to receptacle terminal J1-Y, plug terminal P1-Y (drawing 626-0075), relay K6, plug terminal P1-Z, J1-Z (drawing 626-0106), and to normal line C. Relay K6 energizes and closes contacts K6 (3-5) (drawing 626-0075) to complete a circuit from normal line A (drawing 626-0106), to receptacle terminal J1-X, plug terminal P1-X (drawing 626-0075), K10 retransfer time delay motor, contacts K10 (TDO), contacts K6 (3-5), TB1-4 and -5, test transfer switch S1, plug terminal P1-Y, receptacle terminal J1-Y (drawing 626-0106), and to line B. Time delay K10 energizes (drawing 626-0075), and after the time delay period, closes contacts K10 (7-8) to complete the circuit to energize relay K3 and to energize stop time delay K9 through K9 (TDO) contacts.

Contacts K3 (5-6) close and contacts K3 (1-3) open. Open contacts K3 (1-3) break the circuit to TB6-8 and to TB7-8 (drawing 626-0106) to de-energize the K2 closing coil. Power from normal line B (drawing 626-0106) completes a circuit through receptacle terminal J1-Y, plug terminal P1-Y (drawing 626-0075), closed contacts K3 (5-6), disconnect plug terminal P1-W, receptacle terminal J1-W (drawing 626-0106), closed contacts K2-IC, K1-CS, closing coil K1-CC, to normal line A. Transfer switch contacts K2 open to remove the generator from the load and K1 contacts close to connect the load to the commercial power line.

After the stop time delay period, time delay motor K9 closes contacts K9 (7-8) to complete the circuit to energize relay K7 (drawing 626-0075). Contacts K7 (1-5) open to stop a two-wire start generator set by removing B+ from the RMT terminal. To stop a three-wire start generator set, contacts K7 (1-5) open (drawing 626-0175) to remove battery ground from TB1-H and -3, and contacts K7 (3-5) close to place battery ground on TB1-2.

SIMULATION OF POWER OUTAGE

To ensure the equipment is ready to assume load properly if an actual power outage occurs, the operator should periodically simulate a power outage. Opening test transfer switch S1 de-energizes relays K3 and K7 as described under *Power Outage.*

To end the test, move test transfer switch S1 back to NORMAL (drawing 626-0075). This closes the circuit to energize relay K3 as described under *Restoration of Normal Line.*

AUXILIARY CONTACTS ON LINE SIDE AND GENERATOR SIDE

Small switches mounted on the transfer switch, actuated by the moving armature, provide dry contacts to indicate transfer switch position. Diagram 626-0106 shows the K1 auxiliary contacts S5 connecting to TB9 terminals 1, 2 and 3. The normally open contact connects to terminals 1 and 2 and the normally closed contact connects to terminals 2 and 3. The K2 auxiliary contacts S6 have a normally open contact connecting to terminal block TB9 terminals 4 and 5 and a normally closed contact connecting to terminals 5 and 6.

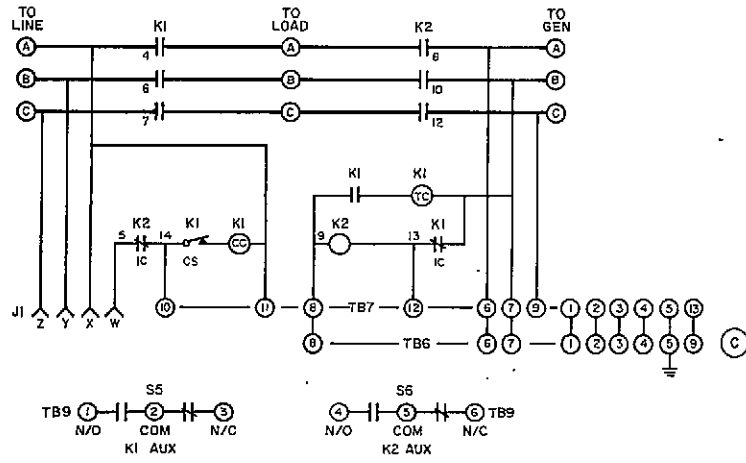
EXERCISER CLOCK

The exerciser clock starts and stops the generator set automatically for periodic test and exercise operations without load. The exerciser clock is connected to lines A and B through disconnect plug terminals X and Y. See drawing 626-0075. With 480- and 600-volt systems, the exerciser is connected to a step-down transformer.

Cam-operated switch contacts M1 (3-5) connect battery positive (B+) to the remote start terminal (RMT). The M1 contacts are shown in the normal position. After the operator selects the desired exercise periods, the exerciser clock automatically exercises the generator set.

626-0106 DWG SIZE C

SCHEMATIC DIAGRAM



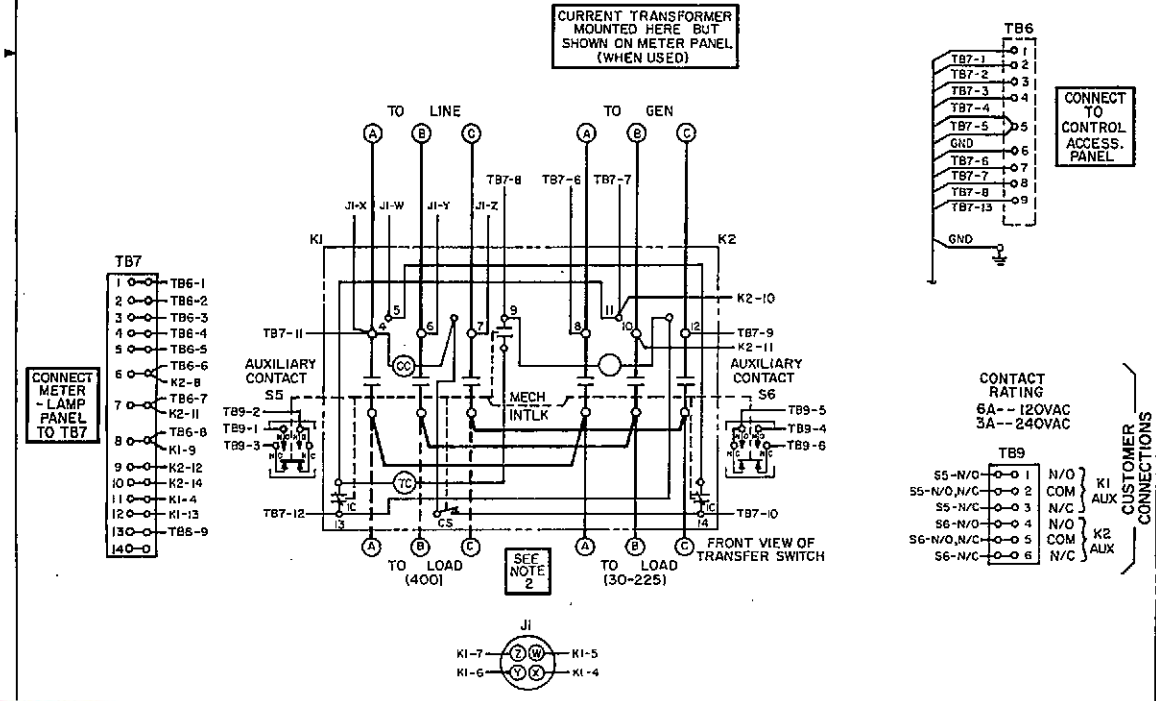
THIS INFORMATION IS FOR MANUFACTURERS USE ONLY				
DASH NO	AMPERE	VOLTAGE	TRANSFER SWITCH	DWG SIZE
-01	30	208/240V	307-0926	C
-02		480V	307-0927	C
-03		600V	307-0928	C
-04	60	208/240V	307-0497	C
-05		480V	307-0506	C
-06		600V	307-0581	C
-07	100	208/240V	307-0488	C
-08		480V	307-0507	C
-09		600V	307-0580	C
-10	225	208/240V	307-1225	C
-11		480V	307-1226	C
-12		600V	307-1227	C
-13	400	208/240V	307-1208	C
-14		480V	307-1209	C
-15		600V	307-1210	C

PARTS LIST

	REF. DES.	PART NO	DWG SIZE	QTY	DESCRIPTION
	JI	338-0880	B	1	HARNESS-DISC PLUG (30-225)
		338-0881	B	1	HARNESS-DISC PLUG (400)
		323-0900(REF)	A	1	RECEPTACLE
	K1,K2	SEE CHART	-	1	TRANSFER SWITCH
	S5,S6	307-0426	P	2	AUXILIARY CONTACT
	TB7	338-0888	D	1	HARNESS-CABINET (30-225)
		338-0889	D	1	HARNESS-CABINET (400)
		332-1697(REF)	A	1	TERMINAL BLOCK
		332-1698	A	1	MARKER STRIP
	TB9	338-0678	B	1	HARNESS-AUX CONTACT (30-225)
		338-0674	D	1	HARNESS-AUX CONTACT (400)
		332-0699(REF)	A	1	TERMINAL BLOCK
A		332-1516	A	1	MARKER STRIP
E		98-2582	A	1	LABEL-WITHSTAND RATING (30)
		98-2532	A	1	LABEL-WITHSTAND RATING (60)
		98-2537	A	1	LABEL-WITHSTAND RATING (100)
		98-2534	A	1	LABEL-WITHSTAND RATING (225)
		98-2535	A	1	LABEL-WITHSTAND RATING (400)
B		98-2799	A	1	LABELS-TERMINAL BLOCK
		301-3778	D	1	CONTROL BOX (30-225)
		301-3779	D	1	CONTROL BOX (400)
		301-3579	C	1	DOOR ASSY (30-400)
		301-3578	C	1	DOOR ASSY (400)
		301-3512	B	1	BRACKET-CONTROL BOX CENTER (400)
		406-0363	A	2	HINGE-PIN
		508-0177	P	2	WASHER-NYLON
D		301-3524	B	1	PLATE-STRIKER
		99-1269	A	1	NAMEPLATE-CONTROL
		406-0370	A	1	PIN-LATCH
		332-1356	P	2	CLAMP-LOOP (30-225)
		332-1024	-	2	CLAMP-LOOP (400)
		332-1414	-	4	CLAMP-LOOP (30-225)
		332-1414	-	5	CLAMP-LOOP (400)
		332-0050	-	1	CLAMP-LOOP

626-0106

WIRING DIAGRAM
INSIDE VIEW OF CONTROL BOX



NOTES:
1. TRANSFER SW MECHANICALLY HELD LINE SIDE

CC -- CLOSING COIL
TC -- TRIP COIL
CS -- CUTOUT SWITCH
IC -- INTERLOCK CONTACT

2. CONNECT LOAD TO RIGHT SIDE OF TRANSFER SWITCH ON 30-225 AMP
CONNECT LOAD TO LEFT SIDE OF TRANSFER SWITCH ON 400 AMP

TRANSFER SWITCH-CABINET ASSY: C

TRANSFER SW MECHANICALLY HELD LINE SIDE
AUXILIARY CONTACTS LINE & GEN SIDE
CABINET (LESS METER PANEL)

LET	REVISION	DR	ENGR	DATE
E	WAS 98-2531		JM	6-9-77
D	WAS 99-127		LL	11-15-76
C	WAS 200 AMP		LL	11-5-76
B	ADDED 98-2799	CDR		11-2-75
A	WAS 332-0730			11-9-74

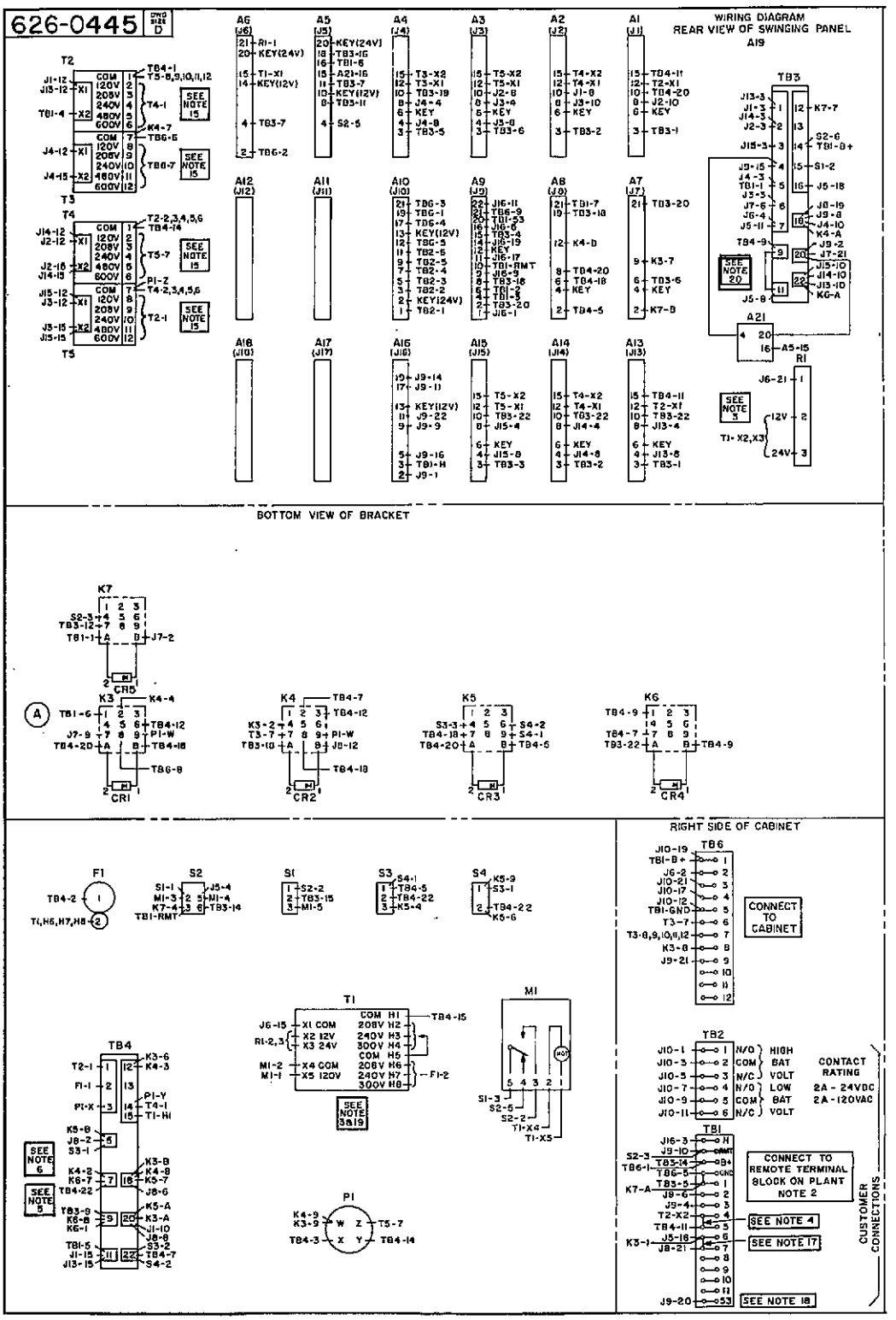
PROD SER. | PROD REL. | MODEL: AT CC, AT DC, AT EC } SPEC B | 208,240,480,600V., 3PH., 4W., 50/60Hz

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

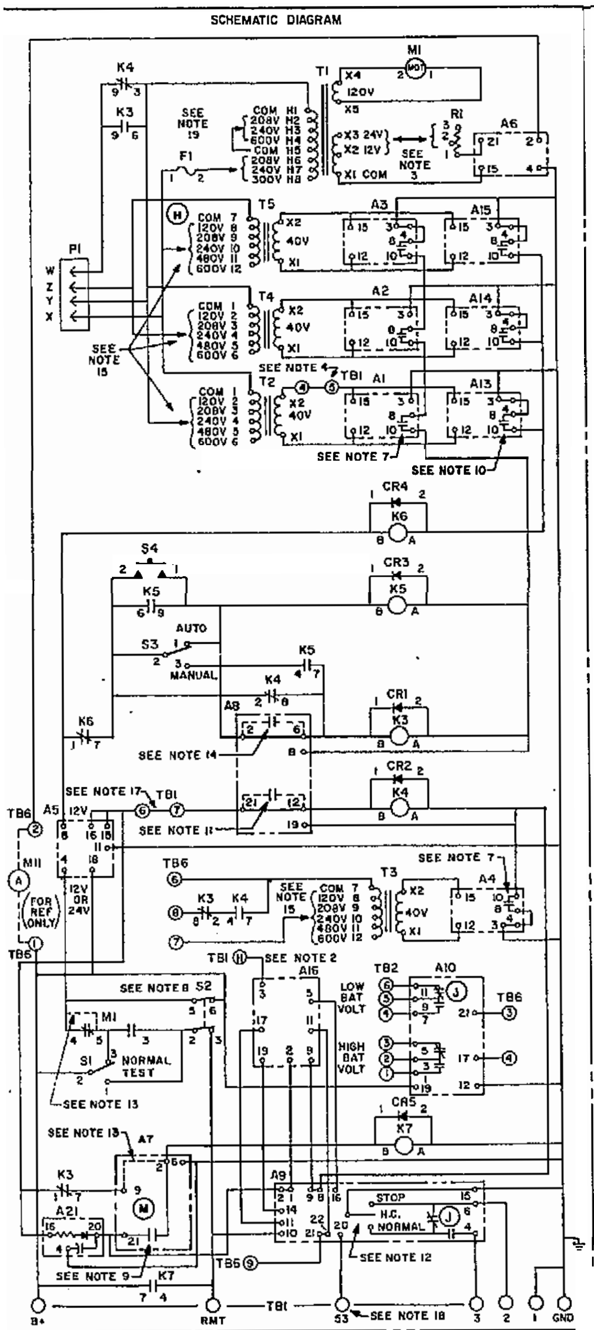
DATE 4-12-74 | DR RMS | ENGR | APP CDR

TRANSFER SWITCH-CABINET ASSY (WIRING DIAGRAM)

SERIAL FROM: | DWG NO 626-0106 | DWG SIZE C



SCHEMATIC DIAGRAM



NOTES:
ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION UNLESS OTHERWISE NOTED

2. 2 WIRE START ON AT C & AT D CONNECT TO B+,GND & RMT
3 WIRE START ON AT E CONNECT TO B+,1,2 & 3 (PLUS H ON DIESELS)

3. FOR 12V BATTERY CONNECT WIRE MARKED T1-X2,X3 R1-2,3 BETWEEN T1-X2 & R1-2 (AT D & AT E)
FOR 24V BATTERY CONNECT WIRE MARKED T1-X2,X3 R1-2,3 BETWEEN T1-X3 & R1-3 (AT C)

4. TO ADD AREA PROTECTION EQUIPMENT,OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER BETWEEN TB1-4 & 5

5. REMOVE JUMPER BETWEEN TB4-7 & 9

6. REMOVE JUMPER BETWEEN TB4-5 & 7

7. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE IS NORMAL (A1,A2,A3,& A4)

8. TEST OR EXERCISE (S2 SHOWN IN WITHOUT LOAD POSITION)
8.1. WITH LOAD-PLANT STARTS AND TAKES OVER LOAD. PLANT RUNS FOR DURATION OF TEST OR EXERCISE PERIOD PLUS ANY TIME DELAYS
8.2. WITHOUT LOAD-PLANT STARTS AND RUNS FOR DURATION OF TEST OR EXERCISE PERIOD

9. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER A 0.1 SEC TO 15 SEC DELAY AND OPENS AFTER A 0.1 MIN TO 10 MIN DELAY

10. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE GOES ABOVE NORMAL (A13,A14 & A15)

11. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES AFTER A DELAY OF .1 SEC TO 15 SEC DELAY ON LOAD TRANSFER

12. 2 TO 3 WIRE CONVERTER (AT E ONLY)
THE SELECTOR SW HAS THREE POSITIONS:
STOP-----STOPS PLANT. PREVENTS STARTING. USE THIS POSITION FOR SERVICING PLANT
NORMAL---ALLOWS PLANT TO START. ASSUMES LOAD IF A LINE FAILURE OCCURS.
HAND CRANK-PREVENTS AUTOMATIC START ALLOWS STARTING & STOPPING AT THE PLANT. USE THIS POSITION FOR PLANT MAINTENANCE.

13. THIS DASHED LINE REPRESENTS A JUMPER CIRCUIT THAT MUST BYPASS A CONTACT OR CLOSE A CIRCUIT TO OPERATE WITHOUT THE REFERENCED MODULE

14. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER A .5 MIN TO 30 MIN DELAY ON RETRANSFER

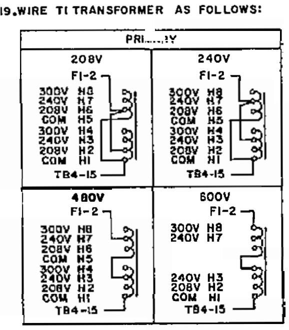
15. WIRE TRANSFORMERS T2,3,4 & 5 AS FOLLOWS
FOR 208V CONNECT T4 -1 TO T2-3
TB6 -7 TO T3-9
T5 -7 TO T4-3
T2 -1 TO T5-9
FOR 240V CONNECT T4 -1 TO T2-4
TB6 -7 TO T3-10
T5 -7 TO [illegible]
T2 -1 TO T5-10
FOR 480V CONNECT T4 -1 TO T2-5
TB6 -7 TO T3-11
T5 -7 TO T4-5
T2 -1 TO T5-11
FOR 600V CONNECT T4 -1 TO T2-6
TB6 -7 TO T3-12
T5 -7 TO T4-6
T2 -1 TO T5-12

16. WIRING DIAGRAM SHOWS CIRCUIT AS IF ALL ADDER PACKAGES WERE INSTALLED, PLUS IT SHOWS JUMPERS REQUIRED WHEN THEY ARE NOT INSTALLED

17. TO ADD PARALLELING SWITCH BOARD TRANSFER INHIBIT CIRCUIT, REMOVE JUMPER TB1-6 & 7

18. OVERCRANK SIGNAL ON AT E ONLY. CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR

19. WIRE T1 TRANSFORMER AS FOLLOWS:



20. TO ADD OVER & UNDER FREQUENCY SENSING, REMOVE JUMPER BETWEEN TB3-9 & 11

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY		
MODEL	208-240V	480-600V
AT C	-01	-04
AT D	-02	-05
AT E	-03	-06

	PARTS LIST				
	REF DES	PART NO	DWG SIZE	QTY	DESCRIPTION
	A1,2,3	300-0780	C	3	UNDER VOLTAGE SENSOR (LINE)
	A4	300-0780	C	1	UNDER VOLTAGE SENSOR (GEN)
	A5	300-0847	B	1	MODULE-VOLTAGE 12V (AT D & E)
		300-0848	B	1	MODULE-24V TO 12V CONVERTER (AT C)
	A6	300-0937	B	1	MODULE-BLANK (SPARE)
*		300-0793(REF)	C	1	BATTERY CHARGER-2 AMP,12V (AT D & E)
*		300-0794(REF)	C	1	BATTERY CHARGER-2 AMP,24V (AT C)
	A7	300-1648	B	1	BYPASS PLUG-START STOP
(B) *		300-0921(REF)	C	1	TD START-STOP
					0.1 SEC TO 15 SEC DELAY ON START
					0.1 MIN TO 10 MIN DELAY ON STOP
(L)	A8	300-1675	B	1	BYPASS PLUG-TRANSFER
*		300-1188(REF)	C	1	TD TRANSFER-RETRANSFER
					.1 SEC TO 15 SEC ON TRANSFER
(K)					.5 MIN TO 30 MIN ON RETRANSFER
	A9	300-0937	B	1	MODULE-BLANK (SPARE) (AT C & D)
		300-0926	C	1	2 TO 3 WIRE CONVERTER (AT E)
	A10	300-0937	B	1	MODULE-BLANK (SPARE)
*		300-0796(REF)	C	1	BATTERY VOLTAGE SENSOR (AT D & E)
*		300-0797(REF)	C	1	BATTERY VOLTAGE SENSOR (AT C)
	A11,12	300-0937	B	2	MODULE-BLANK (SPARE)
	A13,14,15	300-0937	B	3	MODULE-BLANK (SPARE)
(G) *		300-0780(REF)		3	OVER VOLTAGE SENSOR (LINE)
*					
	A16	300-0937	B	1	MODULE-BLANK (SPARE)
*		300-1072(REF)	C	1	MODULE-TD PREHEAT
	A17,18	300-0937	B	2	MODULE-BLANK (SPARE)
	A19	300-1629	C	1	PANEL ASSY-SWINGING
	A21	300-1627(REF)	B	1	CONTROL-START SUPPRESSOR
	F1	321-0180	P	1	FUSE-2AMP (208-240V)
		321-0110	P	1	FUSE-1AMP (480-600V)
(C)		321-0178(REF)	P	1	FUSE-HOLDER
	K3	307-1058	B	1	RELAY-INTERPOSING LINE (12V)
	K4	307-1058	B	1	RELAY-INTERPOSING GEN (12V)
	K5	307-1058	B	1	RELAY-RETRANSFER (12V)
	K6	307-1058	B	1	RELAY-OVER VOLTAGE LINE (12V)
	K7	307-1058	B	1	RELAY-START (12V)
(D)	M1	332-1484	A	1	PLATE-CLOCK COVER
* *		307-1104(REF)	B	1	CLOCK-PLANT EXERCISER (120V 50Hz)
* *		307-1102(REF)	B	1	CLOCK-PLANT EXERCISER (120V 60Hz)
	P1	323-0901(REF)	A	1	PLUG-LINE DISCONNECT
	R1	353-0046(REF)	A	1	RESISTOR-6 OHM (2.5 OHM TAP 75W)
	S1	308-0321(REF)	P	1	SWITCH-TEST TRANSFER
	S2	308-0322(REF)	P	1	SWITCH-SELECTOR
	S3	308-0321	P	1	SWITCH-MANUAL & AUTO
	S4	308-0175	A	1	SWITCH-RETRANSFER
	T1	315-0379(REF)	B	1	TRANSFORMER-BATTERY CHARGER
	T2-5	315-0374(REF)	C	2	TRANSFORMER ASSY-STEPDOWN
	TB1	332-1699	A	1	MARKER STRIP
	TB2	332-1616	A	1	MARKER STRIP
	TB6	332-1469	A	1	MARKER STRIP
		338-1139(REF)	D	1	HARNESS-MAIN (3 SHEETS)
		338-1136	C	1	HARNESS-RETRANSFER
		338-1134	D	1	HARNESS-OVER V
		338-1135	C	1	HARNESS-BAT V
		338-1138	C	1	HARNESS-TD PREHEAT
		332-2114	–	14	PLUG-KEYING
		325-1084	P	12	GUIDES-PC BOARD
		307-1157	P	2	SPRING-RELAY HOLD DOWN
(F)		301-4727	A	2	BRACKET & FASTENER

CONTROL ACCESSORY GROUP 15

STANDARD
3 UNDER VOLTAGE SENSORS (LINE)
1 UNDER VOLTAGE SENSOR (GEN)
2 TO 3 WIRE CONVERTER (AT E ONLY)
NORMAL-TEST SWITCH
WITH LOAD-WITHOUT LOAD SW
MANUAL PUSH TO RETRANSFER

* PLUG-IN-MODULE PACKAGE'S
BATTERY CHARGER MODULE
3 OVER VOLTAGE SENSORS (LINE)
TD START-STOP
TD TRANSFER-RETRANSFER
TD PREHEAT
BATTERY VOLTAGE SENSORS

(E)

** WIRE-IN-PACKAGE'S
EXERCISER CLOCK

LTR	REVISION
M	REVISED A7-2 WIRING
L	A8 WAS 0927
K	WAS .5 SEC
J	CLOSED CONTACTS ON A9,10
H	120V WAS 20 V
G	300-0780 QTY WAS 4
F	301-4727 QTY WAS 1
E	ADD TAB -01 THRU -06
D	M1 WAS 301-5487
C	ADDED (REF) TO 321-0178
B	REM (AT D & E)
A	K5-1 WAS TO TB1-16

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

DATE 12-19-77 DR CIP CDR

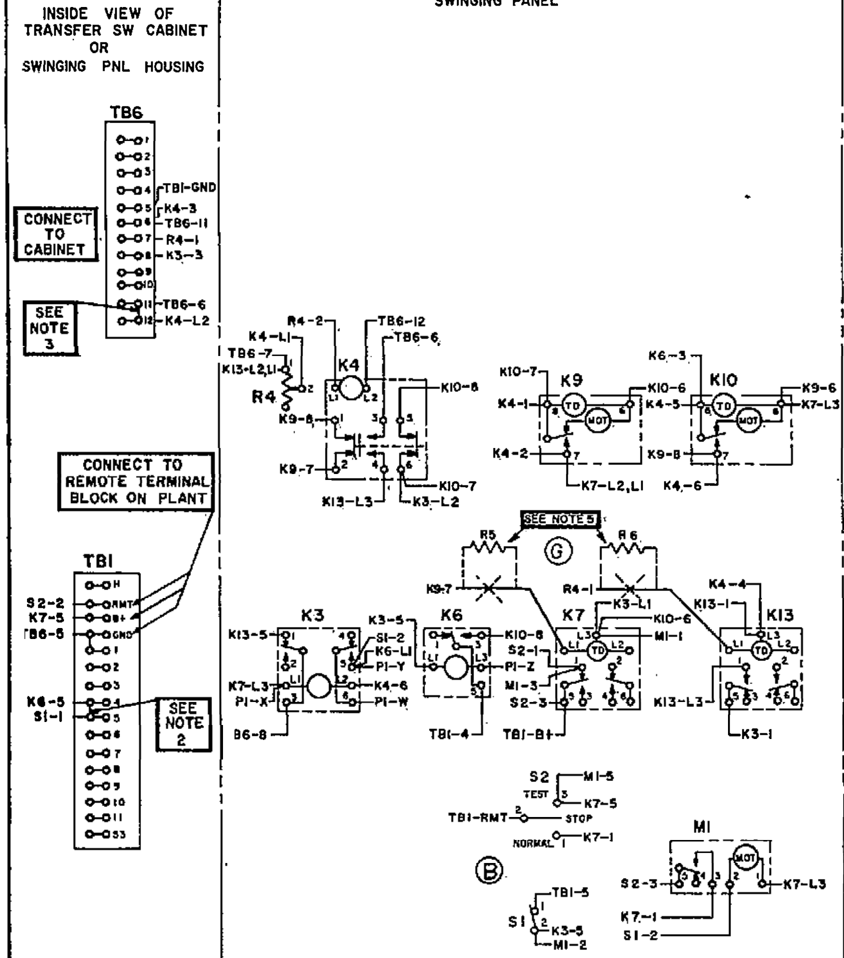
CONTROL-ACCESS PANEL (WIRING DIAGRAM)

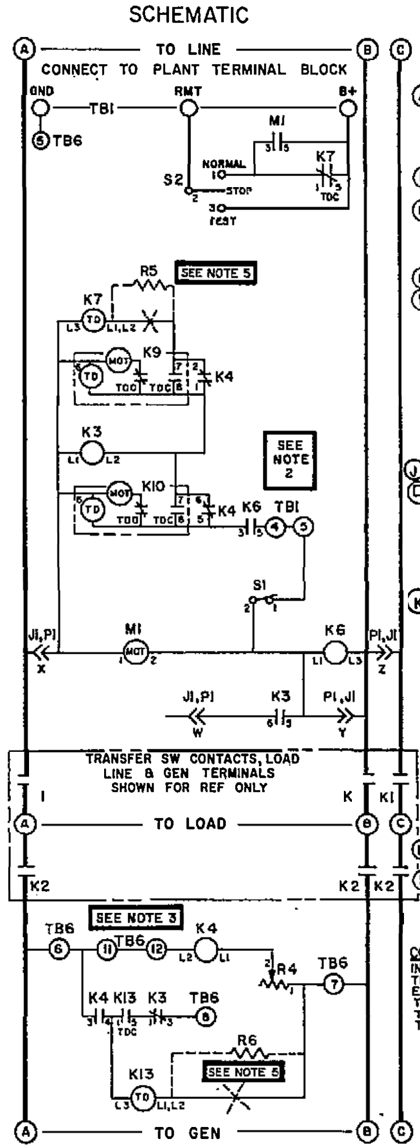
MODEL NO. AT C, AT D, AT E SPEC C

208,240,480,600V., 3PH., 4 W., 50/60 Hz

626-0445 D

626-0075





NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER & CONNECT TO TB1-4 & 5
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER & CONNECT TO TB6-11 & 12
4. AFTER TEST, PLANT WILL RUN FOR DURATION OF TIME DELAYS
5. TO CONNECT RELAYS K7 & K13; (E)
   FOR 208V,60 HZ; WIRE K9-7 TO K7-L2, WIRE R4-1 TO K13-L2
   FOR 240V,60HZ; WIRE K9-7 TO K7-L1, WIRE R4-1 TO K13-L1
   FOR 208V,50HZ; WIRE K9-7 TO K7-L1, WIRE R4-1 TO K13-L1
   FOR 240V,50HZ; WIRE TO R5 BETWEEN K9-7 & K7-L1
   R6 BETWEEN R4-1 & K13-L1

PARTS LIST

REF. DES.	PART NO.	DWG SIZE	QTY	DESCRIPTION
K3	307-1113	B	1	RELAY-INTERPOSING LINE (208V)
	307-1083	B	1	RELAY-INTERPOSING LINE (240V)
K4	307-0664	C	1	RELAY-INTERPOSING GEN
K6	307-1114	B	1	RELAY-PHASE PROTECTION (208V)
	307-1081	B	1	RELAY-PHASE PROTECTION (240V)
K7	307-1156	B	1	RELAY-TIME DELAY ON STARTING
				1 TO 300 SEC ON DE-ENERGIZATION
	301-3315	A	1	MOUNTING PKG-RELAY PNL
K9	307-0724	B	1	RELAY-TIME DELAY ON STOPPING
				AFTER RETRANSFER (50/60 Hz)
	336-2318	A	1	LEAD ASSY
	336-2319	A	1	LEAD ASSY
K10	307-0724	B	1	RELAY-TD ON RETRANSFER (50/60 Hz)
	336-2309	A	1	LEAD ASSY
K13	307-1144	B	1	RELAY-TIME DELAY ON TRANSFER
				1 TO 300 SEC ON ENERGIZATION
	301-3315	A	1	MOUNTING PKG-RELAY PNL
	336-2310	A	1	LEAD ASSY
M1	307-1103	B	1	CLOCK-PLANT EXERCISER (60Hz)
	307-1105	B	1	CLOCK-PLANT EXERCISER (50Hz)
P1	323-0901	A	1	PLUG-LINE DISCONNECT
	301-3765	A	2	PLATE-PANEL INTERLOCK
	503-0801	—	1	HOSE
R5,6	304-0718	A	2	RESISTOR ASSY 500 Ω 25W (50HZ,240V)
R4	304-0131	A	1	RESISTOR, 750 Ω, 25W
S1	308-0069	P	1	SWITCH-TEST TRANSFER
S2	308-0138	A	1	SWITCH-SELECTOR
	332-1969	A	1	CLAMP-CABLE (USE ON P1)
	503-0721	P	1	BUSHING-RUBBER (USE ON P1)
TB1	332-1699	A	1	MARKER STRIP
TB6	332-1469	A	1	MARKER STRIP
	301-3825	D	1	PANEL-SWINGING RELAY
	98-2795	D	1	SILKSCREEN-PANEL (FRONT)
	98-2796	D	1	SILKSCREEN-PANEL (REAR)
	405-1872	A	2	CLIP-DOOR
	526-0003	—	2	WASHER-FLAT
	818-0150	—	2	RIVET-DRIVE
	338-0923	E	1	WIRING HARNESS-MAIN
	301-2259	A	1	PLATE-COVER
	301-3642	A	1	PLATE-COVER
	301-4087	B	2	PLATE-COVER (VOLT SENSOR)
	301-4141	B	1	PLATE-COVER (BAT CHARGER)

626-0075

CONTROL ACCESSORY GROUP 55 (C)

INCLUDES ALL STANDARD ITEMS, PLUS;
TD RETRANSFER 2-60 MIN.
EXERCISER CLOCK
TD START 1-300 SEC
TD TRANSFER 1-300 SEC
TD STOP 2-60MIN

-01	60Hz	240V
-02	50Hz	240V
-03	60Hz	208V
-04	50Hz	208V

LET.	REVISION	CKR.	ENGR.	DATE
K	ADDED 332-1969 & 503-0721	CDK	JM	5-24-76
J	WAS 503-0276, QTY 6	CDK	JM	5-24-76
H	WAS 301-2242 & 3659	WB	JM	4-15-76
B	CHG LOCATION OF S1 & S2	CDK	JM	4-1-76
G	UPDATED R5, R6	CDK	JM	3-25-76
F	ADDED 301-4087 & 301-4141	CDK	JM	3-25-76
E	CHG NOTE 5 FOR 50HZ	WB	JM	2-4-76
D	ADDED R5 & R6	WB	JM	2-4-76
C	GROUP NO WAS 05	WB	JM	2-3-76
B	REVERSE 1 & 3 ON S2	WB	JM	2-2-76
A	K6 WAS 307-0114	WB	JV	2-14-75

LET.	REVISION	CKR.	ENGR.	DATE
P	DELETED 307-0723 K10			4-20-78
N	WAS 60 Hz			4-20-78
M	DELETED 307-0723 K9			4-20-78
L	WAS 60 HZ	CDK		4-20-78

MODEL NO.: AT C, AT D
208/240V, 3 PH, 4W, 50/60 Hz

Onan — DIVISION OF ONAN CORPORATION

DATE: 1-6-75 | DR.: ADB | ENGR.: Jim Vaut | CKR.: CDR

NAME: CONTROL ACCESS. PANEL (WIRING DIAGRAM)

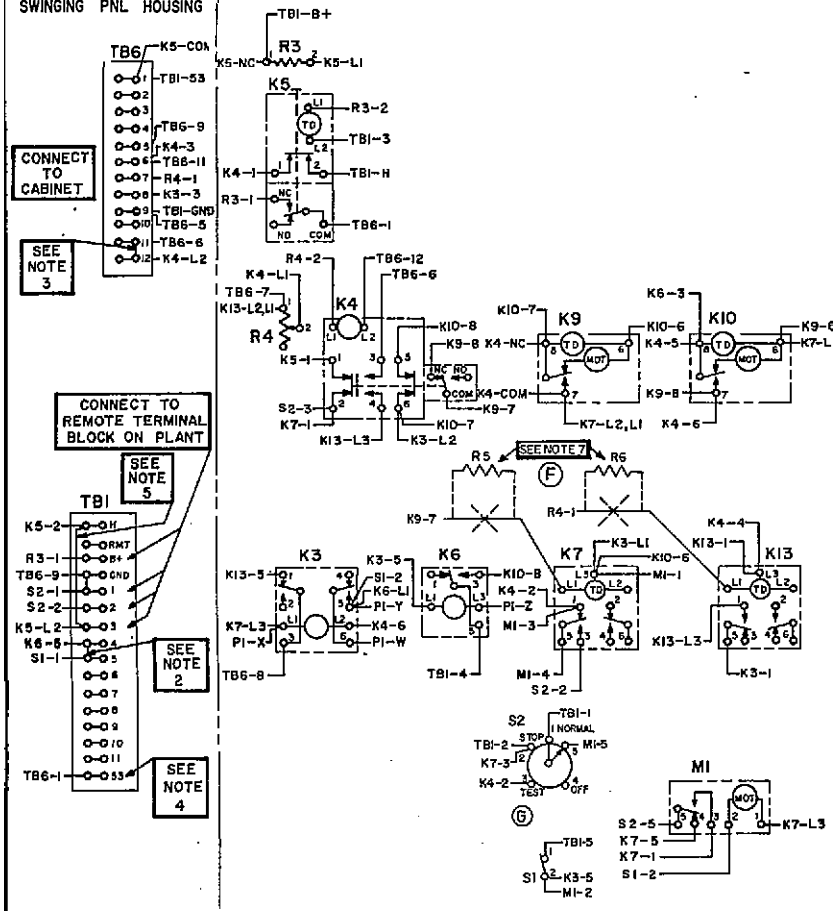
SEPIA FROM: 626-0175 | DWG NO. 626-0075 | DWG SIZE C

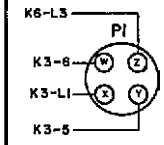
14

626-0175

INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING

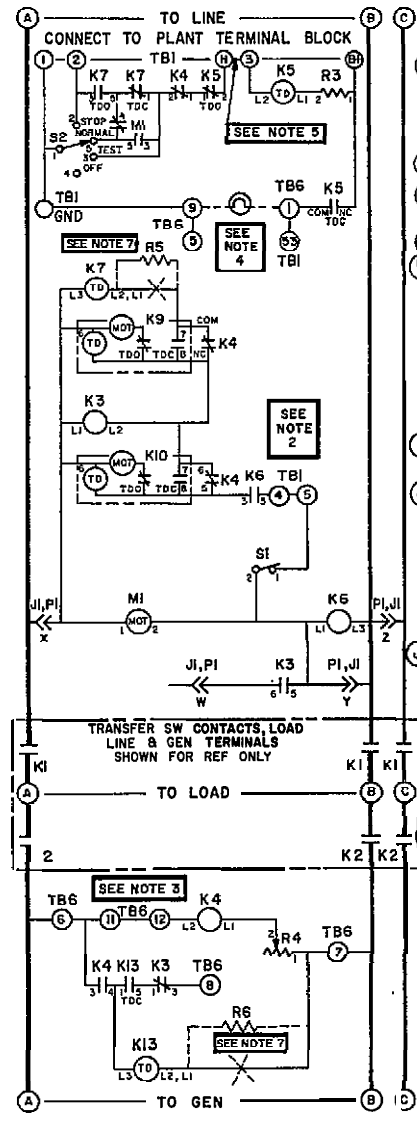
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL





3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER & CONNECT TO TB6-11 & 12
4. OVERCRANK SIGNAL, CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR
5. TO ADD TD PREHEAT, REMOVE JUMPER & CONNECT TD PREHEAT TO TERMINALS H, B+ & 3 ON TB1
6. AFTER TEST, PLANT WILL RUN FOR DURATION OF TIME DELAYS
7. TO CONNECT RELAYS K7 & K13;
   FOR 208V; 60HZ, WIRE K9-7 TO K7-L2, WIRE R4-1 TO K13-L2
   FOR 240V; 60HZ, WIRE K9-7 TO K7-L1, WIRE R4-1 TO K13-L1
   FOR 208V; 50HZ, WIRE K9-7 TO K7-L1; WIRE R4-1 TO K13-L1
   FOR 240V; 50HZ; WIRE TO R5 BETWEEN K9-7 & K7-L1
   ; WIRE TO R6 BETWEEN R4-1 & K13-L1

SCHEMATIC



-01	60Hz	240V
-02	50Hz	240V
-03	60Hz	208V
-04	50Hz	208V

PARTS LIST					
REF. DES.	PART NO.	GRP SIZE	QTY	% BULK	DESCRIPTION
K3	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0664	C	1		RELAY-INTERPOSING GEN
K5	320-0221	B	1		CRANKING LIMITER ASSY
K6	307-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1158	B	1		RELAY-TIME DELAY ON STARTING
					1 TO 300 SEC ON DE-ENERGIZATION
	301-3315	A	1		MOUNTING PKG-RELAY PNL
K9	307-1419	B	1		RELAY ASSY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (50/60Hz)
					2 TO 60 MIN ON ENERGIZATION
K10	307-0724	B	1		RELAY-TD ON RETRANSFER (50/60Hz)
	336-2309	A	1		LEAD ASSY
K13	307-1144	B	1		RELAY-TIME DELAY ON TRANSFER
					1 TO 300 SEC ON ENERGIZATION
	301-3315	A	1		MOUNTING PKG-RELAY PNL
	336-2310	A	1		LEAD ASSY
MI	307-1103	B	1		CLOCK-PLANT EXERCISER (60Hz)
	307-1105	B	1		CLOCK-PLANT EXERCISER (50Hz)
PI	323-0901	A	1		PLUG-LINE DISCONNECT
	301-3765	A	2		PLATE-PANEL INTERLOCK
	503-0801	—	1		HOSE
R3	353-0055	A	1		RESISTOR, 3.0Ω, 10W
R4	304-0131	A	1		RESISTOR, 750Ω, 25W
R5,6	304-0716	A	2		RESISTOR ASSY 500Ω 25W (50HZ, 240V
S1	308-0069	P	1		SWITCH-TEST TRANSFER
S2	308-0193	A	1		SWITCH-SELECTOR
	303-0076	—	1		KNOB
TB1	332-1699	A	1		MARKER STRIP
TB6	332-1469	A	1		MARKER STRIP
	332-1969	A	1		CLAMP-CABLE (USE ON PI)
	503-0721	P	1		BUSHING-RUBBER (USE ON PI)
	301-3825	D	1		PANEL-SWINGING RELAY
	98-2795	D	1		SILKSCREEN-PANEL (FRONT)
	98-2796	D	1		SILKSCREEN-PANEL (REAR)
	405-1872	A	2		CLIP-DOOR
	526-0003	—	2		WASHER-FLAT
	818-0150	—	2		RIVET-DRIVE
	338-0921	E	1		WIRING HARNESS-MAIN
	301-2259	A	1		PLATE-COVER
	301-4087	B	2		PLATE-COVER (VOLT SENSOR)
	301-4141	B	1		PLATE-COVER (BAT CHARGER)

626-0175

CONTROL ACCESSORY GROUP 55 (B)

INCLUDES ALL STANDARD ITEMS, PLUS;
TD RETRANSFER 2-60 MIN
EXERCISER CLOCK
TD START 1-300 SEC
TD TRANSFER 1-300 SEC
TD STOP 2-60 MIN

REV	DESCRIPTION	BY	APP	DATE
K	REM K9 307-1419	CDR	RS	4-21-76
J	ADDED 332-1969 & 503-0721	CDR	JM	5-24-76
H	WAS 503-0276, QTY 15"	CDR	JM	5-24-76
G	CHG LOCATION OF S1 & S2	CDR	JM	3-31-76
F	UPDATED R5, R6	CDR	JM	3-29-76
E	ADDED 301-4087 & 301-4141	CDR	JM	3-29-76
D	CHG NOTE 7 FOR 50HZ	WB	JM	2-5-76
C	ADDED R5 & R6	WB	JM	2-5-76
B	GROUP NO. WAS Q 5	WB	JM	2-5-76
A	K6 WAS 307-0114	WB	JV	2-17-76
LTR	REVISION	EXE. ENGR	DATE	

REV	DESCRIPTION	BY	APP	DATE
N	K10 307-0724 WAS (60Hz)	CDR	RS	4-21-76
M	K9 307-1419 WAS (60Hz)	CDR	RS	4-21-76
L	REM K10 307-0723	CDR	RS	4-21-76

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL NO. AT E

DATE 1-6-75 | DR. ADB | DESIGN JIM VINT | ENG. CDR

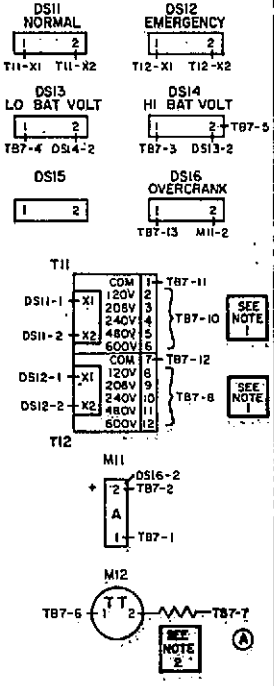
NAME: CONTROL ACCESS. PANEL (WIRING DIAGRAM)

208/240V, 3 PH, 4W, 50/60 Hz

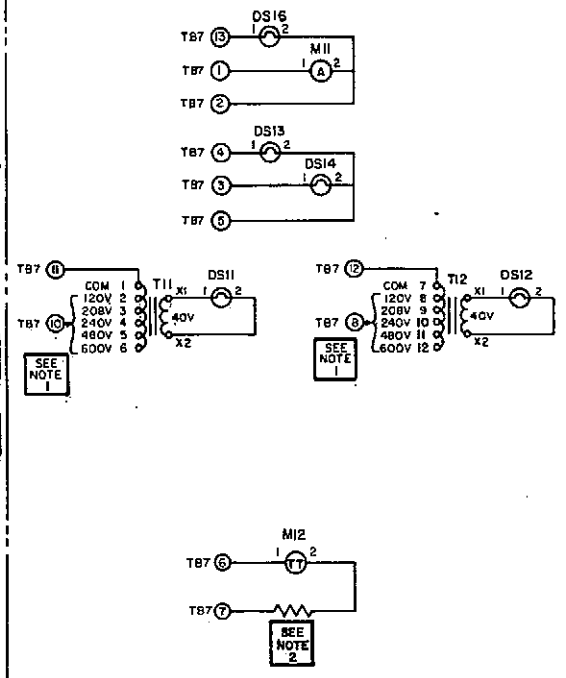
DRWG NO. 626-0175 | GRP SIZE C

626-0164 DWG SIZE C

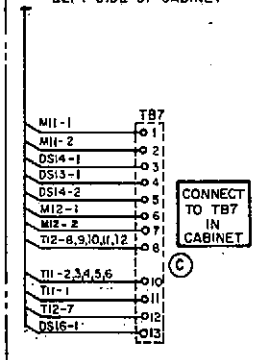
REAR VIEW OF METER PANEL



SCHEMATIC



LEFT SIDE OF CABINET



NOTE:
1. WIRE TRANSFORMER T11 & T12 AS FOLLOWS
   FOR 120V, CONNECT TB7-10 TO T11-2, TB7-8 TO T12-8
   FOR 208V, CONNECT TB7-10 TO T11-3, TB7-8 TO T12-9
   FOR 240V, CONNECT TB7-10 TO T11-4, TB7-8 TO T12-10
   FOR 480V, CONNECT TB7-10 TO T11-5, TB7-8 TO T12-11
   FOR 600V, CONNECT TB7-10 TO T11-6, TB7-8 TO T12-12
2. USE RESISTOR WITH RUNNING TIME METER ON 600V, 60Hz ONLY

PARTS LIST

REF. DES.	PART NO	DWG SIZE	QTY	DESCRIPTION
DS11	322-0146	A	1	LAMP-NORMAL 56V
DS12	322-0147	A	1	LAMP-EMERGENCY 56V
DS13	322-0114	A	1	LAMP-LO BAT VOLT (14V) (AT D & E)
	322-0126	A	1	LAMP-LO BAT VOLT (28V) (AT C)
DS14	322-0115	A	1	LAMP-HI BAT VOLT (14V) (AT D & E)
	322-0127	A	1	LAMP-HI BAT VOLT (28V) (AT C)
DS15	322-0141	A	1	LENS & BEZEL ASSY
DS16	322-0107	A	1	LAMP-OVERCRANK (14V)
M11	302-0807	A	1	AMMETER-BAT CHARGER 0-2 AMP
(B) M12	302-0465	P	1	METER-RUNNING TIME(120V)(600V)(60Hz)
	302-0466	P	1	METER-RUNNING TIME (240V)(60Hz)
	302-0467	P	1	METER-RUNNING TIME (480V)(60Hz)
	304-0536	A	1	RESISTOR, 9000Ω, 50W (600V)(60Hz) (USE WITH 302-0465 RTM ON 600V)
	302-0468	P	1	METER-RUNNING TIME (120V)(50Hz)
	302-0469	P	1	METER-RUNNING TIME (240V)(50Hz)
	302-0470	P	1	METER-RUNNING TIME (480V)(50Hz)
T11,12	315-0374	C	1	TRANSFORMER ASSY-STEPDOWN
	338-0883	C	1	HARNESS-METER
	338-0661	C	1	HARNESS-LAMPS(NORMAL & EMERGENCY)
	338-0659	B	1	HARNESS-LAMPS(BAT VOLTS)
	301-3505	C	1	PANEL-METER
	98-2413	D	1	SILKSCREEN-METER PANEL
	98-2445	A	1	LABEL-POWER SENTRY

626-0164

METER-LAMP COMBINATION: 16

CHARGE AMMETER
OVERCRANK LAMP (USE ON AT E ONLY)
RUNNING TIME METER

NORMAL & EMERGENCY LAMPS
BATTERY VOLTAGE LAMPS

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY			
HERTZ	VOLTAGE	AT C	AT D&E
60	120V	-01	-08
60	208-240V	-02	-09
60	480V	-03	-10
60	600V	-04	-11
50	120V	-05	-12
50	208-240V	-06	-13
50	480V	-07	-14

LET	REVISION	DR	CHK	DATE
D	ADDED 208V	WS	LL	8-4-75
C	M12-2 WENT TO TB7-9	WS	JV	5-19-75
B	ADDED 600V TO M12	JVM	JV	6-12-74
A	WAS TB7-9	JVM	JV	6-12-74

DRAWN REL. JVM 7-18-74
TRACED REL. LLL 8-8-74
MODEL AT C, AT D, AT E } SPEC B
(D) 120,208,240,480,600V 1 & 3PH 50/60Hz

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
DATE 7-18-74 BY DFD DSGN JVM CHK CDR
METER LAMP PANEL (WIRING DIAGRAM)
REPLACES DWG NO 626-0164 DWG SIZE C

MODIFICATIONS

Modifications to the automatic transfer switches are described in this section. At the end of the section, instructions are also given for adding a module to the control accessory panel of groups 10-15 and 20-25. For calibration checks and adjustments of new modules or relays, etc., see the *ADJUSTMENTS* section.

WARNING **Throughout any modification, follow the instructions carefully. Otherwise, the automatic transfer switch and generator set present a serious shock hazard.**

CHANGING THREE-PHASE AT TO SINGLE-PHASE

To change a three-phase AT to a single-phase AT, use the following procedure:

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to "STOP" (on the engine control for two-wire starting, in cabinet for three-wire starting).
3. Disconnect the battery cables of the starting batteries.
4. Remove the AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the control disconnect plug and open the control accessory panel.
6. *400 ampere AT only:* Remove one screw from the inside center support for the left cabinet door and open.
7. Remove generator, line and load connections from the transfer switch terminal C.
8. Connect single-phase generator, line, and load connections to respective terminals A and B. Make sure single-phase voltage matches transfer switch voltage.

CAUTION **Incorrect voltage may damage transfer switch.**

9. *Control accessory groups 10-15 and 20-25:* For control accessory panels with plug-in modules, remove undervoltage sensors 2 and 3 (if equipped). Insert 300-0927 bypass plug modules into the module openings 2 and 3.

If a different generator set is used with a different voltage starting system, see *Changing Control Accessory Panel DC System Voltage.*

Control accessory groups 51 through 55: When changing phase of an AT with one of these control accessory panels, replace the panel with one matching the single-phase voltage. See *Changing Control Accessory Panel.*

10. Remove the one screw on top and one screw on bottom from inside the meter-lamp panel flange.
11. Swing meter-lamp panel outward.
12. If the meter-lamp panel is three-phase only, remove the panel as described under *Changing Meter-Lamp Panel.* If the meter-lamp panel is a single- or single- and three-phase panel, rewire the connections on transformers T11 and T12 (if equipped). See Figure 1.
    a. For 120 volts, reconnect lead from TB7-10 to T11-2, and reconnect lead from TB7-8 to T12-8.
    b. For 240 volts, reconnect lead from TB7-10 to T11-4, and reconnect lead from TB7-8 to T12-10.

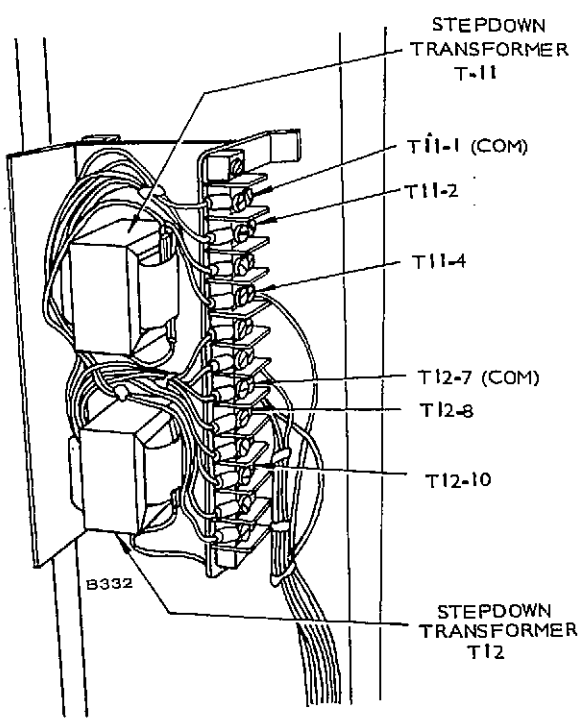


FIGURE 1. STEPDOWN TRANSFORMERS T11 AND T12 ON METER-LAMP PANEL

13. Close the meter-lamp panel and secure the top and bottom with two screws removed in Step 10.
14. *400 ampere AT only:* Close the left cabinet door and secure to inside center support with one screw removed in Step 6.
15. Close the control accessory panel and reconnect the control panel disconnect plug.
16. Restore AC line voltage to the AT.
17. Reconnect the starting batteries.
18. Move the operation selector to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
19. Close the cabinet door.

CHANGING METER-LAMP PANEL

To change a meter lamp panel in an automatic transfer switch, use the following procedure:

1. Open the front door of the cabinet.
2. Move operation selector switch to "STOP" (located in cabinet for three-wire starting, on engine control for two-wire starting).
3. Disconnect the starting battery.
4. Remove the AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

5. Remove the twist-lock disconnect plug and pull control accessory panel open.
6. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open.
7. Remove the one screw on top and one screw on bottom from inside the meter-lamp panel flange.
8. Swing the meter-lamp panel outward.
9. Disconnect the meter-lamp panel wire leads from TB7 and TB8 (if present). See Figure 2.
10. Remove the four nuts and washers holding the meter-lamp panel on the left wall of the cabinet and remove the meter-lamp panel.
11. Mount the new meter-lamp panel on the cabinet using the same four nuts and washers.

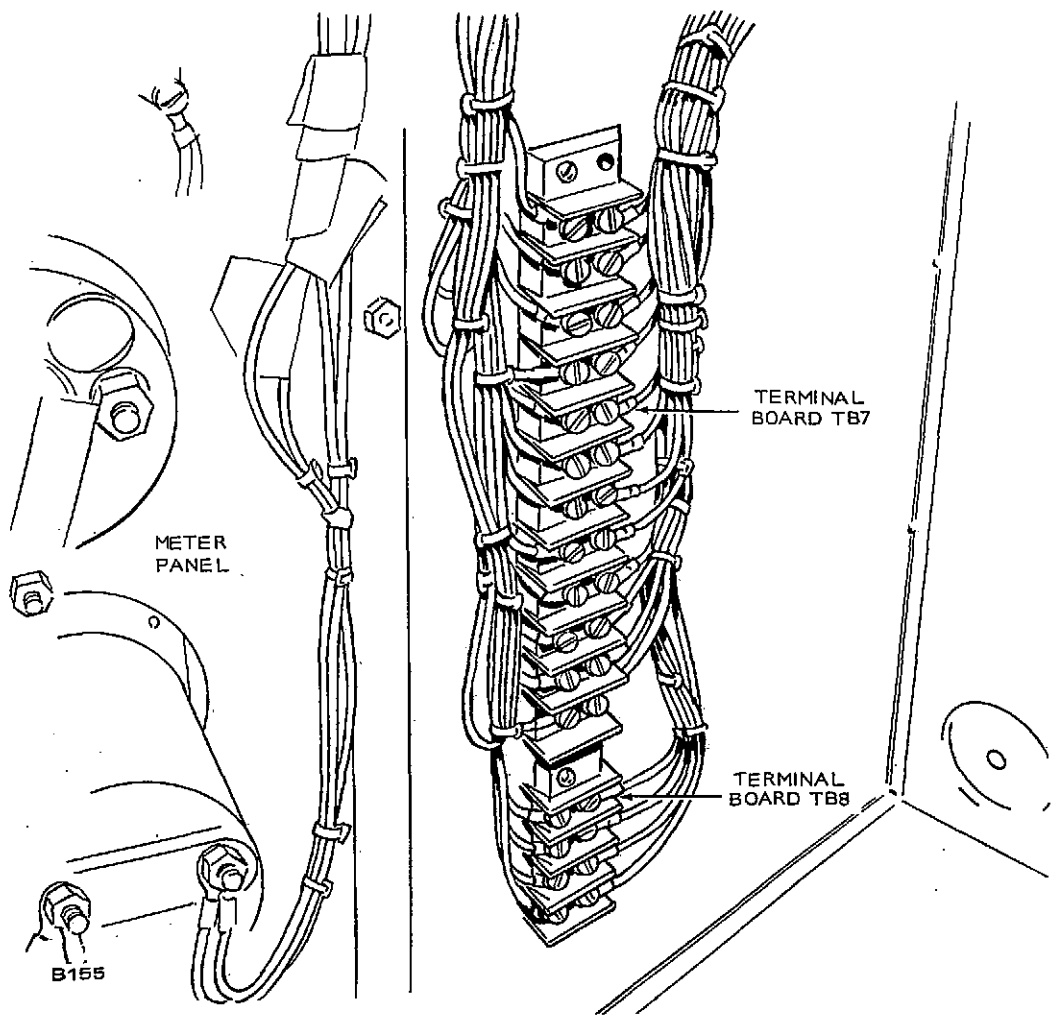


FIGURE 2. TERMINAL BOARD FOR METER-LAMP PANEL WIRE CONNECTIONS

12. Connect the wire leads as marked, from the meter-lamp panel wiring harness to terminal blocks TB7 and TB8 (if present).
13. Close the meter-lamp panel and secure the top and bottom with the two screws from the other meter-lamp panel (from Step 7).
14. *400 ampere AT only:* Shut the left cabinet door. Secure the door to the cabinet's center support with the one screw removed in Step 6.
15. Close the control accessory panel and reconnect the twist-lock disconnect plug.
16. Restore AC line voltage to the automatic transfer switch.
17. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
18. Reconnect starting battery.
19. Close cabinet door.

CHANGING CONTROL ACCESSORY PANEL

Panel Groups 10-15 and 20-25

1. Open automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Remove AC line voltage from the automatic transfer switch.
4. Disconnect the starting batteries.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove external wires from TB1, TB2, TB6 and TB9 (if all present), then remove these terminal blocks from mounting. See Figure 3.

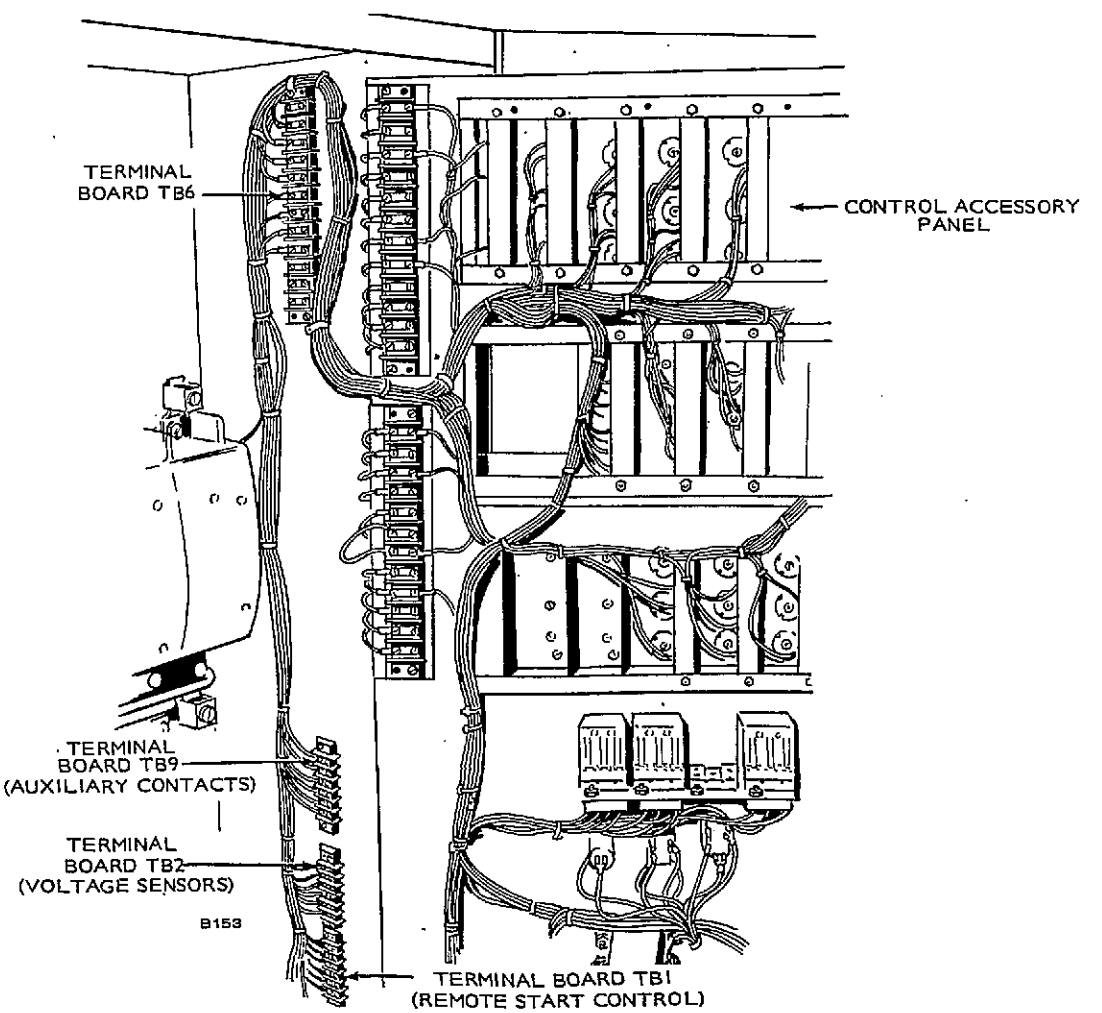


FIGURE 3. TERMINAL BOARD CONNECTIONS FOR CONTROL ACCESSORY PANEL

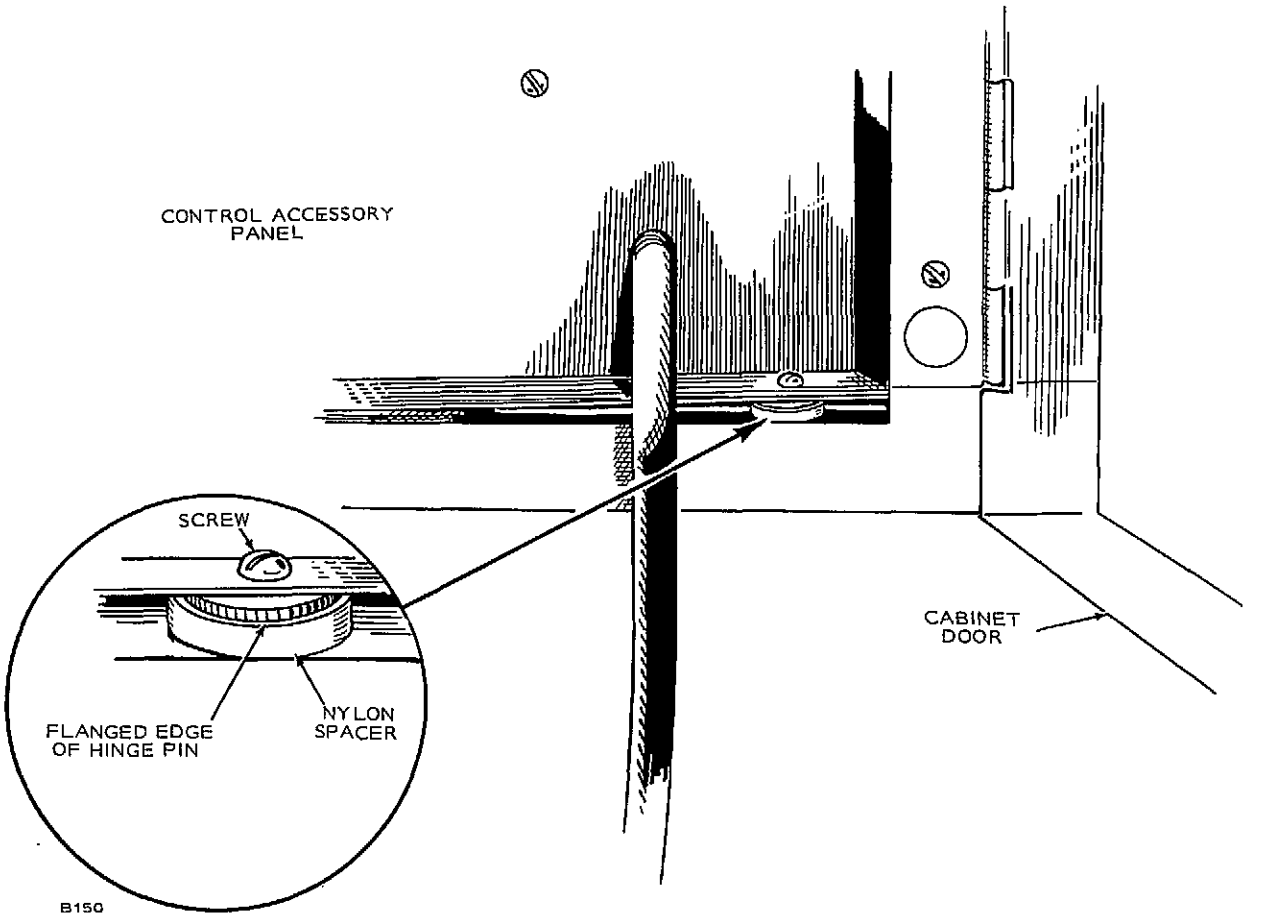


FIGURE 4. BOTTOM HINGE PIN FOR CONTROL ACCESSORY PANEL

7. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

8. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
9. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
10. Remove the top hinge pin from control accessory panel and install on new panel if required.
11. Lift up new control accessory panel into cabinet, carefully engaging top hinge pin.
12. Center the hole on the bottom control panel flange over hinge pin.
13. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
14. Install the terminal boards (from new control accessory panel) on the wall of the cabinet, using #6-32 screws. TB2 mounts just above TB1 remote terminal block, TB9 just above TB2, and TB6 in the upper right side.
15. Connect loose wire leads to terminal blocks as marked.
16. If an area protection circuit or remote test switch is used, remove the jumper between terminals TB1-4 and -5, and connect the wire leads from the equipment.
17. If the AC voltage of the new control accessory panel is different, see *Changing Control Accessory Panel AC Voltage*.
18. If the DC system voltage and number wire start is different on the new control panel, see *Changing Control Accessory Panel DC System Voltage* and/or *Three to Two Wire Start Conversion (12 Volts)*, or *Two to Three Wire Start Conversion (12 Volts)*.
19. For external alarms or signal circuits of the battery voltage sensors, connect lead wires to TB2. These contacts are rated 2 amperes for 12 volts DC or 120 volts AC.
20. Close the control accessory panel and reconnect the twist-lock disconnect plug.

21. Restore AC line voltage to the automatic transfer switch.
22. Reconnect the starting batteries.
23. Move operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
24. Close the cabinet door.

Panel Groups 51 Through 55

The new control accessory panel installed must match AC system voltage and start control (2- or 3-wire) of panel removed.

1. Open automatic transfer switch cabinet door.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open control accessory panel.
6. Remove the external wires from TB1 and TB6, then remove the terminal blocks from mounting. See Figure 3.
7. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

8. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
9. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
10. Remove the top hinge pin from control panel and install on new panel if required.
11. Lift up new control panel into cabinet, carefully engaging top hinge pin.
12. Center the hole on the bottom control panel flange over the hinge pin.
13. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
14. Install terminal boards TB1 and TB6 (from new control accessory panel). Connect loose wires in cabinet to terminal blocks as marked.
15. If an area protection circuit or a remote test switch is used, remove the jumper between terminals TB1-4 and -5, and connect the wire leads from the equipment.
16. Close the control accessory panel and reconnect the twist-lock disconnect plug.
17. Set the time delays following instructions in the *ADJUSTMENTS* section.
18. Restore AC line voltage to the automatic transfer switch.
19. Reconnect the starting batteries.
20. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
21. Close cabinet door of automatic transfer switch.

CHANGING CONTROL ACCESSORY PANEL AC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 10-15 and 20-25.

If the control accessory panel has been changed and its nominal voltage differs from the automatic transfer switch, use the following procedure:

1. Open automatic transfer switch cabinet door.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and control accessory panel.
6. Rewire the stepdown transformers T2, T3, T4, and T5 using the wiring diagram furnished with the control accessory panel. Change the wire lead connections on the right side (facing panel rear) of the terminal strip for the transformers. See Figure 5.
7. Rewire battery charger transformer T1 so the wire from F1-2 and T1-H5 (COM) go to the appropriate connections on the transformer for the nominal AC voltage (Figure 6). See the wiring diagram for the correct connections.
8. Close the control accessory panel.
9. Reconnect the twist-lock disconnect plug.
10. Restore AC line voltage to the automatic transfer switch.
11. Reconnect the starting batteries.

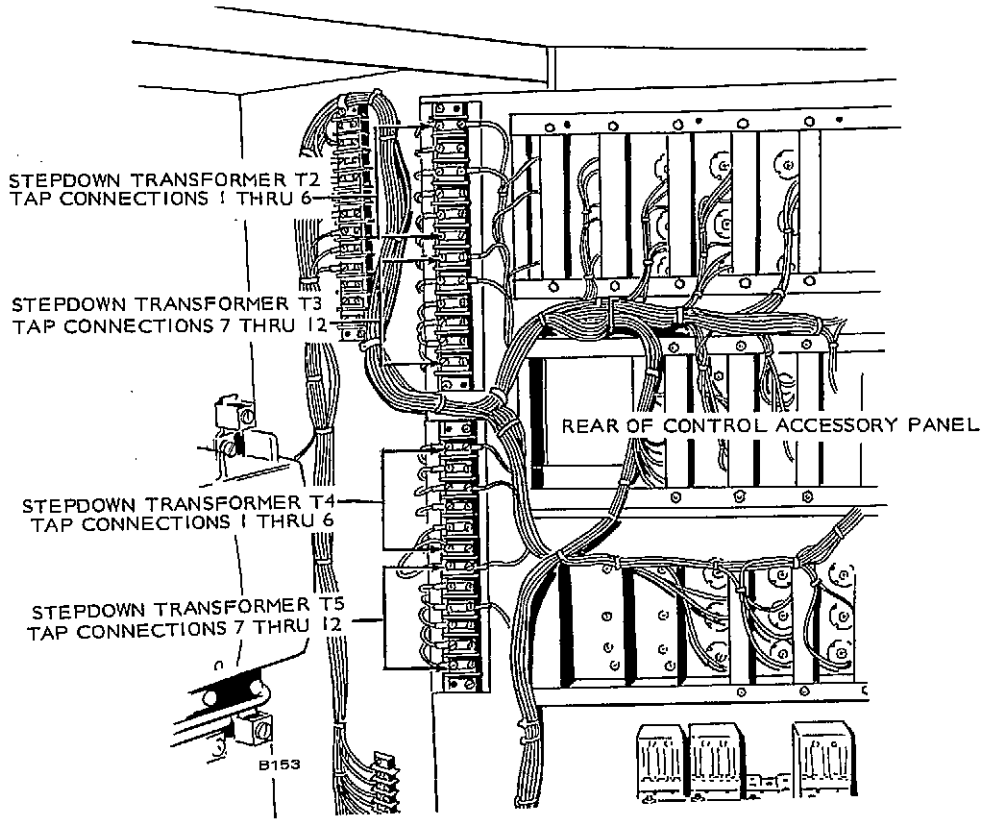


FIGURE 5. AC VOLTAGE CONNECTIONS FOR STEPDOWN TRANSFORMERS

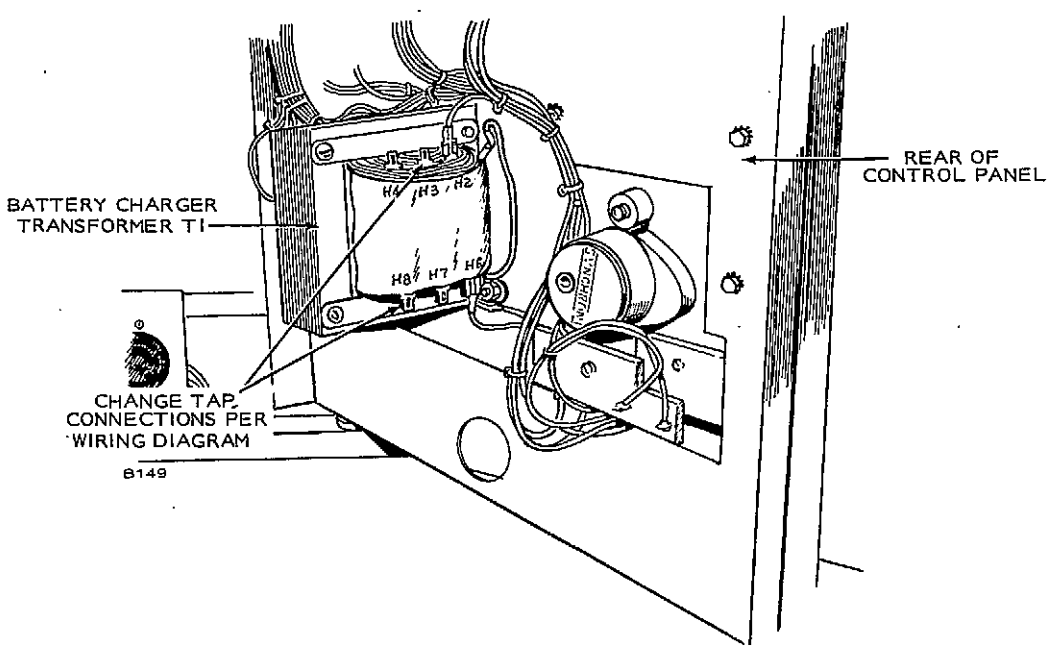


FIGURE 6. BATTERY CHARGER TRANSFORMER AC CONNECTIONS

12. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
13. Close the cabinet door.

CHANGING CONTROL ACCESSORY PANEL DC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 10-15 and 20-25.

From 24 to 12 Volts

Some control accessory panels do not have all the items mentioned in the following procedures. For example, a group 10 panel does not have a battery charger module, battery charger transformer T1, charger resistor R1, high and low battery voltage indicator lamps DS14 and DS13, etc. If a panel does not have the mentioned item, proceed to the next step.

1. Open the automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove the wire lead from transformer T1 terminal T1-X3 and connect to terminal T1-X2 (Figure 7).
7. Remove the wire lead from resistor R1 terminal R1-3 and connect to terminal R1-2. See Figure 8.
8. Remove the 24-volt battery charger module 6 (number 300-0794) and replace with the 12-volt module, number 300-0793.
9. Remove the 24- to 12-volt converter module 5 (number 300-0848) and replace with the 12-volt module, number 300-0847.
10. *Spec A and B only:* Remove the 24-volt, start-stop time delay module 7 (number 300-0922) and replace with the 12-volt time delay module 300-0921.
11. If module 10 is a 24-volt battery voltage sensor, number 300-0797, remove and replace it with a 12-volt, number 300-0796 sensor module.
12. *400 ampere AT only:* Remove the one screw from inside center support for left cabinet door and open door.
13. Remove the one screw on top and one screw on bottom from inside meter-lamp panel flange.
14. Swing the meter-lamp panel outward.
15. Remove "LO BAT VOLT" lamps DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0114 and 322-0115 lamps respectively.
16. Close the meter-lamp panel and secure the top and bottom with the two screws.
17. *400 ampere AT only:* Close the left cabinet door. Secure the door to the cabinet center support with the screw removed in Step 12.

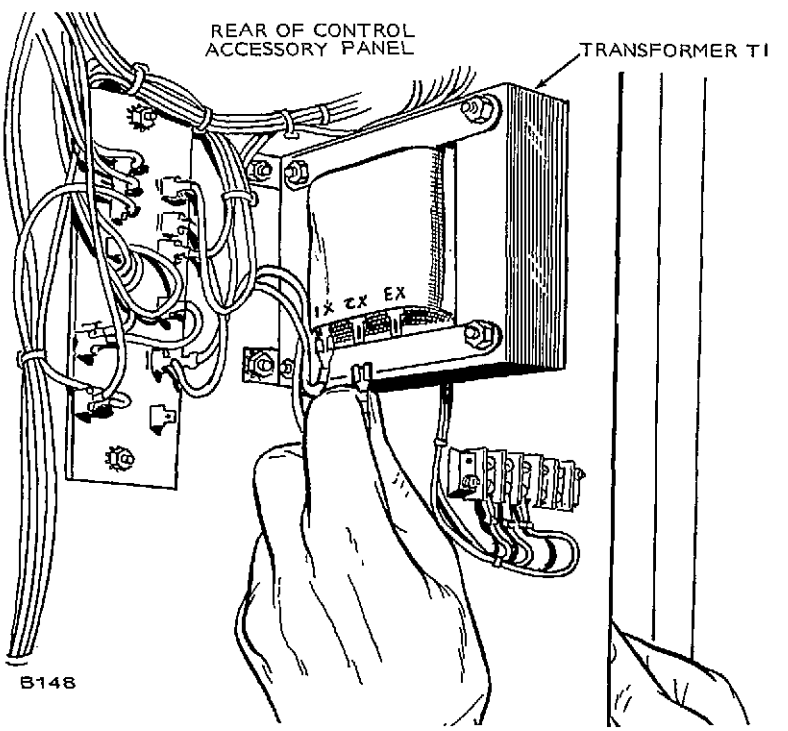


FIGURE 7. BATTERY CHARGER TRANSFORMER DC CONNECTIONS

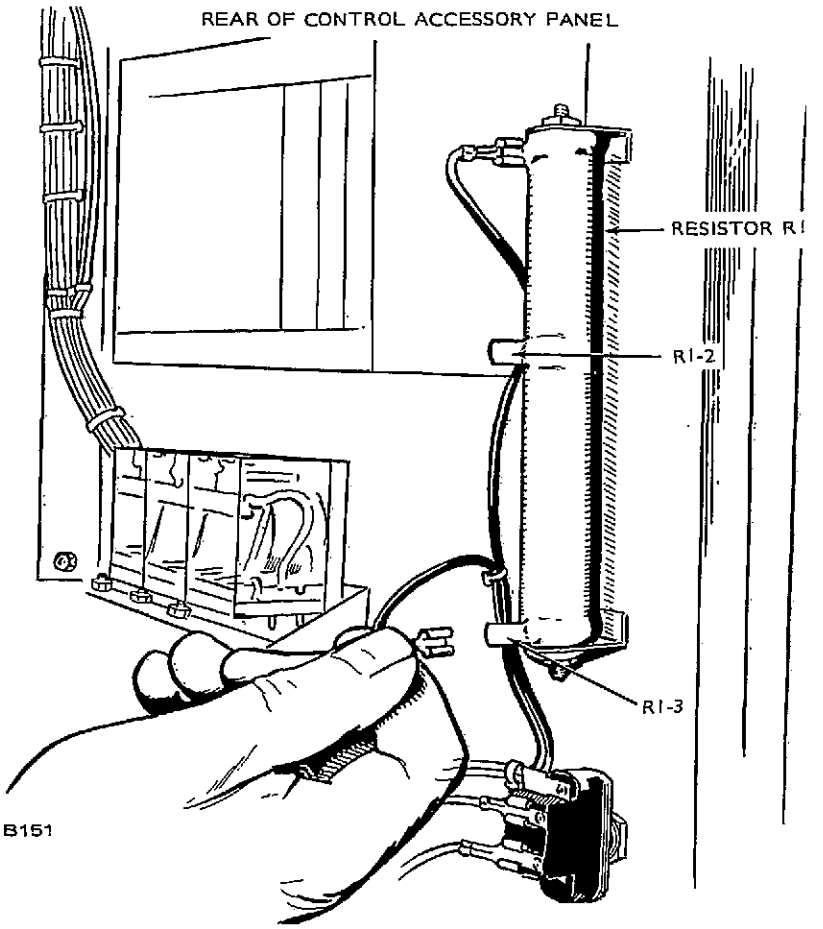


FIGURE 8. CHANGING RESISTOR R1 TAP SETTING

18. Close the control accessory panel and reconnect the twist-lock disconnect plug.

If starting is changed from two- to three-wire starting, proceed to that modification described in this section.

19. Connect a 12-volt battery and restore AC line voltage to the automatic transfer switch.
20. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
21. Close the cabinet door.

From 12 to 24 Volts

Some control accessory panels do not have all the items mentioned in the following procedures. For example, a group 10 panel does not have a battery charger module, battery charger transformer T1, charger resistor R1, high and low battery voltage indicator lamps DS14 and DS13, etc. If a panel does not have the mentioned item, proceed to the next step.

1. Open the automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove the wire lead from transformer T1 terminal T1-X2 and connect to terminal T1-X3 (Figure 7).
7. Remove the wire lead from resistor R1 terminal R1-2 and connect to terminal R1-3. See Figure 8.
8. Remove the 12-volt battery charger module 6 (number 300-0793) and replace with the 24-volt module, number 300-0794.
9. Remove the 12-volt module 5 (number 300-0847) and replace with the 24- to 12-volt converter module, number 300-0848.
10. *Spec A and B only:* Remove the 12-volt, start-stop time delay module 7 (number 300-0921) and replace with the 24-volt time delay module 300-0922.
11. If module 9 is a 2 to 3 wire converter, number 300-

0926, remove and replace with a blank (spare) 300-0937 module.

12. If module 10 is a 12-volt battery voltage sensor, number 300-0796, remove and replace it with a 24-volt, number 300-0797 sensor module.
13. *400 ampere AT only:* Remove the one screw from inside center support for left cabinet door and open door.
14. Remove one screw on top and one screw on bottom from inside meter-lamp panel flange.
15. Swing the meter-lamp panel outward.
16. Remove "LO BAT VOLT" lamp DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0126 and 322-0127 lamps respectively.
17. Close the meter-lamp panel and secure the top and bottom with the two screws.
18. *400 ampere AT only:* Close the left cabinet door. Secure the door to the cabinet center support with the one screw removed in Step 13.
19. Close the control accessory panel and reconnect the twist-lock disconnect plug.

If starting is changed from three to two-wire starting, proceed to that modification in this section.

20. Connect a 24-volt battery and restore AC line voltage to the automatic transfer switch.
21. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
22. Close the cabinet door.

TWO TO THREE WIRE START CONVERSION (12 VOLTS)

This procedure applies only to control accessory panels in groups 10-15 and 20-25.

To convert a two-wire start control automatic transfer switch to three-wire start, use the following procedure:

1. Move the operation selector switch on the engine control to "STOP."
2. Disconnect the starting batteries.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

4. Open the automatic transfer switch cabinet door.
5. Remove the remote start wire leads between the engine control remote terminal block and the automatic transfer switch terminal block TB1.
6. Remove the 300-0937 blank (spare) module 9 and replace with a 300-0926 2 to 3 wire converter module.
7. Check battery voltage (battery must be a 12-volt unit). If DC system was 24 volts, make the conversion *Changing Control Accessory Panel DC System Voltage* described in this section.
8. Connect automatic transfer switch to terminals TB1-B+, -1, and -3 to the three-wire start engine control.
9. Restore AC line voltage to the automatic transfer switch.
10. Connect the starting batteries.
11. Move the operation selector switch on the 2 to 3 wire converter module 9 to "NORMAL."
12. Close the cabinet door.

THREE TO TWO WIRE START CONVERSION (12 VOLTS)

This procedure applies only to control accessory panels in groups 10-15 and 20-25.

For a conversion from three-wire, 12-volt system to a two-wire, 24-volt system, perform the *Changing Control Accessory Panel DC System Voltage* first, then proceed to the following:

1. Open the automatic transfer switch cabinet door.
2. Move the operation selector switch on 2 to 3 wire converter module 9 to "STOP."
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the wire leads between the engine control remote terminal block and the automatic transfer switch remote terminal block TB1.
6. Remove 300-0926 2 to 3 wire converter module 9 and replace it with a 300-0937 blank (spare) module.
7. Connect automatic transfer switch terminals TB1-B+, -RMT and -GND to the 2-wire start engine control.
8. Restore AC line voltage to the automatic transfer switch.
9. Connect the starting batteries.
10. Move the operation selector switch on the engine control to "RMT."
11. Close the cabinet door.

ADDING MODULE IN CONTROL ACCESSORY PANEL

The following procedure applies only to control accessory groups 10-15 and 20-25.

Whenever adding a plug-in module in the control accessory panel where there previously was a blank (spare), be sure to use the following procedure:

1. Open the cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting) and disconnect starting battery.
3. Remove AC line voltage from the automatic transfer switch.

   WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and open control accessory panel.
5. Install keying plug(s), #332-2114 for begin.Spec C or #332-1276 for Spec A or B AT, in the slot(s) of the printed circuit board receptacle as needed. Figure 9 shows how a keying plug is inserted into the receptacle. See a control accessory panel wiring diagram showing location of the keying plug(s) for that particular module.
6. Insert the new module in the control accessory panel.
7. Restore AC line voltage to the automatic transfer switch.
8. Close the control accessory panel and reconnect the disconnect plug.
9. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
10. Close cabinet door.

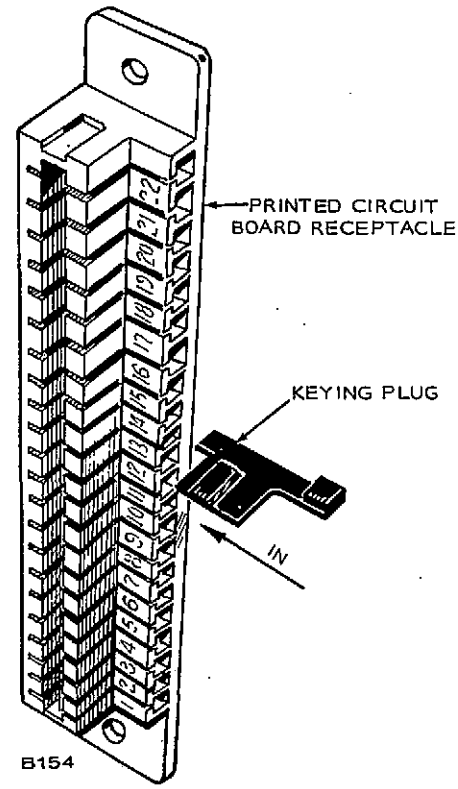


FIGURE 9. INSTALLATION OF KEYING PLUG

ADJUSTMENTS

See the *TRANSFER SWITCH* section for maintenance, repair or adjustments of transfer switch mechanism.

LATCH AND LATCH PIN ADJUSTMENT

If the control accessory panel will not close because the latch is above or below the latch pin (on meter panel for 30 through 225 ampere AT's, on cabinet center support for 400 ampere AT's), perform the following:

1. Open cabinet door of automatic transfer switch.
2. Move operation selector switch to "STOP" (in AT cabinet for three-wire starting, on engine control for two-wire starting) and disconnect starting battery.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug.
5. Completely open the control accessory panel.
6. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open. Proceed to Step 8.
7. Remove the one screw on top and one screw on bottom from inside meter panel flange. Open meter panel.
8. Loosen the latch pin on the edge of the meter panel or cabinet center support, whichever applies, and move the latch pin up or down in the slot as necessary (Figure 10). Then tighten.
9. *400 ampere AT only:* Close the left cabinet door and reinstall the one screw. Proceed to Step 11.
10. Close the meter panel and reinstall the two screws removed in Step 7.
11. Close the control accessory panel. If more adjustment is necessary, repeat Steps 5 through 11.
12. Reconnect the twist-lock disconnect plug.

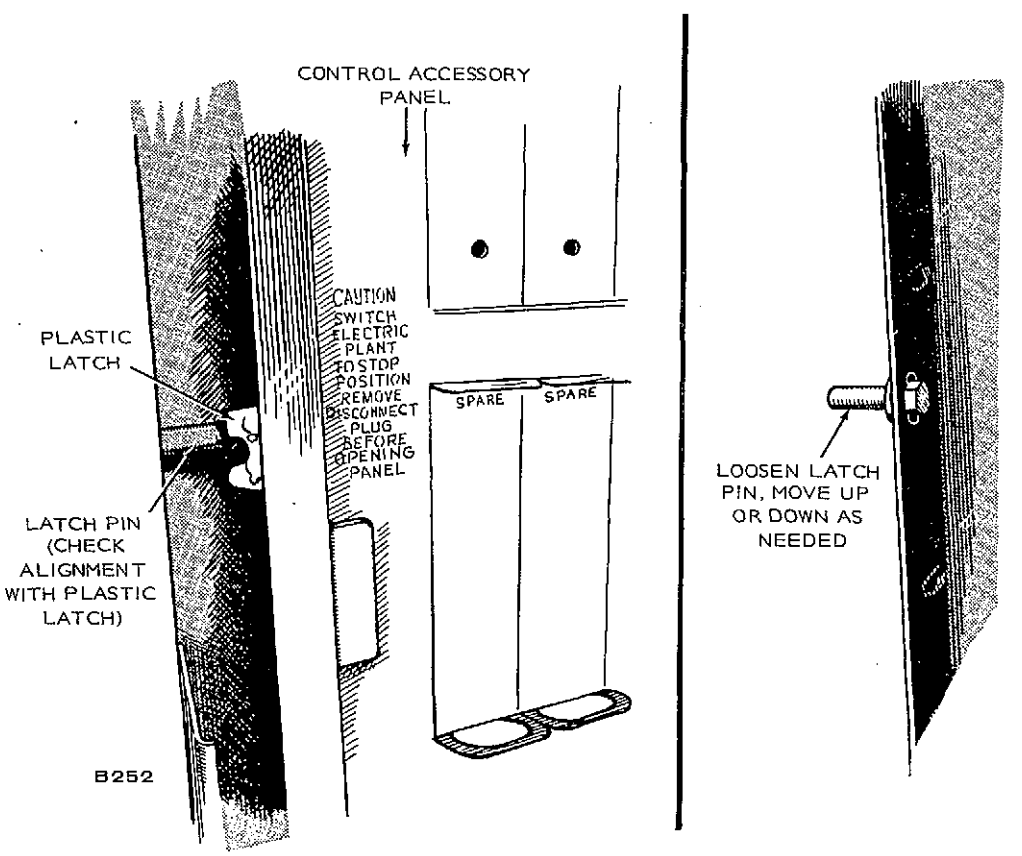
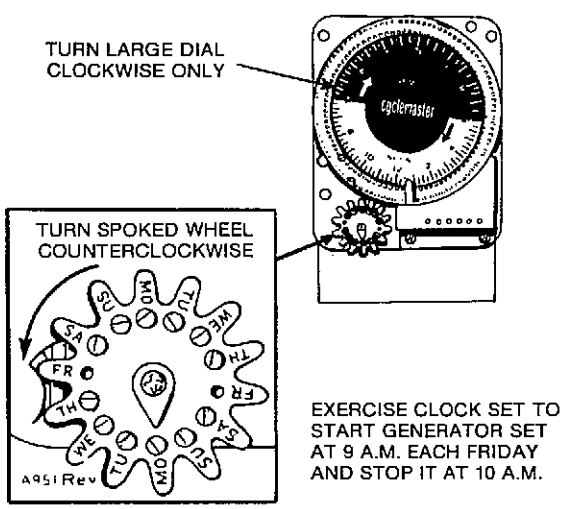


FIGURE 10. ADJUSTMENT OF LATCH PIN

13. Restore AC line voltage to the automatic transfer switch.
14. Move operation selector switch to "NORMAL" (in cabinet for three-wire starting) or "RMT" (on engine control for two-wire starting), whichever applies.
15. Reconnect starting battery.
16. Close cabinet door.

EXERCISER CLOCK

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch (on engine control for two-wire starting, in AT cabinet for three-wire starting) to "STOP."
3. Install a trip pin (left-hand thread) in the inside row of holes on the large dial for the time of day you want the generator set to start. See Figure 11.



NOTE: Trip pins are left-hand thread.

FIGURE 11. EXERCISER CLOCK

4. Place a trip pin in the outside row of holes on the large dial to stop the generator set.

Onan recommends settings which operate the generator set for at least 30 minutes each week. Exercising for one long period is better than several short periods.

5. Install a trip pin in the small spoked wheel for every day *no exercise* is desired.
6. Rotate the large dial clockwise until the correct time is correctly aligned with the time pointer.
7. Align the small spoked wheel with the correct day at its pointer.

Sixteen trip pins are supplied with the clock. Store unused pins on the time pointer bracket.

8. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
9. Close the cabinet door.

AC VOLTAGE SENSORS

Voltage sensors can be used for either undervoltage or overvoltage sensing on line or generator power supplies. Range of the settings is from 90 to 140 volts for a nominal 120-volt system. For higher voltage systems, the PICK-UP VOLTAGE knob readings are multiplied by the following multiplying factors.

VOLTAGE	MULTIPLYING FACTOR
120	1.0
208	1.73
240	2.0
480	4.0
600	5.0

If you wish to check the calibration of the sensors before making the settings, see *Undervoltage Sensor Calibration* or *Overvoltage Sensor Calibration*, whichever applies. Otherwise, see *Undervoltage Sensor Settings* or *Overvoltage Sensor Settings*. Refer to Figure 12.

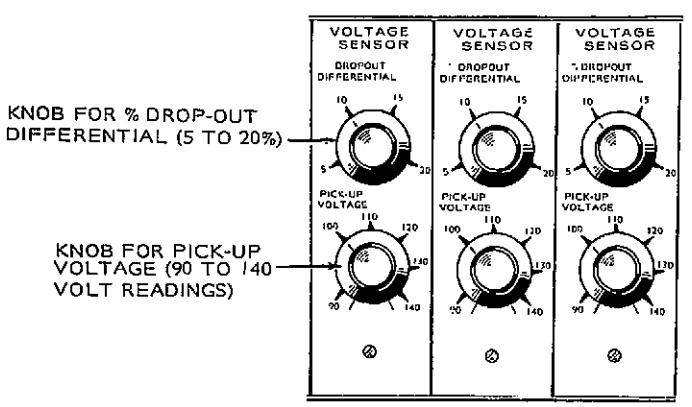


FIGURE 12. VOLTAGE SENSORS

Undervoltage Sensor Calibration

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to STOP (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Turn all the undervoltage sensor knobs to minimum voltage setting.
4. Turn the PICK-UP VOLTAGE knob of the sensor to be calibrated to its clockwise limit.
5. Turn the PICK-UP VOLTAGE knob very slowly counterclockwise until you hear relay K3 pick up. This reading times the multiplying factor (for your system voltage) should equal the line voltage.

Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 7. If not, proceed to Step 6.

6. *Setting Too Low:* (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver through the CALIBRATE hole and turn counterclockwise very slowly until you hear relay K3 pick up.

   Setting Too High: (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit. (b) Insert a small screwdriver through the CALIBRATE hole and turn to its clockwise limit. (c) Turn the PICK-UP VOLTAGE knob to desired setting. (d) Turn the CALIBRATE adjustment counterclockwise very slowly until you hear relay K3 pick up.

7. Repeat Steps 3 through 6 for each undervoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See *Undervoltage Sensor Settings* (near end of section).

8. For a more accurate calibration and calibration of the % DROP-OUT DIFFERENTIAL knob, use the Onan Multi-Tester or a variac and use the following procedure.

9. Remove the twist-lock disconnect plug and open the control accessory panel.

10. On the back side and top left of the control accessory panel, remove the white plastic cover which covers the transformer terminals for T2 and T3 (Figure 13).

In order to check voltage sensor calibrations, you must vary the input voltage to the respective transformer. The following procedure isolates transformer T2 from the normal line connection of the control and connects it to an independent power source.

11. Remove the transformer leads from T2-1 (COM) and T2-2 (120-V) from left side of the terminal strip and connect them to the output leads of a 120-volt variac (240-volt variac would require removal of transformer leads from T2-1 and T2-4 and connecting variac to these leads, etc.). See Figure 14. (Use instructions with Onan Multi-Tester if used.)

12. Note right side of terminal strip to see which terminal of T2-2 through T2-6 has an AC input lead (for example, a wire connected to T2-3 indicates 208 volts AC input). On the left side of the terminal strip, remove the corresponding

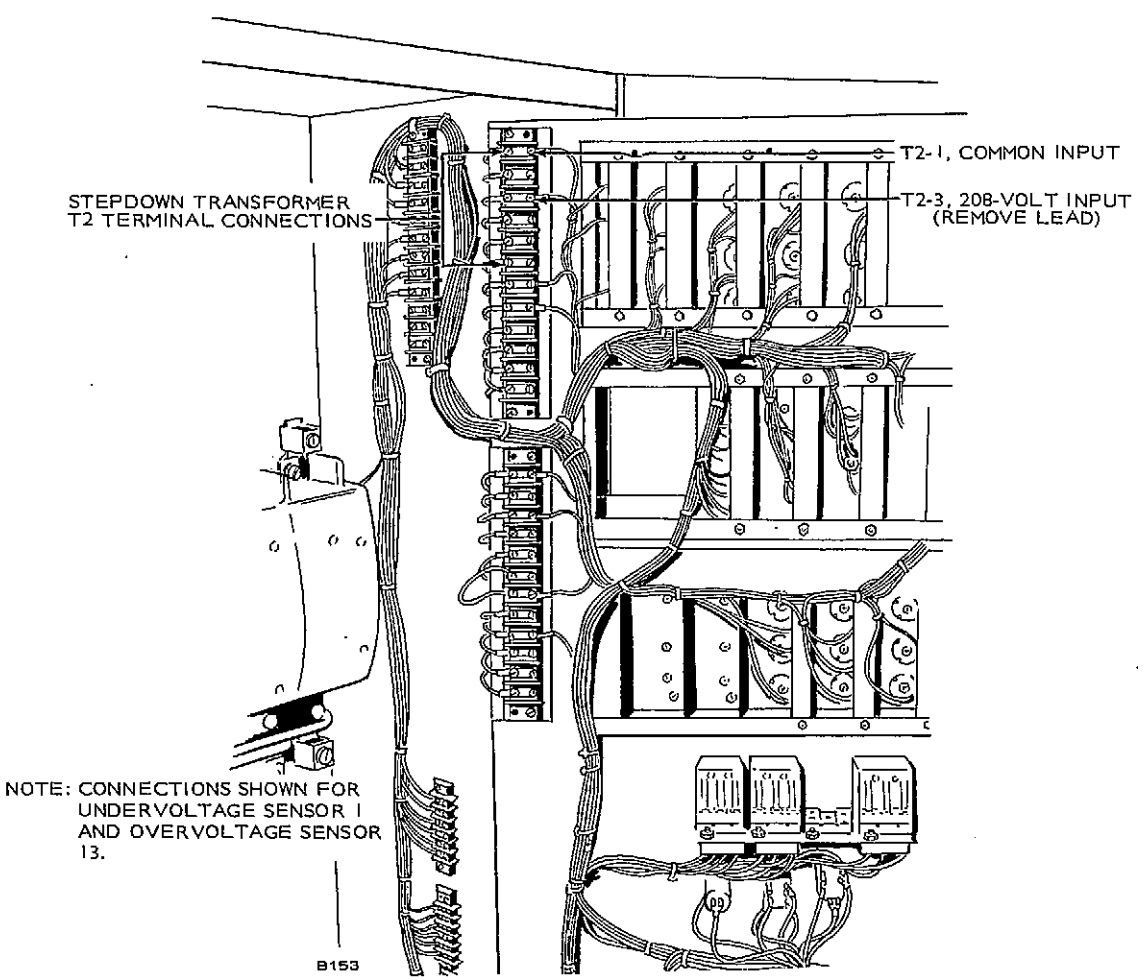


FIGURE 13. VOLTAGE SENSOR TRANSFORMER CONNECTIONS

transformer lead and tape it. Figure 14 shows an example of this.

If this transformer lead is already removed and connected to variac or Onan Multi-Tester because its nominal voltage matches transformer input voltage, ignore this step.

13. Connect a voltmeter to the output leads of the variac.
14. Connect the variac to a 120-volt AC source.
15. Reconnect the disconnect plug.

WARNING **Rear of control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**

16. Turn all the undervoltage sensor knobs to minimum.
17. Adjust the Multi-Tester or variac to give a 120-volt output for the undervoltage sensor module.
18. Turn the PICK-UP VOLTAGE knob on the sensor to be calibrated to its clockwise limit.
19. Turn the knob very slowly counterclockwise until you hear relay K3 pick up. The knob should indicate 120 volts. If not, proceed to Step 20. If it does read 120 volts, proceed to Step 21.
20. *Setting Too Low:* (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver through the CALIBRATE hole and turn counterclockwise very slowly until you hear relay K3 pick up.

    Setting Too High: (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit. (b) Insert a small screwdriver through the CALIBRATE hole and turn to its clockwise limit. (c) Turn the CALIBRATE adjustment counterclockwise very slowly until you hear relay K3 pick up.
21. With sensor module PICK-UP VOLTAGE knob at 120 volts and % DROP-OUT DIFFERENTIAL knob at maximum, lower the AC output voltage from the Multi-Tester or variac until the voltmeter reads 108 volts.
22. Turn % DROP-OUT DIFFERENTIAL knob counterclockwise until you hear relay K3 drop out. The knob should read approximately 10 (90 percent of 120 volts = 108 volts). If not, use a small screwdriver to loosen the knob and reposition so it indicates 10 percent.
23. Set the PICK-UP VOLTAGE and % DROP-OUT DIFFERENTIAL knobs at desired settings.
24. Decrease the voltage with the Multi-Tester or variac until you hear relay K3 drop out.
25. Increase the voltage with the Multi-Tester or variac until you hear relay K3 pick up.
26. Readjust the PICK-UP VOLTAGE and % DROP-OUT DIFFERENTIAL knobs to give the desired pickup and dropout voltages.
27. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other undervoltage sensors, pull out the already calibrated module and replace it with one of the other undervoltage sensors. Then perform the calibration procedures in this position.
28. After calibration is complete, remove the disconnect plug.
29. Disconnect the Multi-Tester or variac and voltmeter.
30. Reconnect the wire leads and install the plastic cover over the terminals.
31. Close the control accessory panel and reconnect

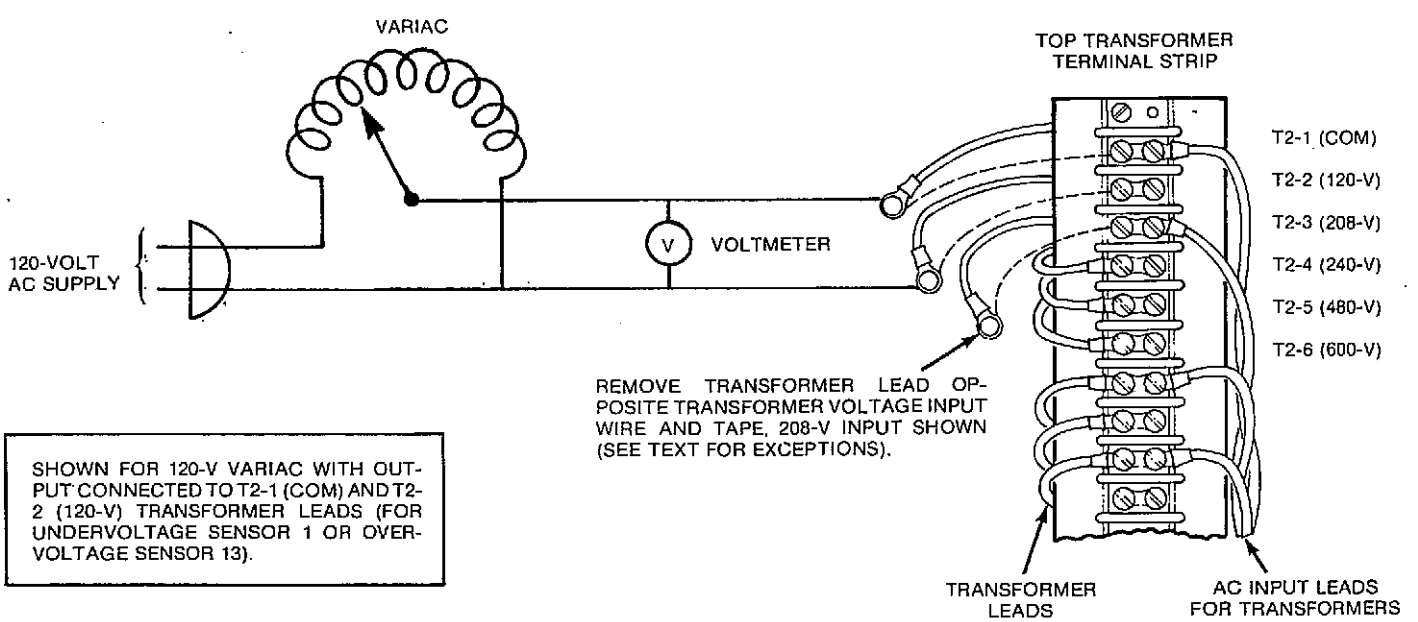


FIGURE 14. CONNECTION OF VARIAC TO STEPDOWN TRANSFORMER

the disconnect plug.

32. Make the sensor settings. See *Undervoltage Sensor Settings* (near end of section).

Overvoltage Sensor Calibration

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to STOP (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Turn the % DROP-OUT DIFFERENTIAL knobs to minimum and the PICK-UP VOLTAGE knobs to the clockwise limit (maximum).
4. On the sensor to be calibrated, turn PICK-UP VOLTAGE knob very slowly counterclockwise until you hear relay K6 close. This reading times the multiplying factor should equal the line voltage. Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 6. Otherwise, proceed to Step 5.
5. *Setting Too Low:* (a) Turn the % DROP-OUT DIFFERENTIAL knob counterclockwise to minimum. (b) Turn the PICK-UP VOLTAGE knob to the desired setting. (c) Insert a small screwdriver through the CALIBRATE hole and turn counterclockwise very slowly until you hear relay K6 pick up.

   Setting Too High: (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit. (b) Insert a small screwdriver through the CALIBRATE hole and turn to its clockwise limit. (c) Turn the PICK-UP VOLTAGE knob to the desired setting. (d) Turn the CALIBRATE adjustment counterclockwise very slowly until you hear relay K6 pick up.
6. Repeat Steps 3 through 5 for each overvoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See *Overvoltage Sensor Settings* (near end of section).
7. For a more accurate calibration and calibration of the % DROP-OUT DIFFERENTIAL knob, use the Onan Multi-Tester or a variac and use the following procedure.
8. Remove the twist-lock disconnect plug and open the control accessory panel.
9. On the back side and top left of the control accessory panel, remove the white plastic cover which covers the transformer terminals for T2 and T3 (Figure 13).

   In order to check voltage sensor calibrations, you must vary the input voltage to the respective transformer. The following procedure isolates transformer T2 from the normal line connection of the control and connects it to an independent power source.

10. Remove the transformer leads from T2-1 (COM) and T2-2 (120-V) from left side of the terminal strip and connect them to the output leads of a 120-volt variac (240-volt variac would require removal of transformer leads from T2-1 and T2-4 and connecting variac to these leads, etc.). See Figure 14. (Use instructions with Onan Multi-Tester if used.)
11. Note right side of terminal strip to see which terminal of T2-2 through T2-6 has an AC input lead (for example, a wire connected to T2-3 indicates 208 volts AC input). On the left side of the terminal strip, remove the corresponding transformer lead and tape it. Figure 14 shows an example of this.

    If this transformer lead is already removed and connected to variac or Onan Multi-Tester because its nominal voltage matches transformer input voltage, ignore this step.
12. Connect a voltmeter to the output leads of the variac.
13. Connect the variac to a 120-volt AC source.
14. Reconnect the disconnect plug.

    WARNING **Rear of control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**
15. Turn the % DROP-OUT DIFFERENTIAL knob(s) to minimum and the PICK-UP VOLTAGE knob(s) to the clockwise limit (maximum).
16. Adjust the Multi-Tester or variac to give a 120-volt output for the overvoltage sensor module.
17. Turn the PICK-UP VOLTAGE knob on the sensor to be calibrated counterclockwise very slowly until you hear relay K6 close. The knob should indicate 120 volts. If not, proceed to Step 18. If it does, proceed to Step 19.
18. *Setting Too Low:* (a) Turn the % DROP-OUT DIFFERENTIAL knob counterclockwise to minimum. (b) Turn the PICK-UP VOLTAGE knob to the desired setting. (c) Insert a small screwdriver through the CALIBRATE hole and turn counterclockwise very slowly until you hear relay K6 pick up.

    Setting Too High: (a) Turn the PICK-UP VOLTAGE knob to its clockwise limit. (b) Insert a small screwdriver through the CALIBRATE hole and turn to its clockwise limit. (c) Turn the PICK-UP VOLTAGE knob to the desired setting. (d) Turn the CALIBRATE adjustment counterclockwise very slowly until you hear relay K6 pick up.
19. Turn the sensor module PICK-UP VOLTAGE knob to 132 volts, relay K6 should drop out. Increase the AC output voltage from the Multi-Tester or variac until relay K6 picks up at approximately 132 volts.
20. Decrease the Multi-Tester or variac output voltage to check % DROP-OUT DIFFERENTIAL. With the knob set at 5 percent, relay K6 should drop out at approximately 95 percent of 132 volts = 125 to 126 volts. If not, use a small screwdriver to loosen the knob and reposition so it indicates 5 percent with drop-out voltage of 125 to 126 volts.

21. Set the PICK-UP VOLTAGE and % DROP-OUT DIFFERENTIAL knobs at desired settings.
22. Increase the voltage with the Multi-Tester or variac until you hear relay K6 pick up.
23. Decrease the voltage with the Multi-Tester or variac until you hear relay K6 drop out.
24. Readjust the PICK-UP VOLTAGE and % DROP-OUT DIFFERENTIAL knobs to give the desired pick-up and drop-out voltages.
25. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other overvoltage sensors (if more than one), pull out the already calibrated module and replace it with one of the other overvoltage sensors. Then perform the calibration procedures in this position.
26. After calibration is complete, remove the disconnect plug.
27. Disconnect the Multi-Tester or variac and voltmeter.
28. Reconnect the wire leads removed and install the plastic cover over the terminals.
29. Close the control accessory panel and reconnect the disconnect plug.
30. Make the sensor settings. See *Overvoltage Sensor Settings.*

Undervoltage Sensor Settings

Use the following steps for setting undervoltage sensors. Your settings, however, might vary considerably from the example shown due to your particular application requirements. Use settings which give load protection and yet will avoid "nuisance" load transfers.

1. Open the cabinet door.
2. Move the operation selector switch to STOP, on engine control for two-wire starting with AT-C or AT-D control, or in cabinet for three-wire starting with AT-E control.
3. Turn the PICK-UP VOLTAGE knob to the desired pick-up voltage, voltage at which load is transferred from the generator set to the normal power source. A setting of 108 volts, for example, gives a pick-up voltage which is 90 percent of the nominal voltage for a 120-volt system.
4. Turn the % DROP-OUT DIFFERENTIAL knob to the desired percent deviation below the pick-up voltage. This setting determines the voltage at which load is transferred from the normal power source to the generator set. A setting of 15 percent, for example, would give a 16-volt differential from 108 volts (pick-up voltage from Step 3). Drop-out voltage is then pick-up voltage minus the differential voltage, 108 - 16 = 92 volts.
5. After settings are finished, move the operation selector switch on the engine control to REMOTE for two-wire starting with AT-C or AT-D control, or move the operation selector switch in the AT-E cabinet to NORMAL for three-wire starting, whichever applies.
6. Close the cabinet door.

Overvoltage Sensor Settings

Use the following steps for setting overvoltage sensors. Your settings, however, might vary considerably from the example shown due to your particular application requirements. Use settings which give load protection and yet will avoid "nuisance" load transfers.

1. Open the cabinet door.
2. Move the operation selector switch to STOP, on engine control for two-wire starting with AT-C or AT-D control, or in cabinet for three-wire starting with AT-E control.
3. Turn the PICK-UP VOLTAGE knob to the desired pick-up voltage, voltage at which load is transferred from the normal power source to the generator set. A setting of 135 volts, for example, gives a pick-up voltage which is 113 percent of the nominal voltage for a 120-volt system.
4. Turn the % DROP-OUT DIFFERENTIAL knob to the desired percent deviation below the pick-up voltage. This setting determines the voltage at which load is transferred from the generator set to the normal power source. A setting of 5 percent, for example, would give a 7-volt differential from 135 volts (pick-up voltage from Step 3). Drop-out voltage is then 135 - 7 = 128 volts.
5. After settings are finished, move the operation selector switch on the engine control to REMOTE for two-wire starting with AT-C or AT-D control, or move the operation selector switch in the AT-E cabinet to NORMAL for three-wire starting, whichever applies.
6. Close the cabinet door.

BATTERY FLOAT CHARGE

For the following adjustments, a fully-charged battery, a hydrometer and an accurate voltmeter (1/2 percent accuracy) are needed. Onan recommends float voltages of: 13.3 volts for nominal 12-volt or 26.6 volts for nominal 24-volt lead-acid batteries; 14.0 to 14.5 volts for 10-cell nickel-cadmium batteries, or 28.0 to 29.0 volts for 20-cell nickel-cadmium batteries.

Lead-acid battery only: During the first few weeks of operation, the batteries should be checked periodically with a hydrometer. A high specific gravity, bubbling of electrolyte and loss of water indicate excessive float voltage. A drop in specific gravity indicates insufficient float voltage.

1. Connect the fully-charged battery (verify charge condition with the hydrometer).
2. Connect the voltmeter directly to the battery terminals.
3. Measure the battery voltage. If voltage is above the recommended float voltage, proceed to Step 4. If the voltage is below the recommended float voltage, proceed to Step 7.
4. Open right cabinet door of automatic transfer switch.
5. Insert a small screwdriver through the hole in the front panel of battery charger module 6. Turn counterclockwise in small increments to decrease the float voltage.
6. After five minutes, measure the battery terminal voltage again. If voltage is still high, repeat Steps 5 and 6 until voltage stabilizes at the recommended float voltage. Proceed to Step 11.
7. Open right cabinet door of automatic transfer switch.
8. Note charge current rate on charge ammeter on meter-lamp panel.
9. Insert a small screwdriver through hole in front panel of battery charger module 6. Turn clockwise in small increments to increase float voltage. Note increase in the charging current on the charge ammeter on the meter-lamp panel.
10. In approximately one hour or when charge current has decreased to initial value noted in Step 8, recheck battery terminal voltage. Repeat Steps 8 through 10 until the battery terminal voltage stabilizes at the recommended float voltage.
11. Check the battery terminal voltage periodically during the first few weeks of operation. Readjust the float charge rate if necessary.
12. Close the cabinet door.

BATTERY VOLTAGE SENSOR ALARM SETTINGS

The following adjustments apply only to control accessory panel groups 11 through 15 and 21 through 25.

The high and low battery voltage alarm circuits monitor the condition of the battery charging system. A battery charging malfunction lights one of the lamps to indicate either a failure to charge ("LO BAT VOLTS") or battery overcharge ("HI BAT VOLT").

Ensuring proper function of both alarm lamps requires careful setting of the potentiometers for both the low and high battery voltage sensing circuits. Setting the alarm points requires a screwdriver, DC voltmeter (1/2 percent accuracy preferred), and a battery charger (separate charger required for high battery voltage alarm settings).

You can build a test fixture as shown in the *TROUBLESHOOTING* section for making adjustments on the battery voltage sensor module rather than using the following procedures.

High Battery Voltage Alarm Setting

1. Open cabinet door of automatic transfer switch.
2. Connect a DC voltmeter to the battery terminals.
3. Pull out the battery charger module 6.
4. Connect a separate battery charger to the battery.

Using a separate battery charger eliminates changing charger settings of battery charger module 6 for this procedure. The separate battery charger must have sufficient capacity for the particular battery.

5. For the alarm setting, the battery should be charged until the voltage reaches approximately:
   14.5 volts for a 12-volt lead-acid battery,
   29.0 volts for a 24-volt lead-acid battery,
   15.5 volts for a 10-cell nickel-cadmium battery, or
   31.0 volts for a 20-cell nickel-cadmium battery.

Since these are suggested high battery voltage settings, consult the battery manufacturer for the recommended alarm settings.

6. Insert a small screwdriver into the HIGH opening of battery voltage sensor module 10 for adjusting potentiometer R9. Adjust to the on-off point for the "HI BAT VOLT" lamp. The lamp must stay lit at this voltage.
7. Unplug or turn off the battery charger. The lamp must go out as soon as voltage drops a few tenths.
8. Turn on battery charger. The lamp must light as voltage returns to value given in Step 5.

High battery voltage lamp does not light for normal operation.

9. Disconnect the battery charger and voltmeter.
10. Insert battery charger module 6 into control panel.
11. Close cabinet door.

Low Battery Voltage Alarm Setting

1. Open the cabinet door of the automatic transfer switch.
2. Connect a DC voltmeter to the battery terminals.
3. For the alarm setting, the battery should be charged until the voltage reaches approximately:
   12.9 to 13.3 volts for the 12-volt lead-acid battery,
   25.8 to 26.6 volts for the 24-volt lead-acid battery,
   13.8 to 14.5 volts for the 10-cell nickel-cadmium battery, or

27.6 to 29.0 volts for the 20-cell nickel-cadmium battery.

4. Insert a small screwdriver into the LOW opening of battery voltage sensor module 10 for adjusting potentiometer R17. Adjust to the on-off point for the "LO BAT BOLT" lamp. The lamp must stay off.
5. Pull out the battery charger module 6. The lamp must light when the battery terminal voltage drops to:

   12.6 volts for the 12-volt battery,
   25.2 volts for the 24-volt battery,
   12.6 volts for the 10-cell nickel-cadmium battery, or
   25.2 volts for the 20-cell nickel-cadmium battery.

6. Insert battery charger module 6 back into its normal position. The "LO BAT VOLT" lamp must go out as the terminal voltage returns to values listed in Step 3.
7. Disconnect the voltmeter from the battery terminals.
8. Close the cabinet door.

OVERCRANK TIME (AT-E ONLY)

The following adjustment applies only to control accessory groups 10 through 15 and 20 through 25.

Overcrank settings are made at the factory for approximately 75 ± 10 seconds cranking. To adjust, perform the following.

1. Remove the positive lead from the generator set's start solenoid or starter.
2. Open cabinet door of automatic transfer switch.
3. Move selector switch to WITHOUT LOAD.
4. Move 2 to 3 wire converter module 9 selector switch to NORMAL.
5. Move test transfer switch to TEST. Overcrank lamp on automatic transfer switch should light at end of crank period. Measure the crank time with a stop watch or watch with a second hand.
6. To change the time, insert a small screwdriver through the CRANK TIME hole in the front of the 2 to 3 wire converter module. Turn clockwise to increase the cranking time or counterclockwise to decrease the cranking time. Make adjustments in small increments.
7. Move test transfer switch to NORMAL.
8. Push the PUSH TO RESET button on the 2 to 3 wire converter module.
9. Repeat Steps 5 through 8 until the desired cranking time is obtained.
10. Move selector switch to desired position, WITHOUT LOAD or WITH LOAD.
11. Close cabinet door.
12. Reconnect positive lead to generator set's starter or start solenoid.

PROGRAMMED TRANSITION

Both programmed transition time delays can provide 1 to 300 seconds of no power to loads during transfer or retransfer of transfer switch operation. For adjustment of either time delay, use the following procedure:

1. Open cabinet door of automatic transfer switch.
2. Move the operation selector switch to STOP (in AT cabinet for three-wire starting, on engine control for two-wire starting) and disconnect starting battery.
3. Remove AC line power to the automatic transfer switch.

   WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open.
5. Remove the two screws from the meter lamp panel's inside flange and open meter-lamp panel.
6. Locate the time delay assembly below the transfer switch on rear panel of cabinet. Transfer time delay K11 (for line side) is located on the left, time delay K12 (for generator side) is on the right.
7. Turn the knob (on the time delay to be adjusted) clockwise to increase delay (increments marked on knob), counterclockwise to decrease time delay.
8. Close the meter-lamp panel and secure with two screws.
9. *400 ampere AT only:* Close the left cabinet door and secure with screw to cabinet center support.
10. Restore AC line voltage to automatic transfer switch.
11. Move the operation selector switch to NORMAL (in cabinet for three-wire starting) or REMOTE (on engine control for two-wire starting), whichever applies.
12. Reconnect the starting battery.
13. Close the cabinet door.

TIME DELAYS—CONTROL GROUPS 10-15 AND 20-25

Start-Stop Time Delay

Onan has set the time delay on start at 2.5 seconds, time delay on stop at 5 minutes. For other times, use the following procedure. You can set the delay for the start function from 0.1 to 15 seconds, the stop function from 0.1 to 10 minutes.

1. Open the right cabinet door of automatic transfer switch.
2. Move selector switch to WITH LOAD.
3. Move test transfer switch to TEST.

4. With a stop watch or watch with a second hand, measure the time until the generator set starts cranking.
5. Insert a small screwdriver through START opening in front panel of start-stop time delay module 7. Turn START potentiometer clockwise to increase start time delay or counterclockwise to decrease start time delay. Make adjustments in small increments.
6. Move test transfer switch to NORMAL.
7. Measure time until generator set begins to shut down.
8. Turn STOP potentiometer with the small screwdriver clockwise to increase the stop time delay or counterclockwise to decrease the stop time delay. Make adjustments in small increments.
9. Repeat Steps 2 through 8 until desired delay times are obtained.
10. Move selector switch to desired position, WITHOUT LOAD or WITH LOAD.
11. Close cabinet door.

Optional Start-Stop Time Delay

For setting the time delay of the programmable timer, follow below procedure.

1. Open right cabinet door of automatic transfer switch.
2. Pull out time delay module 7 from the control accessory panel.
3. Change the switch settings on the side of the printed circuit board for the desired times (Figure 15). Table 1 lists the switch positions for the available time delays.

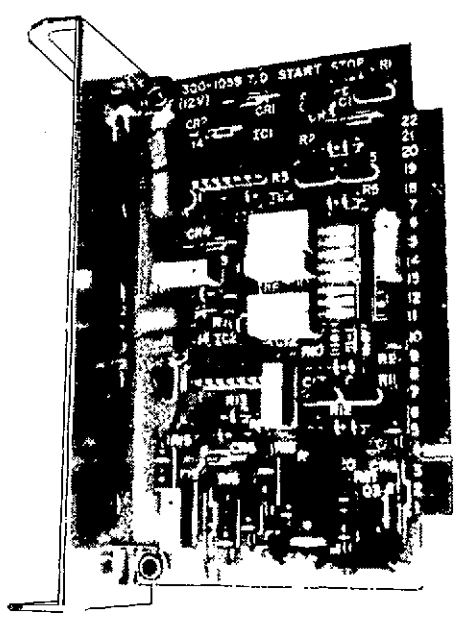


FIGURE 15. START-STOP TIME DELAY (BEGIN SPEC C)

Example: For a start time delay of 2.4 seconds, close switches 1, 2, and 3, and open switch 4. For a 345-seconds delay on stopping generator set, close switches 5, 7, and 8, and open switch 6.

4. Insert the time delay module back into the control accessory panel.
5. Close the cabinet door.

TABLE 1. PROGRAMMABLE TIME DELAY

PROGRAMMABLE START — STOP TIMER

c = SWITCH CLOSED
o SWITCH OPEN

SWITCH POSITIONS				
1	2	3	4	TO START
5	6	7	8	TO STOP
				TIME
o	o	c	o	0.5 sec
o	o	o	c	1.0 sec
c	o	c	o	1.4 sec
c	c	c	o	2.4 sec
c	o	o	c	5.5 sec
o	o	o	o	7.9 sec
c	c	o	c	9.6 sec
c	o	o	o	43 sec
o	o	c	c	62 sec
c	c	o	o	76 sec
c	o	c	c	345 sec
c	c	c	c	615 sec

TIME TOL ± 20%

Transfer-Retransfer Time Delay (Begin Spec C)

This module has factory settings of 2.5 seconds for delay on transfer and 10 minutes for delay on retransfer. To change delay times, use the following procedure and refer to Figure 16. The transfer time delay function has a time range of 0.1 to 15 seconds, the retransfer delay function has a time range of 0.5 to 30 minutes.

1. Open the cabinet door of the automatic transfer switch.
2. Move the selector switch to WITH LOAD.
3. Move the test transfer switch to TEST. The generator set will start and run.
4. With a stopwatch or watch with a second hand, measure the time the red transfer LED on the time delay module 8 remains lit. The red LED will turn off after the time delay is complete. If the time delay is correct or time you desire, proceed to Step 6. If not, proceed to Step 5.

5. Insert a small screwdriver through the TRANSFER opening (upper opening) in the front panel of the transfer-retransfer time delay module. Turn clockwise in small increments to increase the time delay, counterclockwise to decrease time delay.

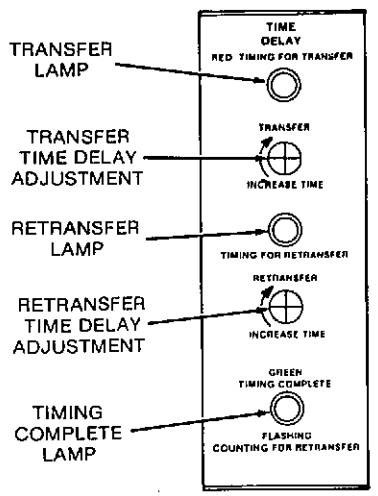


FIGURE 16. TRANSFER-RETRANSFER TIME DELAY

6. Move the test transfer switch to NORMAL.
7. With a stopwatch or watch with a second hand, count the number of flashes the bottom green LED makes in 60 seconds (Onan suggests counting for 60 seconds—shorter intervals would give less accuracy for determining time delays). Once retransfer timing is complete, the red retransfer LED will turn off and the green LED will remain on for the duration of the generator set stop delay. The following list gives the correlating pulses to time delays.

Pulses/60 sec	Time Delay (min)
50	5
25	10
17	15
13	20
10	25
8	30

If time delay is correct or time you want, proceed to Step 10. Otherwise, proceed to Step 8.

8. Insert a small screwdriver through the RETRANSFER opening (lower opening) in the front panel of the transfer-retransfer time delay module. Turn clockwise in small increments to increase the time delay, counterclockwise to decrease the time delay.
9. Repeat Steps 3 through 8 until the desired time delays are obtained.
10. Move the selector switch to WITH LOAD if you want the generator set to assume load during exercise or tests.
11. Close the cabinet door.

Transfer Time Delay (Spec A and B)

For adjustment or change of the transfer time delay (transfer of the load to the generator set) from the standard setting, two to three seconds, use the following procedure.

1. Open cabinet door of automatic transfer switch.
2. Move operation selector switch to STOP (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Move selector switch to WITH LOAD.
4. Remove the twist-lock disconnect plug.
5. Open the control accessory panel.
6. Locate generator interposing relay K4 (Figure 17).
7. Reconnect the twist-lock disconnect plug with the control accessory panel open.

WARNING **Rear of the control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**

8. Move operation selector switch to REMOTE (on engine control for two-wire starting) or NORMAL (in cabinet for three-wire starting), whichever applies.
9. Move test transfer switch to TEST. Generator set will start and run.
10. With a stopwatch or watch with a second hand, measure time from instant generator set reaches full speed until relay K4 contacts close. If time delay is correct or time you desire, proceed to Step 14. If not, proceed to Step 11.
11. Insert a small screwdriver through hole in front panel of transfer time delay module 8. Turn clockwise in small increments to increase the time delay, counterclockwise to decrease the time delay.
12. Move the test transfer switch to NORMAL to stop the generator set.
13. Repeat Steps 9 through 12 until the desired time delay is obtained.
14. Move the test transfer switch to NORMAL.
15. Move operation selector switch to STOP.
16. Remove the disconnect plug and close the control accessory panel.
17. Reconnect the disconnect plug.
18. Move the operation selector switch to REMOTE (on engine control for two-wire starting) or to NORMAL (in cabinet for three-wire starting), whichever applies.
19. Return selector switch to desired position, WITHOUT LOAD or WITH LOAD.
20. Close the cabinet door.

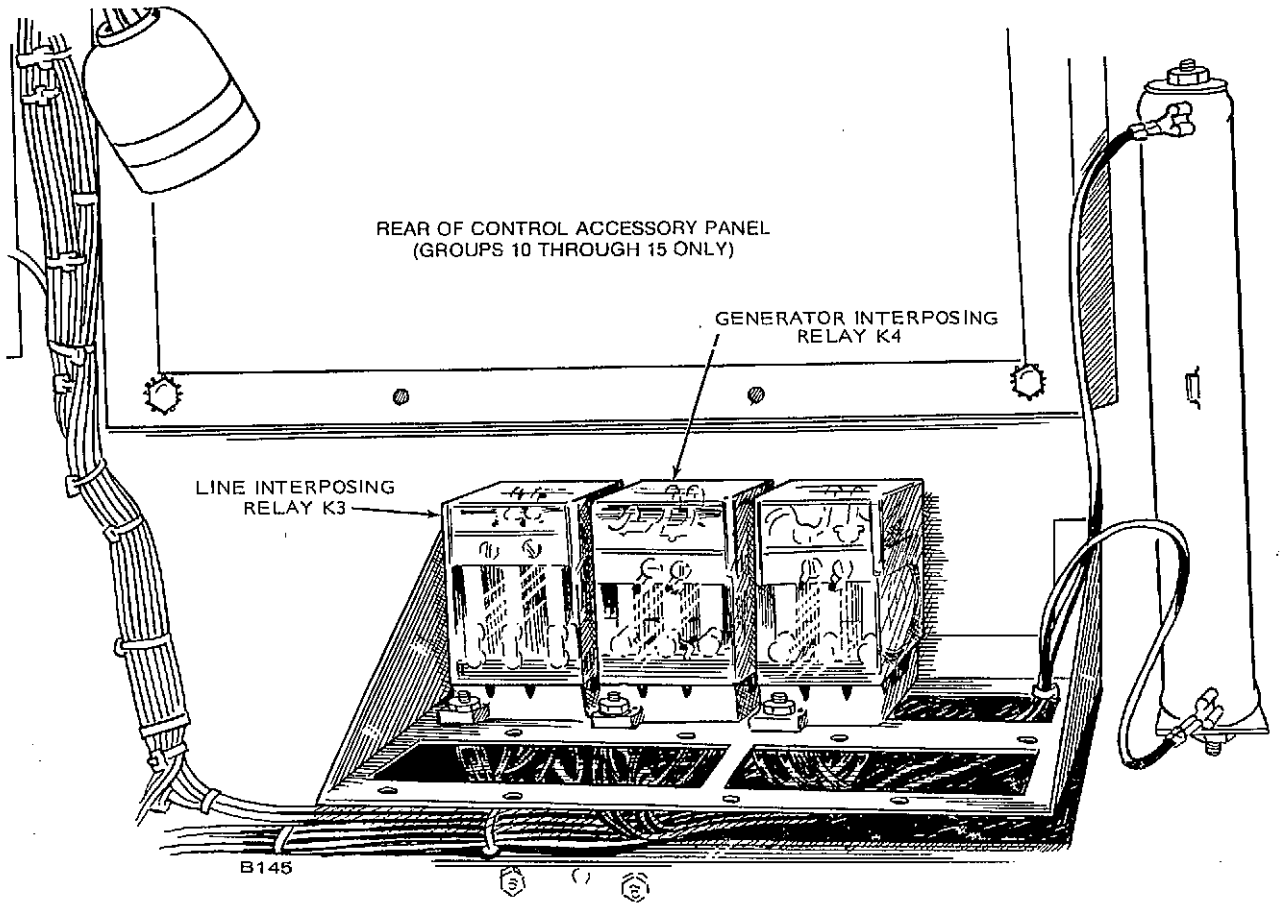


FIGURE 17. LOCATION OF INTERPOSING RELAYS

Retransfer Time Delay (Spec A and B)

One of two retransfer time delays can be used to provide 0 to 30 minutes time delay on retransfer (retransfer of load to commercial power line). Both have similar adjustments. See the *OPERATION* section for operation description.

The one retransfer time delay shown on the left in Figure 18 has two lamps ("POWER ON" and "TIMING") and a time adjustment knob. To set the delay, turn the adjustment knob clockwise to the desired retransfer delay time.

Shown on the right in Figure 18 is the other retransfer time delay. It has one lamp ("POWER ON") and a time adjustment knob. The adjustment knob has a black pointer and a red time-remaining indicator pointer. Turn the adjustment knob clockwise until the black pointer aligns with the desired time delay.

Preheat Time Delay: The preheat time delay (module 16) for diesel generator sets with 3-wire starting is adjustable from 5 to 60 seconds. To change the delay, follow these instructions.

1. Open the cabinet door of the automatic transfer switch.
2. Move the selector switch to WITHOUT LOAD.
3. Move the test transfer switch to TEST.
4. With a stopwatch or watch with a second hand, measure the amount of time the small lamp on module 16 (preheat time delay module) lights before engine cranks.
5. Move the test transfer switch back to NORMAL.
6. If time delay for preheat is set as desired, proceed to Step 9. If a different time is desired, proceed to Step 7.
7. Insert a small screwdriver through the PREHEAT opening in the front panel of preheat time delay module 16. Turn potentiometer clockwise to increase preheat time, counterclockwise to decrease delay. Make adjustments in small increments.
8. Repeat Steps 3 through 7 until desired preheat time is obtained.
9. Move selector switch to desired position, WITHOUT LOAD or WITH LOAD.
10. Close the cabinet door.

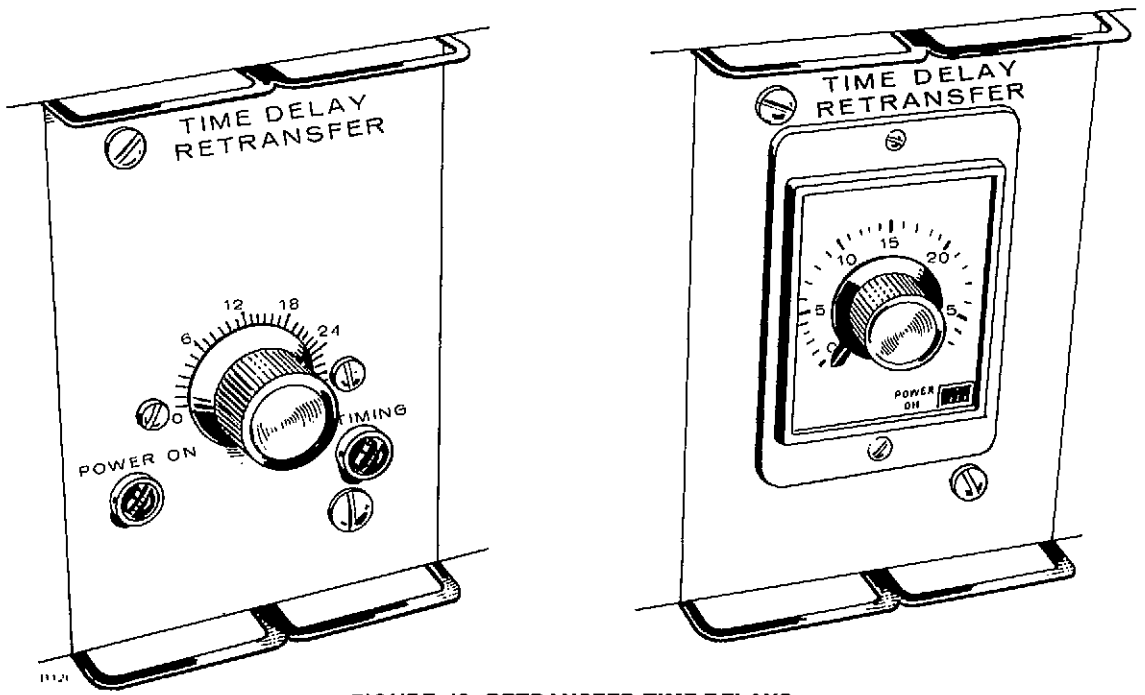


FIGURE 18. RETRANSFER TIME DELAYS

TIME DELAYS—CONTROL GROUPS 51-55

Start, Transfer, and Preheat Time Delays

Onan has suggested settings of 1 to 3 seconds for the start time delay, 2 to 5 seconds for the transfer time delay and 60 seconds for the preheat time delay. All require the same adjustments for changing settings and have time ranges of 1 to 300 seconds. To make the settings, perform the following.

1. Open the cabinet door of the automatic transfer switch.
2. Turn the knob on the time delay clockwise to increase delay time, counterclockwise to decrease the delay time. See Figure 19.
3. Close the cabinet door.

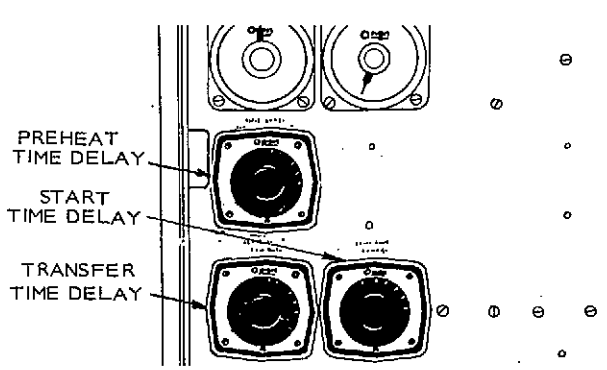


FIGURE 19. START AND TRANSFER TIME DELAY RELAYS

Stop and Retransfer Time Delays

Suggested settings for these time delays are 5 minutes for stopping and 10 to 20 minutes for retransfer. To change time settings, adjustable from 2 to 60 minutes, use the procedure following.

1. Open the cabinet door of the automatic transfer switch.
2. Set the time delay by turning the adjustment knob in the center of the delay. See Figure 20.

   The black pointer on the face of the time delay indicates the preset delay. The red pointer indicates the delay time left in operation.

3. Close the cabinet door.

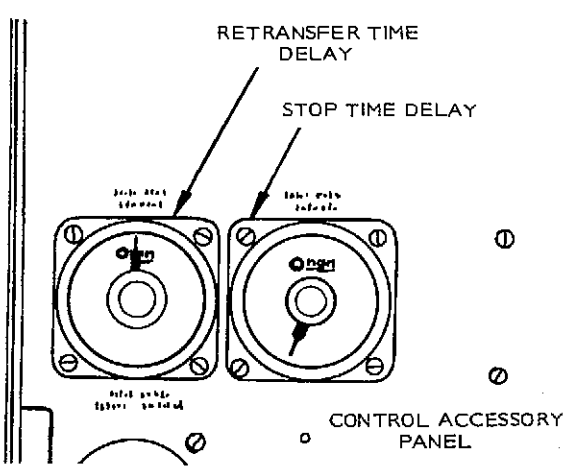


FIGURE 20. STOP AND RETRANSFER TIME DELAY RELAYS

TRANSFER SWITCH

WARNING **Due to the serious shock hazard, never touch the transfer switch unless all power is removed from the automatic transfer switch. Also set the operation selector switch to "STOP" and disconnect the generator set starting batteries.**

TRANSFER SWITCH DESCRIPTION

The following description is for a mechanically-held (line side) transfer switch. Line contacts are closed and locked in the following manner (Figure 21). The line-side main coil pulls the contacts closed. While the contacts are closing, a mechanical latch engages the contact control rod and locks the contacts closed. At the same time, an arm on the mechanical latch actuates the coil cutout switch (microswitch) which opens the main pull-in coil circuit. The contacts have been closed, locked in place and power removed from the main coil simultaneously. To open the line contacts, the trip coil must be energized by generator output to disconnect the latch mechanism, allowing the line contacts to open and generator contacts to close. A mechanical interlock in the transfer switch prevents generator and line contacts from closing at the same time.

CONTACTS

Contacts should never require cleaning or refacing for the life of the equipment except in unusually dusty or dirty environments. Discoloration of the silver does not affect their efficiency.

CAUTION **Filing the contact face destroys the mating surfaces.**

If the contacts ever do become burned or pitted, replace them in the following manner:

1. Remove the plastic hood from the transfer switch.
2. Remove the washers and springs.
3. Lift the contacts from the slide posts.
4. Remove attaching screws from the stationary contacts.
5. Install new contacts (curved silver contact surfaces facing inward).
6. Reassemble the springs and washers.
7. Reinstall the plastic hood.

TRANSFER SWITCH COILS

If a transfer switch coil is grounded or has an open circuit, replace by following appropriate instructions, for a 30 ampere, 60 through 100 ampere; or, 200, 225 and 400 ampere transfer switch.

30 Ampere Transfer Switch

1. Disconnect the coil lead wires.

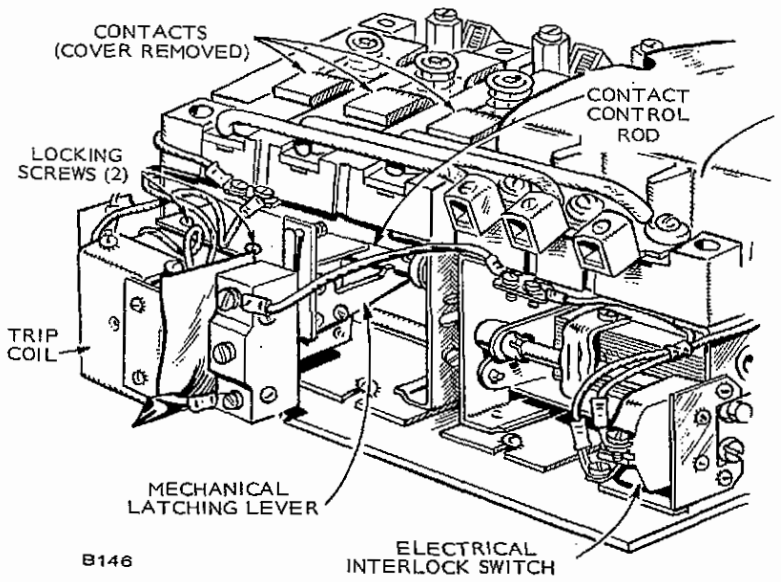


FIGURE 21. MECHANICALLY-HELD (LINE-SIDE) TRANSFER SWITCH

2. Remove the screw holding the stationary armature and coil assembly.
3. Slide out the stationary armature and coil assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

60 through 100 Ampere Transfer Switch

1. Disconnect the coil lead wires.
2. Pull off the hairpin-shaped retaining clips holding the control rod and slide out the control rod (use a needle-nose pliers).
3. Slide out the stationary armature and coil assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

200, 225 and 400 Ampere Transfer Switch

1. Disconnect the coil lead wires.
2. Remove the capscrews mounting the coil and stationary armature to the case.
3. Pull out the assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

MECHANICAL LATCH AND CUTOUT SWITCH

The latch mechanism and coil disconnect switch must be adjusted to open the main line circuit just as the contacts reach the closed position. If the main coil pull-in circuit is not broken, coil hum will result. If the coil disconnect switch opens before the transfer switch contacts are closed, the contacts will chatter.

Latching Mechanism Adjustments: Adjust the latching mechanism for positive locking by following this procedure.

1. Loosen the locking screws which secure the latching brackets.
2. Adjust the bracket for 1/16-inch (1.6 mm) clearance between the contact control rod and the latching lever when the main coil armature is fully seated (Figure 22).

The 200, 225 and 400 ampere transfer switches have a slightly different appearing latching mechanism but have the same operation sequence and use the same adjustments.

Cutout Switch Adjustments: Adjust the coil cutout switch by following this procedure.

1. Align the microswitch actuating arm and the adjusting screw on the latching lever.
2. Set the adjusting screw so the microswitch opens just as the latching lever engages the contact operating rod.
3. Operate the transfer switch several times to check the microswitch adjustment.
4. Adjust as required and seal the adjustment with paint.

TRANSFER SWITCH HUM

Hum of mechanically-held transfer switches is caused either by incorrect adjustment of the coil cutout switch or because of dirt between the armature sealing faces of the switch. If hum is due to the cutout switch adjustment, see "MECHANICAL LATCH AND CUTOUT SWITCH" in this section. If hum is due to dirt between the armature sealing faces, clean them with Dowclene EC, Chlorothene Nu, or similar electrical cleaning material. Use medium fine grade emery paper to clean rusted sealing faces. Remove all traces of emery dust.

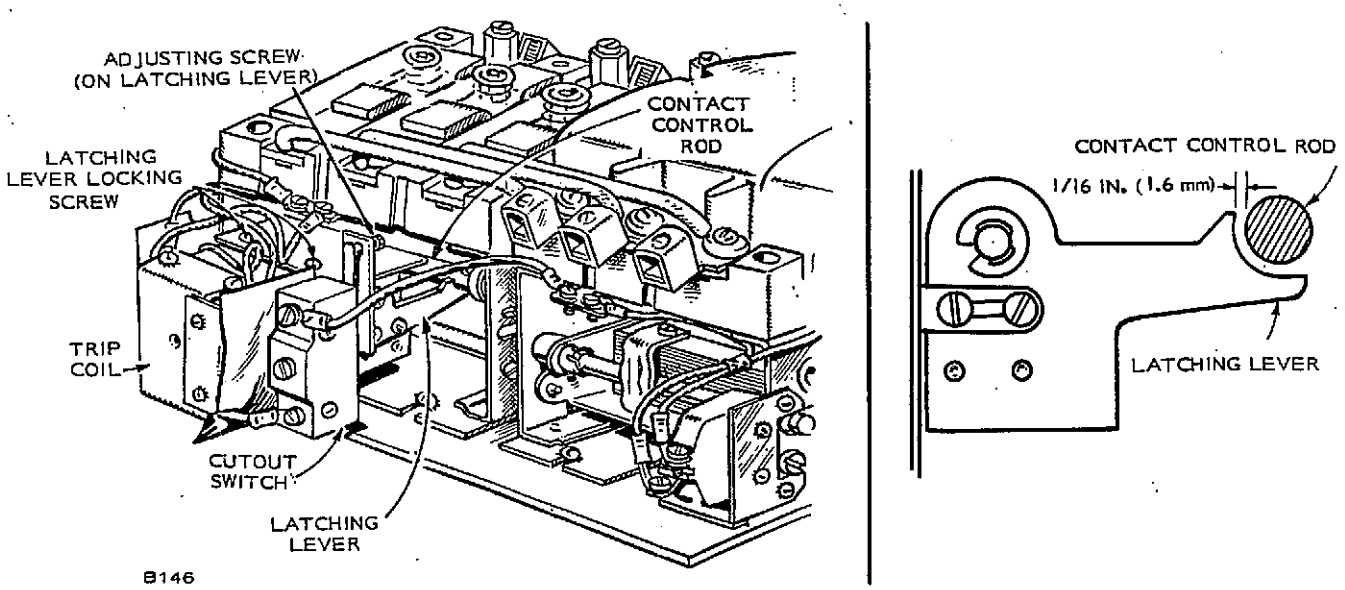


FIGURE 22. LATCH MECHANISM ON MECHANICALLY-HELD TRANSFER SWITCH

TROUBLESHOOTING

This troubleshooting section is divided into two main parts, one for the automatic transfer switches with control accessory panels in groups 10 through 15 or 20 through 25 (modular-type panels), and one for automatic transfer switches with control accessory panels in groups 51 through 55 (relay-type panels). Those with control accessory panel groups 10 through 15 or groups 20 through 25 are covered first (see below) while those with groups 51 through 55 are started on page 69.

AT'S WITH CONTROL PANEL GROUPS 10-15 OR 20-25

Find the problem below and proceed to the page indicated. Then answer the questions in the chart on that page either "YES" or "NO." Refer to the number in the column and proceed to that step, etc.

INDEX

For modular, solid-state control accessory panels, use any tin edge contact boards still in your stock for replacement only in Spec A and Spec B AT transfer switches. After depleting the stock, use only boards with gold edge contacts for all AT transfer switches (any AT can use a board with a gold edge contact).

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2A.	Is control panel disconnect plug properly inserted into receptacle?	3A	—
3A.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	4A	8A
4A.	Is the green "NORMAL" lamp lit?	5A	8A
5A.	Are contacts K1-CS closed to connect rated voltage across closing coil K1-CC?	7A	6A
6A.	Repair or replace K1-CS contacts.	—	—
7A.	Is closing coil K1-CC open circuited or is there an obstruction preventing transfer switch from closing?	—	—
8A.	Are relay contacts K4 (3-9), contacts K4 (3-7) for control groups 20-25, closed and making good contact?	11A	9A
9A.	Clean K4 contacts. Does this correct problem?	—	10A
10A.	Replace relay K4.	—	—
11A.	Does AT have programmed transition time delay assembly (located in rear of standard cabinet below transfer switch)?	12A	14A
12A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	13A	14A
13A.	Repair or replace time delay K11.	—	—
14A.	Is transfer switch mechanically-held on generator side?	15A	19A
15A.	Are generator-side main contacts of transfer switch open?	19A	16A
16A.	Jumper normally-open K2 interlock contacts (in series with K2 trip coil). Does transfer switch operate?	17A	18A
17A.	Repair or replace normally-open K2 interlock contacts.	—	—
18A.	Is K2 trip coil open circuited or is trip coil mechanism obstructed?	—	—
19A.	Is rated voltage across closing coil K1-CC?	23A	20A
20A.	Does transfer switch operate if normally-closed K2-1C contacts are jumpered?	21A	22A
21A.	Repair or replace normally-closed K2-IC contacts.	—	—
22A.	Repair or replace cutout switch K1-CS.	—	—
23A.	Closing coil K1-CC is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	3B	4B
3B.	Is "EMERGENCY" lamp lit?	24B	5B
4B.	Is rated AC voltage present between TB7-8 and TB7-12?	30B	5B
5B.	Does transfer switch operate to close generator side when voltage sensor module 4 pick-up voltage knob is turned to minimum (counterclockwise)?	6B	7B
6B.	Is input voltage to transformer T3 connected to correct primary voltage tap to give nominal 40 volts AC on T3 (X1-X2)?	7B	—
7B.	Does transfer switch operate when voltage sensor module 4 is replaced by bypass plug or if K4 terminal A, K4 terminal 1 for control groups 20-25, is jumpered to ground?	8B	9B
8B.	Replace voltage sensor module.	—	—
9B.	Is plug-in module 8 a transfer or transfer-retransfer time delay?	10B	12B
10B.	Does transfer switch operate when transfer time delay module 8 is replaced by a bypass plug or if K4 terminal B, K4 terminal 2 for control groups 20-25, is jumpered to TB1-7?	11B	12B
11B.	Replace time delay module 8.	—	—
12B.	Is voltage on K4 (A-B), on K4 (1-2) for control groups 20-25, above 9 volts DC?	18B	13B
13B.	Is voltage from TB1-GND to TB1-B+ equal to rated battery terminal voltage?	14B	36B
14B.	Is voltage from TB3-7 to TB3-16 equal to rated battery voltage?	15B	36B
15B.	Is voltage from TB3-7 to TB1-6 greater than 9 volts DC?	16B	37B
16B.	Is voltage from TB3-7 to TB1-7 greater than 9 volts DC?	17B	38B
17B.	Is voltage from TB3-7 to K4-B, to K4-2 for control groups 20-25, greater than 9 volts DC?	18B	39B
18B.	Is relay K4 energized and are contacts K4 (4-7), contacts K4 (4-6) for control groups 20-25, closed properly?	20B	19B
19B.	Replace relay K4.	—	—
20B.	Is rated AC voltage present on transfer switch generator terminals?	21B	—
21B.	Are contacts K3 (8-2), contacts K3 (4-8) for control groups 20-25, closed to bring rated AC voltage down to TB6-8? Measure for rated AC voltage between TB7-8 and TB7-6.	23B	22B
22B.	Replace relay K3.	—	—
23B.	Are K1 line-side contacts open?	27B	24B

B.	(Continued)	YES	NO
24B.	Jumper normally-open K1 interlock contacts. Does transfer switch operate?	25B	26B
25B.	Repair or replace normally-open K1 interlock contacts.	—	—
26B.	Is K1 trip coil open circuited or is trip coil mechanism obstructed?	—	—
27B.	Does AT have a programmed transition time delay assembly (located in rear of standard cabinet below transfer switch)?	28B	30B
28B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6 of time delay assembly?	29B	30B
29B.	Repair or replace K12 time delay.	—	—
30B.	Is transfer switch mechanically held on generator side?	31B	33B
31B.	Does transfer switch operate if you jumper K2-CS cutout switch?	32B	33B
32B.	Replace K2-CS cutout switch.	—	—
33B.	Does transfer switch operate if terminal TB7-7 is jumpered to TB7-12?	34B	35B
34B.	Replace normally-closed K1-IC interlock contacts.	—	—
35B.	Closing coil K2-CC is open circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—
36B.	Check for poor connection, defective battery, etc.	—	—
37B.	Replace module 5.	—	—
38B.	Check circuit from TB1-6 to TB1-7. It must be closed by a jumper or external circuit.	—	—
39B.	Replace module 8 with bypass plug. Make sure circuit from J8-21 to J8-12, J8-22 to J8-12 for Spec A and B, is closed.	—	—

C.	Automatic transfer switch fails to start generator set during a power outage.	YES	NO
1C.	Is plug-in module 9 of control accessory panel a 2 to 3 wire converter 300-0926 with selector switch set in NORMAL position?	2C	12C
2C.	Push the module 9 reset switch. If engine does not crank, place module 9 selector switch in HAND CRANK position. Can you start generator set with start switch on engine control?	3C	14C
3C.	Stop generator set and move module 9 selector switch to NORMAL. Place selector switch S2 on control accessory panel to WITHOUT LOAD and test transfer switch S1 to TEST. Does generator set start?	18C	4C
4C.	Jumper TB1-B+ to TB1-RMT (make sure that voltage from ground to TB1-RMT is equal to rated battery voltage). Does engine crank?	5C	6C
5C.	Check circuit from TB1-B+ through control panel test transfer switch S1 (2-1) and selector switch S2 (2-3) to TB1-RMT for loose connections or open circuits.	—	—
6C.	Jumper TB1-GND to TB1-3. Does engine crank?	8C	7C
7C.	Check all wiring and switches between B+, GND and terminal 3 on the generator set, the B+, GND and terminal 3 on TB1 in the automatic transfer switch for an open circuit.	—	—
8C.	Is plug-in module 16 a preheat time delay module?	10C	9C
9C.	Replace 2 to 3 wire converter module 9.	—	—
10C.	Remove wire lead from J16-19. Does engine crank?	11C	9C
11C.	Replace preheat time delay module 16.	—	—
12C.	Is selector switch on engine control in REMOTE position?	13C	—
13C	Does generator set start, run, and stop with selector switch on generator set? Return switch to remote position.	15C	14C
14C.	Refer to the generator set operator's manual and service manual.	—	—
15C.	Place selector switch S2 on control accessory panel to WITHOUT LOAD and test transfer switch S1 to TEST. Does generator set start?	18C	16C
16C.	Jumper TB1-B+ to TB1-RMT (make sure that voltage from ground to TB1-RMT is equal to rated battery voltage). Does engine crank?	17C	—
17C.	Check circuit from TB1-B+ through control panel test transfer switch S1 (2-1) and selector switch S2 (2-3) to TB1-RMT for loose connections or open circuits.	—	—
18C.	Move selector switch S2 on control accessory panel to WITH LOAD and test transfer switch S1 back to NORMAL. Is DC voltage from TB1-GND to TB1-6 12 volts?	20C	19C
19C.	Check wire connections to voltage module 5. If OK, replace module 5.	—	—

C.	(Continued)	YES	NO
20C.	Jumper TB1-6 and J7-9. Does generator set start (allow for start time delay if used)?	21C	22C
21C.	Replace interposing relay K3.	—	—
22C.	Is module 7 a start-stop time delay module?	23C	25C
23C.	Replace start-stop time delay module 7 with a bypass plug or jumper J7-9 to J9-2. Does generator set start?	24C	25C
24C.	Replace start-stop time delay module 7.	—	—
25C.	Is voltage from TB1-GND to J7-21 (J7-22 for Spec A and B only) about 12 volts DC?	27C	26C
26C.	Replace start suppressor control A21.	—	—
27C.	Begin Spec C: Replace start relay K7 (K7 contacts 4-7 do not close to connect TB1-B+ to TB1-RMT).	—	—

D.	**Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.**	YES	NO
1D.	Is control panel disconnect plug properly inserted into receptacle?	2D	
2D.	Does automatic transfer switch have an exerciser clock?	3D	4D
3D.	Is exerciser turned to an exerciser period?	—	4D
4D.	Does AT have battery charging feature?	5D	6D
5D.	Check battery charging fuse F1. Is fuse OK?	6D	-
6D.	Is motor disconnect switch S8 closed?	7D	
7D.	Is rated AC voltage present at transfer switch line terminals?	8D	
8D.	Does AT have area protection equipment or a remote test switch connected to terminals TB1-4 and TB1-5?	9D	11D
9D.	Jumper terminals TB1-4 and TB1-5. Does AT retransfer load to normal line at end of retransfer time delay, if any?	10D	11D
10D.	Check area protection equipment or remote test switch for malfunction (circuit must close for retransfer).	—	—
11D.	Is module 8 a transfer-retransfer time delay?	12D	15D
12D.	Has module completed its retransfer time delay to connect about 12 volts DC to relay K3? If not sure, measure voltage from TB1-GND to TB4-18.	35D	13D
13D.	Does AT transfer load to normal line if module 8 is replaced by a bypass plug?	14D	19D
14D.	Replace transfer-retransfer time delay module 8.	—	—
15D.	Is module 11 a retransfer time delay? **If the retransfer time delay has been returned to zero time for tests, etc., make sure the timer does not go back beyond zero. Otherwise, the generator set will not retransfer the load.**	16D	19D
16D.	Is motor timer module 11 POWER ON lamp lit?	17D	19D
17D.	Has motor timer completed its time delay period?	35D	18D
18D.	Replace motor timer if it has stalled or does not time out.	—	—
19D.	Does control accessory panel have a manual-automatic selector switch S3 and push to retransfer switch S4?	20D	21D
20D.	Place manual-automatic selector switch S3 in AUTO position. Does automatic transfer switch retransfer load to line (at end of retransfer time delay if used)?	—	21D
21D.	Is voltage from TB1-GND to TB3-11 about 12 volts DC?	23D	22D
22D.	Replace voltage module 5.	—	—

D.	(Continued)	YES	NO
23D.	Does AT have overvoltage sensor modules 13, 14, and 15 (only one in position 13 on single-phase AT)?	24D	31D
24D.	Has overvoltage sensor relay K6 energized to open contacts K6 (1-7)?	25D	29D
25D.	Record pick-up voltage dial settings with small pencil marks on voltage sensor modules 13, 14, and 15 (only one in position 13 for single-phase). Turn pick-up voltage knobs to 140 volts or higher. Does the AT retransfer the load to the normal line after retransfer time delay, if any.	26D	27D
26D.	Recheck the normal line voltage and output voltage of transformers T2, T4, and T5 for higher than normal readings. Make sure voltage sensors are set for correct pick-up voltages.	—	—
27D	Remove one overvoltage sensor module from the control accessory panel. Does AT transfer load to normal line after retransfer time delay, if any?	28D	29D
28D.	**Three-Phase:** Isolate malfunctioning voltage sensor by plugging each individual voltage sensor module into position 15 with bypass plugs in positions 13 and 14.	—	—
	Single-Phase: Replace voltage sensor module in position 13.	—	—
29D.	Jumper TB4-9 to TB4-7. Does AT transfer load to normal line after retransfer time delay, if any?	30D	31D
30D.	Replace overvoltage line relay K6.	—	—
31D.	Record the pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2, and 3 (only one in position 1 for single-phase AT). Turn pick-up voltage knobs to 90 or below. Does the AT retransfer the load to the normal line (after retransfer time delay if any)?	32D	33D
32D.	Recheck the normal line voltage and output voltage of transformers T2, T4, and T5 for lower than normal readings. Make sure voltage sensors are set for correct pick-up voltages.	—	—
33D.	Replace voltage sensor modules 1, 2, and 3 with bypass modules or jumper TB1-GND to TB4-20. Does AT retransfer load to normal line (after retransfer time delay if any)?	34D	35D
34D.	**Three-Phase:** Isolate malfunctioning voltage sensor by plugging each individual voltage sensor module into position 3 with bypass plugs in positions 1 and 2.	—	—
	Single-Phase: Replace voltage sensor module in position 1.	—	—
35D.	Did relay K3 pick up to close contacts K3 (6-9) and open K3 (2-8) for control groups 10-15 or close contacts K3 (3-5) and open K3 (4-8) for control groups 20-25?	6A	36D
36D.	Measure K3 (A-B) voltage for control groups 10-15 or K3 (1-2) voltage for control groups 20-25. If it is 9 volts DC or greater, the coil is probably open. Replace relay.	—	—

E.	Automatic transfer switch delays transferring load to line until generator set stops after normal power outage.	YES	NO
1E.	Do relay contacts K3 (6-9) close for control groups 10-15 or contacts K3 (3-5) close for control groups 20-25 as relay K3 picks up when the normal source voltage returns.	2E	3E
2E.	Clean K3 contacts. Does this correct problem?	—	3E
3E.	Replace relay K3.	—	—

F.	Generator set starts during normal service.	YES	NO
1F.	Is control panel disconnect plug properly inserted into receptacle?	2F	—
2F.	Does automatic transfer switch have an exerciser clock?	3F	4F
3F.	Is exerciser clock turned to the exercise period?	—	4F
4F.	Record pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2 and 3 (only one in position 1 for single-phase AT). Turn pick-up voltage knobs to 90 or below. Does generator set stop (after time delay)? After test, return knobs to original settings.	5F	6F
5F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for lower than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
6F.	Are modules 13, 14 and 15 overvoltage sensors (only one in position 13 for single-phase AT)?	7F	10F
7F.	Record pick-up voltage dial settings with small pencil mark on voltage sensor modules. Turn pick-up voltage knobs to 140 volts. Does generator set stop (after time delay)? After test, return knobs to original settings.	8F	9F
8F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for higher than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
9F.	Are relay contacts K6 (1-7) closed and making good contact?	10F	—
10F.	Measure K3 (A-B) voltage for control groups 10-15, measure K3 (1-2) voltage for control groups 20-25. If 9 volts or more, the relay probably has an open coil. Replace relay.	12F	11F
11F.	Is relay K3 energized, contacts K3 (1-7) open and contacts K3 (6-9) closed properly for control groups 10-15, or contacts K3 (C/NC) open and contacts K3 (3-5) closed properly for control groups 20-25?	—	—
12F.	Remove start-stop time delay module 7 and replace with the bypass plug module. Does generator set stop?	13F	—
13F.	Replace start-stop time delay module.	—	—

G.	Exerciser clock fails to start generator set.	YES	NO
1G.	Does exerciser motor timer M1 operate? Voltage on M1 (1-2) should be approximately 120 VAC.	2G	5G
2G.	Has overcrank condition occurred (note overcrank lamp on AT-E models)?	—	3G
3G.	Do contacts M1 (4-5) open and contacts M1 (3-5) close to put battery voltage on TB1-RMT terminal during exercise period? See instructions for exercise clock adjustments.	1C	4G
4G.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—
5G.	Is fuse F1 in control panel "blown"?	6G	—
6G.	Replace fuse F1.	—	—

H.	Battery Charger Malfunctions	YES	NO
1H.	Does battery charger fail to charge? Charge ammeter shows zero current and battery discharges?	6H	2H
2H.	Does battery charger charge at high rate and cause battery to lose electrolyte (look for bubbling)?	4H	3H
3H.	Does charger supply current but battery fails to supply sufficient cranking power?	5H	—
4H.	Lower charger float voltage a small amount. Measure specific gravity once a week and readjust float voltage until charger will hold recommended specific gravity without overcharging. Increase float voltage again if specific gravity drops below recommended value.	—	—
5H.	Check battery under load to see if it might have a dead cell. Check specific gravity of battery electrolyte and increase float voltage a small amount (check specific gravity once per week and reset float voltage until charger will hold recommended specific gravity).	—	—
6H.	Check fuse F1. Is fuse OK?	7H	—
7H.	Does primary of transformer T1 have rated input on correct terminals to produce approximately 20 volts AC on T1 (X1-X2) or approximately 40 volts on T1 (X1-X3)?	8H	—
8H.	Remove module 6 and measure AC voltage at J6 (15-21). Is this approximately 20 volts for AT-D or AT-E and 40 volts for AT-C?	9H	—
9H.	Replace battery charger module 6 with new module.	—	—

I.	OVERCRANK lamp lights while generator set is running. (OT-E only)	YES	NO
1I.	Is generator output voltage near normal.	2I	—
2I.	Does undervoltage sensor module 4 have correct setting so that relay K4 energizes?	3I	—
3I.	Is there less than 2 volts DC present between TB3-18 and TB1-GND?	8I	4I
4I.	Is relay K4 energized and does overcrank lamp go out if voltage sensor module 4 pick-up voltage knob is turned to minimum (counterclockwise)?	5I	6I
5I.	Is input voltage to transformer T3 connected to correct primary voltage tap to give nominal 40 volts AC on T3 (X1-X2)?	6I	—
6I.	Is relay K4 energized and does overcrank lamp go out if you replace voltage sensor module 4 with a bypass plug?	7I	8I
7I.	Replace voltage sensor module 4.	—	—
8I.	Replace 2 to 3 wire converter module.	—	—

J.	Overcrank lamp lights without any engine cranking (OT-E only)	YES	NO
1J.	Has a power outage occurred?	4J	2J
2J.	Is control accessory panel disconnect plug removed?	3J	—
3J.	Connect the disconnect plug, move the selector switch on 2 to 3 wire converter module to NORMAL. (Lamp lights if power outage occurred with selector switch in STOP or HAND CRANK positions.)	—	—
4J.	For generator set operation, move the selector switch on 2 to 3 wire converter module to NORMAL. (Lamp lights if power outage occurred with selector switch in STOP or HAND CRANK positions.)	—	—

USE OF BYPASS PLUG OR EXTENSION BOARD MODULE

A bypass module plug can bypass the operation of the voltage sensors, start-stop time delay, transfer time delay or retransfer time delay. The extension board module extends the voltage sensor or time delay out from the control accessory panel to expose printed circuit components for troubleshooting, testing, etc. Follow these instructions for the particular module.

Extension Board Module

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at STOP (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the plug-in module.
6. Note position and remove keying plug(s) from the printed circuit board receptacle by sliding the plug(s) to the right.
7. Insert extension board module into receptacle.
8. Insert module removed in Step 5 into the back of the extension module (Figure 23).
9. Close control accessory panel and connect disconnect plug.

WARNING **Module extended from extension board module is now energized and presents a serious shock hazard!**

10. Perform module adjustments or tests using appropriate instructions.
11. When the tests, etc., are completed, remove twist-lock disconnect plug and open control accessory panel.
12. Remove both modules from the control accessory panel.
13. Reinsert keying plug(s) removed in Step 6, into printed circuit board receptacle.
14. Plug in module removed in Step 5 or install new module, if required, into control accessory panel.
15. Close control accessory panel and connect disconnect plug.
16. Move the operation selector switch to REMOTE (two-wire starting - on engine control) or NORMAL (three-wire starting - in cabinet), whichever applies.
17. Close cabinet door.

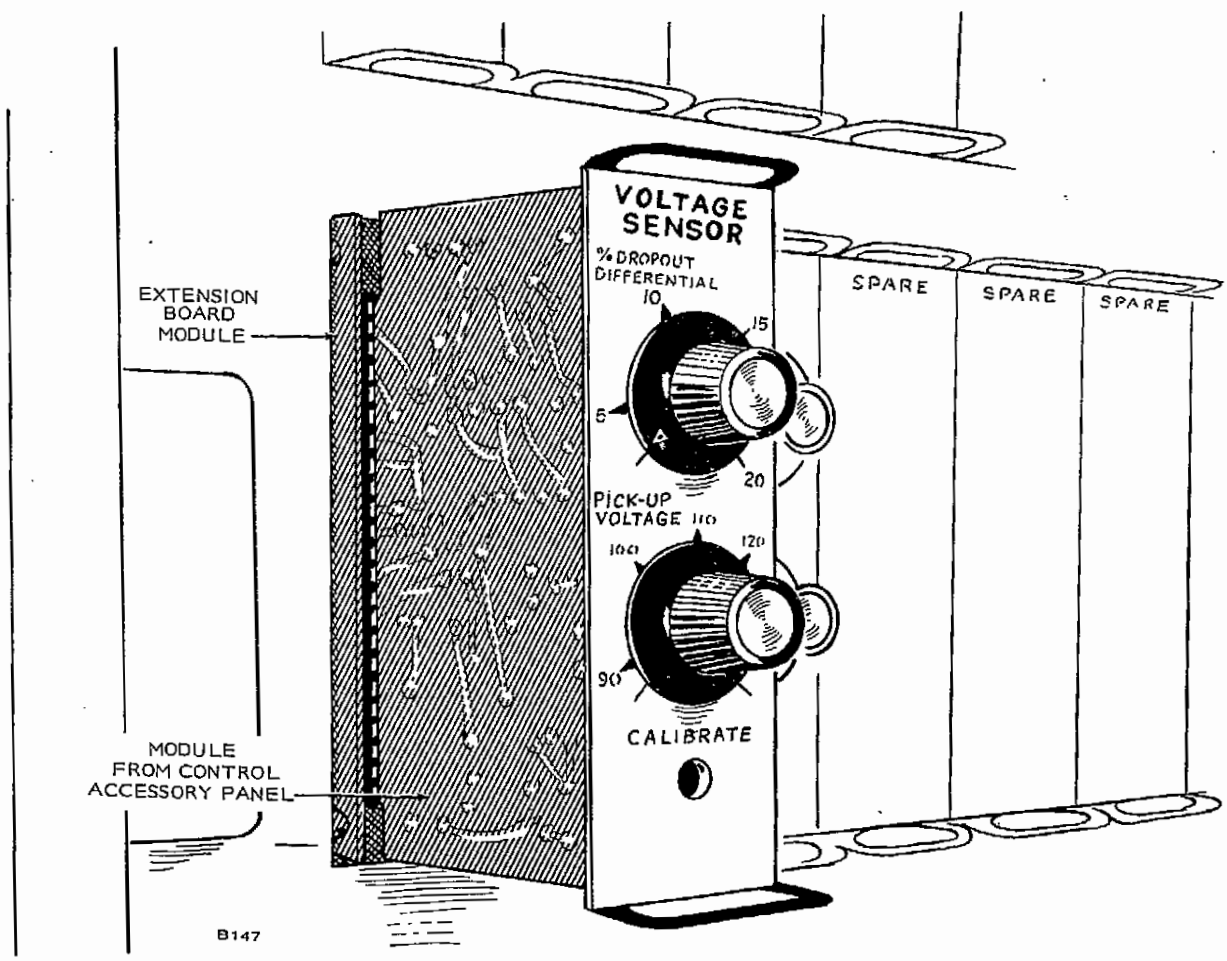


FIGURE 23. EXTENSION BOARD MODULE IN CONTROL ACCESSORY PANEL

Voltage Sensor and Transfer-Retransfer Time Delay Bypass Plug Module

Use a 300-1675 bypass plug module for begin Spec C automatic transfer switches, a 300-0927 bypass module for Spec A and Spec B automatic transfer switches. Do not use this bypass module for start-stop time delay module 7, but rather use a start-stop bypass plug module.

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at STOP (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the module to be bypassed.
6. Slide the keying plug(s) to the right and pull out from the printed circuit board receptacle. Note position of the keying plug(s) when removing.
7. Close the control accessory panel.
8. Spec A and B: Set switches S1 and S2 on the bypass module 300-0927 to the correct position (instructions on bypass module printed circuit board) for the particular bypass and insert the module. See Figure 24.

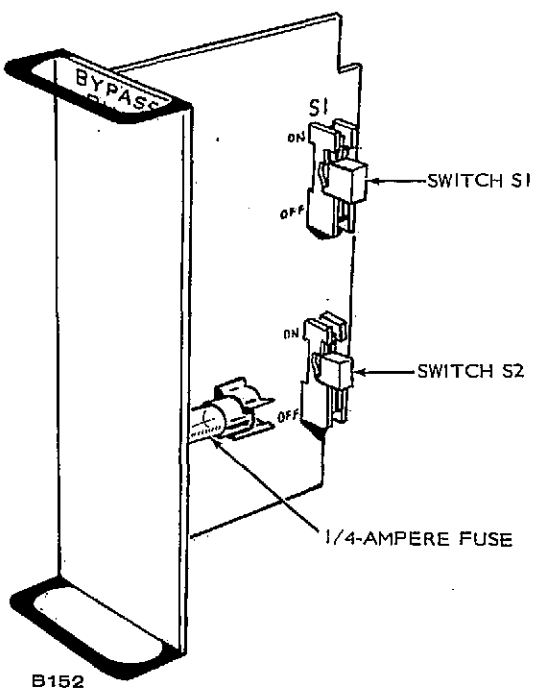


FIGURE 24. BYPASS PLUG MODULE

9. Connect the disconnect plug, reposition the operation selector switch and check operation of the automatic transfer switch.

If the 1/4 ampere fuse on the bypass plug burns out, check and correct switch positions, then replace the fuse before inserting the bypass module again.

10. Move the operation selector switch to "STOP" after test is finished.
11. Remove disconnect plug and open control accessory panel.
12. Take out bypass plug module and reinstall keying plug(s) removed in Step 6.
13. Reinstall module from Step 5 or install new module, if required.
14. Close control accessory panel and connect the disconnect plug.
15. Move the operation selector switch to "RMT" (two-wire starting - engine control) or "NORMAL" (three-wire starting - in cabinet), whichever applies.
16. Close cabinet door.

Start-Stop Bypass Plug Module

Use this bypass plug module in place of the start-stop time delay module in position 7 of the control accessory panel. Use a 300-1648 bypass plug module for begin Spec C automatic transfer switches, a 300-1177 bypass plug module for Spec A and Spec B automatic transfer switches.

You do not have to remove the keying plugs from the printed circuit board receptacle when using these bypass plug modules.

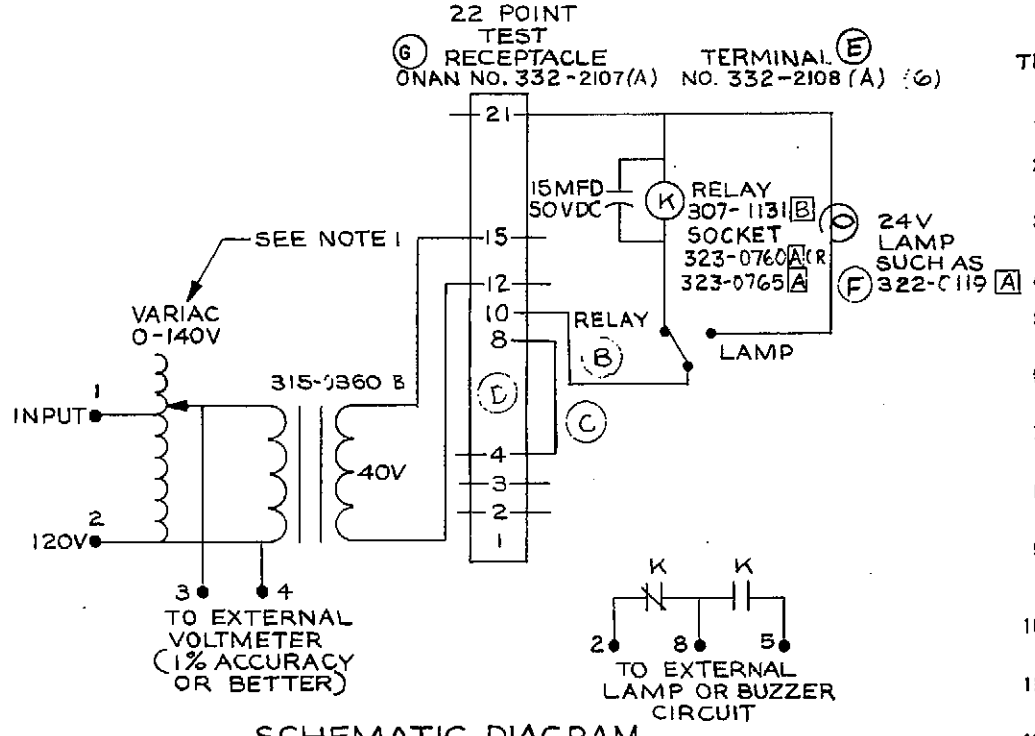
1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at "STOP" (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).
3. Remove start-stop time delay module 7.
4. Insert the bypass plug module into position 7.
5. Reposition the operation selector switch and check operation of the automatic transfer switch.
6. Move the operation selector switch to "STOP" after the test is finished.
7. Remove the start-stop bypass plug module.
8. Reinstall module from Step 3 or install new module, if required.
9. Move the operation selector switch to "RMT" (two-wire starting on engine control) or NORMAL (three-wire starting - in cabinet), whichever applies.
10. Close cabinet door.

MODULE TEST PROCEDURES

The following drawings give test procedures for the individual modules. Note on the drawings that test circuits are usually required. If you find a module defective or the correct calibration cannot be obtained, replace it.

539-0161

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	REVISED		JV	CP	2-9-71
B	RELAY MOVED FROM # 8 TO # 10	C-3	J.P.	CP	2-3-72
C	JUMPER MOVED FROM # 6 TO # 5	C-3	J.P.	CP	
D	PINS # 5, 6, & 7 REMOVED	C-3	J.P.	CP	
E	WAS # 332A1267	D-2	HBM	JV	9-27-73
F	WAS # 332A119	C-2	HBM	CP	9-27-73
G	WAS # 332-1271	3-D	[illegible]	CIP	6-5-79
E	WAS # 332-1269	3-D	[illegible]	CIP	6-5-79



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURE FOR VOLTAGE SENSOR 300-0780 D

1. SET % DIFF DROPOUT CONTROL TO 5%.
2. SET PICK-UP CONTROL TO MARK BETWEEN 110 & 120V. THIS IS 115V POSITION.
3. SET CALIBRATE CONTROL TO FULL CLOCKWISE POSITION WITH A NARROW BLADE SCREWDRIVER.
4. ENERGIZE TEST CIRCUIT AND ADJUST FOR 115 VOLTS INPUT.
5. SLOWLY TURN THE CALIBRATE CONTROL CCW UNTIL RELAY PICKS UP OR LAMP LIGHTS.
6. REDUCE INPUT VOLTAGE SLOWLY TO 80 VOLTS. RELAY SHOULD DROP OUT AT APPROXIMATELY 109 VOLTS.
7. SET PICK-UP CONTROL TO 90 VOLTS THEN SLOWLY INCREASE INPUT VOLTS TO SEE THAT RELAY PICKS UP AT 90 ± 2 VOLTS.
8. INCREASE PICK-UP VOLTAGE SETTING TO 140 VOLTS. RELAY SHOULD DROP OUT.
9. INCREASE INPUT VOLTAGE. RELAY MUST PICK UP AT 140 ± 2 VOLTS. DIAL MUST HAVE RANGE TO COVER 90 VOLTS TO 140 VOLTS. IF IT WILL NOT, IT WILL BE NECESSARY TO CHANGE CALIBRATE POINT SLIGHTLY.
10. DECREASE INPUT VOLTAGE SLOWLY, RELAY SHOULD DROP OUT AT APPROXIMATELY 133 ± 4 VOLTS.
11. INCREASE VOLTAGE TO 140 VOLTS. IF RELAY DOES NOT PICK-UP, ADJUST PICK-UP CONTROL UNTIL RELAY DOES OPERATE.
12. SET % DIFF DROPOUT CONTROL TO 20% THEN REDUCE INPUT VOLTAGE RELAY SHOULD DROP OUT AT 112 ± 4 VOLTS.

NOTES:

1. VARIAC MUST BE SMALL SIZE WITH VERY SMOOTH CONTROL FOR FINE ADJUSTMENT OF VOLTAGE IN RANGE OF 90-140 VOLTS.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY | SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± | DECIMALS 2 PLACE ± | 3 PLACE ±
ANGLES ±

539-0161

ME	SA	COST	HSG	TP	RELAY	GD	PUR
MILL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE JV 11-18-20
SEPIA FROM

DR JER ENG JIM VANT CKR CP
DATE 10-16-70 SC ~
MODEL

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE

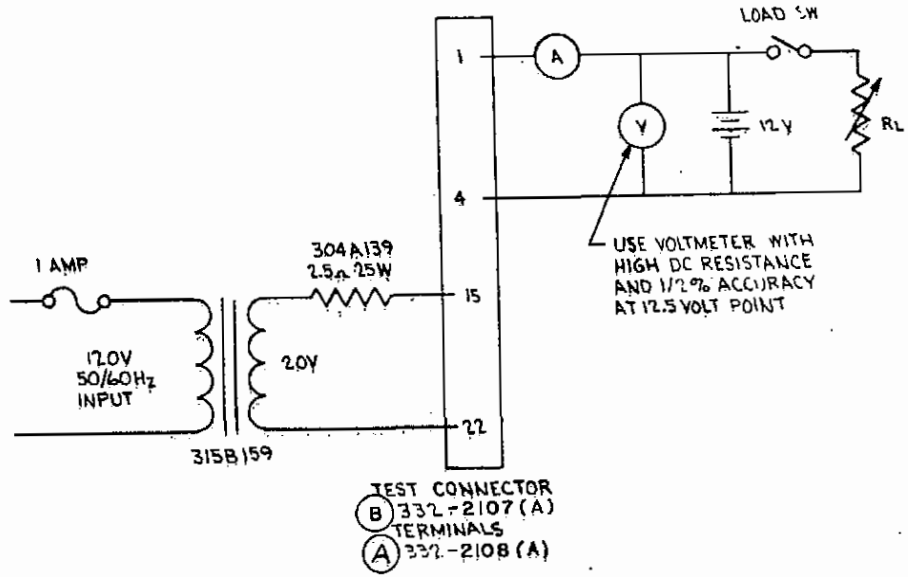
PART NO

DWG NO 539-0161 B

55

539-0163

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332 A 1267	4-A	[illegible]	CJP	9-27-73
B	WAS # 332-1271	4-A	"	CJP	6-4-79
A	WAS # 332-1269	4-A	-	CJP	6-4-79



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1 PLUG FLOAT CHARGER INTO TEST CIRCUIT

2 TURN CALIBRATE POT FULLY CLOCKWISE

3. CHECK OUTPUT CURRENT
APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 12.6 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 12.6 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.

4 CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 15.0 VOLTS TO MAKE SURE REG. COVERS 12.5 TO 15.0V RANGE.

5. FACTORY ADJUST
TURN CALIBRATE POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 13.3 VOLTS AT BATTERY TERMINALS FOR LEAD ACID BATTERIES OR 14.0 VOLTS FOR NICKLE CADMIUM BATTERIES. (UNLESS ORDER SPECIFIES SOME OTHER VOLTAGE).

6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY | SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
DECIMALS 2 PLACE ±
ANGLES ± 3 PLACE ±

539-0163

M/S	SA	COST	HSG	TP	QC RELAY	GO	PUR
MILL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED — DR JTM — ENG Jim Vint — CKR
SAMPLE RELEASE — DATE 12-3-70 — SC —
PROD RELEASE Jim Vint — MODEL 2 AMP BATTERY FLOAT CHARGER — PATT NO
SEPIA FROM — DWG NO 539-0163 B

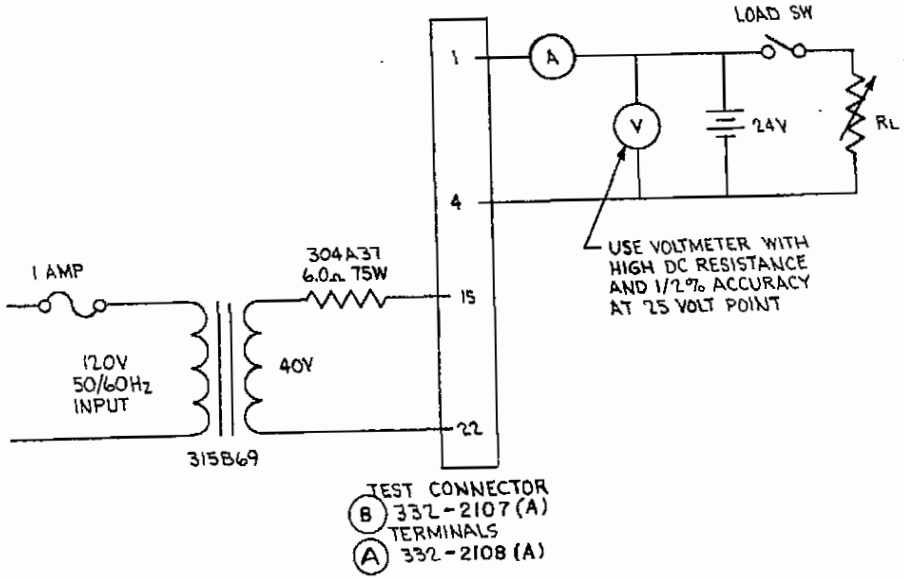
Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 12V

56

539-0164

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332-1269	A-4	HBM	CP	9-27-73
B	WAS # 332-1271	4-A	JR	CIP	6-4-79
A	WAS # 332-1269	4-A	JR	CIP	6-4-79



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1 PLUG FLOAT CHARGER INTO TEST CIRCUIT

2 TURN FLOAT VOLTAGE ADJUSTMENT POT FULLY CLOCKWISE

3 APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 25.2 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 25.2 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.

4. CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 26.6 VOLTS.

5 TURN FLOAT VOLTAGE ADJUSTMENT POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 26.6 VOLTS AT BATTERY TERMINALS.

6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	539B163
	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
DECIMALS 2 PLACE ± 3 PLACE ±
ANGLES ±

539-0164

ME	SA	COST	HSG	TP	TAPE RELAY	GD	PUR
HULL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE JV 4-20-71
SEPIA FROM

DR JTM ENG JTM VINT CKR J.W.D.
DATE 12-3-70 SC —

MODEL 2 AMP BATTERY FLOAT CHARGER

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 24V

PATT NO

DWG NO 539-0164 B

5390188

LET	REVISIONS	ZONE	ENG	CHK	DATE
A	WAS # 332A1267	2-B	HFM	CP	9-27-73
A	WAS # 332-1269	2-B	RR	CIP	6-5-79
B	WAS # 332-1271	2-B	RR	CIP	6-5-79

TEST PROCEDURE

1. PLUG 12V BATTERY VOLTAGE SENSOR 300C798 INTO TEST CONNECTOR.

2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.

3. SET THE DC POWER SUPPLY VOLTAGE TO 12.3 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.

4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.

5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM 12.3 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.

6. TURN DC POWER SUPPLY VOLTAGE UP TO 13.7 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 REMAIN DARK.

7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.

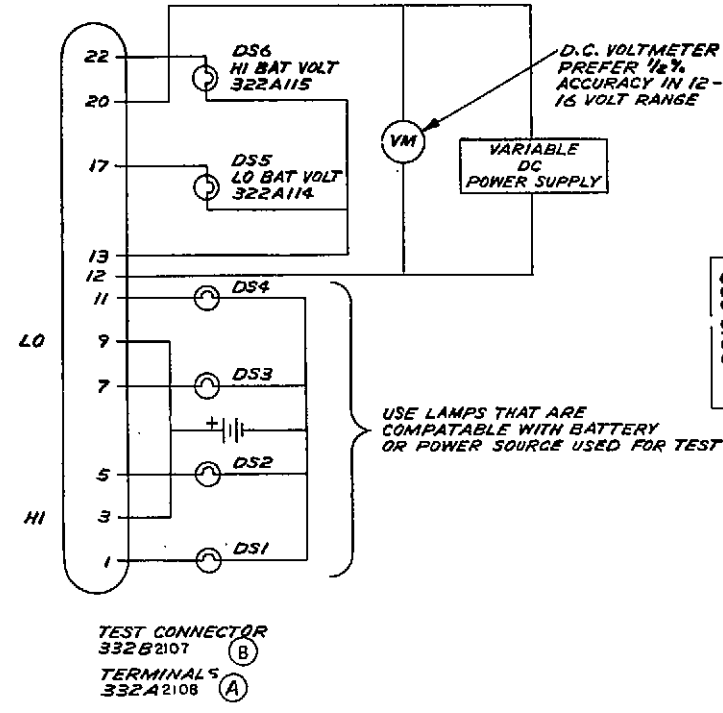
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.

9. RAISE DC SUPPLY VOLTAGE TO 15.5 ±.05 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.

10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
    LAMPS DS2 AND DS4 SHOULD LIGHT.
    LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.

11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 15.5 VOLTS.
    LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.

12. MAKE FINAL FACTORY ADJUSTMENT.
    a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 14.5 VOLTS AND GOES DARK WHEN LOWERED TO 14.4 VOLTS.
    b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 12.6 VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 12.8 VOLTS.



539-0188

300C796	539C189
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES ±
HOLES +.006 −.002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0188

SERIA FROM
DR J.W. MORK
CKR W.J.B
ENGR Jim Vust
SAMP REL
PROD REL JV 6-20-72
PROD REL
DATE 6-16-72

ITEM	PART NO.	QTY	BULK	DESCRIPTION OR MATERIAL
				Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
				TEST PROCEDURE BAT V SENSOR (12V)
				ATSD & ATSE

DWG SIZE C

539-0188

539-0189

LTR	REVISIONS	ZONE	DWG	CKD	DATE
A	WAS # 332A 1267	2-B	H/H	CP	9-28-73
A	WAS 3321269	2-B	AR	CIP	6-5-79
B	WAS 3321271	2-B	AR	CIP	6-5-79

TEST PROCEDURE

1. PLUG24V BATTERY VOLTAGE SENSOR 300C797 INTO TEST CONNECTOR.

2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.

3. SET THE DC POWER SUPPLY VOLTAGE TO 24.6 ± 0.1 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.

4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.

5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM24.6 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.

6. TURN DC POWER SUPPLY VOLTAGE UP TO 27.4 ± 0.2 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1 DS3 DS5 AND DS6 REMAIN DARK.

7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.

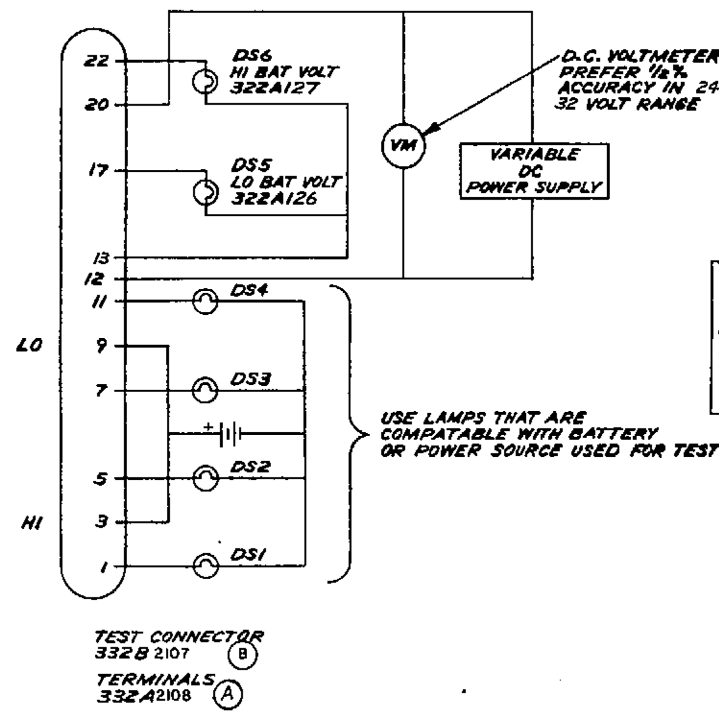
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.

9. RAISE DC SUPPLY VOLTAGE TO 31 ± 0.1 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.

10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.

11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 31 VOLTS.
   LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.

12. MAKE FINAL FACTORY ADJUSTMENT.
   a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 29 VOLTS, AND GOES DARK WHEN LOWERED TO 28.8 VOLTS.
   b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 25.2 VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 25.4 VOLTS.



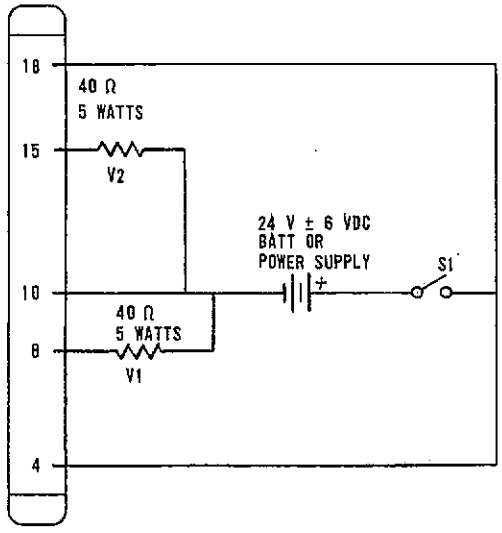
539-0189

59

300C797	539C188	SERIA FROM	ITEM	PART NO.	DWG SIZE	QTY	DESCRIPTION OR MATERIAL
NEXT ASSY	SIMILAR TO	DR J. W. MORK					Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± ANGLES ± HOLES +.006 −.002	DECIMALS 2 PLACE ± 3 PLACE ±	CKD W J B					TEST PROCEDURE BAT V SENSOR (24V)
		ENGR Jim Vint	DATE 6-16-72				
The proprietary design information on this print is owned by the Onan Division of Onan Corporation. Conveyance of this right is not extended to others.		PROD REL JV 6-20-72	ATSC				539-0189 SHEET C

539-0194 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS # 332A1267	A-4	[illegible]	CF	9-27-73
B	WAS # 332-1271	4-A	[illegible]	CIP	6-4-79
A	WAS # 332-1269	4-A	[illegible]	CIP	6-4-79



B TEST CONNECTOR
332-2107 (A)

A TERMINALS
332 2108 (A)

NOTES

1. PLUG 24VTO 12 V CONV INTO TEST FIXTURE.
2. CLOSE SWITCH S1 TO APPLY 24 V ± 6 VDC.
3. V1 & V2 SHALL BE 13.4 V ± 1 VDC.

NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONS ±	DECIMALS
ANGLES. . . ±	2 PLACE ±
HOLES. . . . + .006 − .002	3 PLACE ±

539-0194

SEPIA FROM

DR J. MORK

CKR WJB

ENGR

SAMP REL

PROD REL

PROD REL

DATE 7-27-72

ITEM	PART NO.				DWG SIZE
	95 Relay	price	tp	pur	ms
	weld	sa	hsg	gd	qc
	sec	punch	crank	ck	po
				sc	—

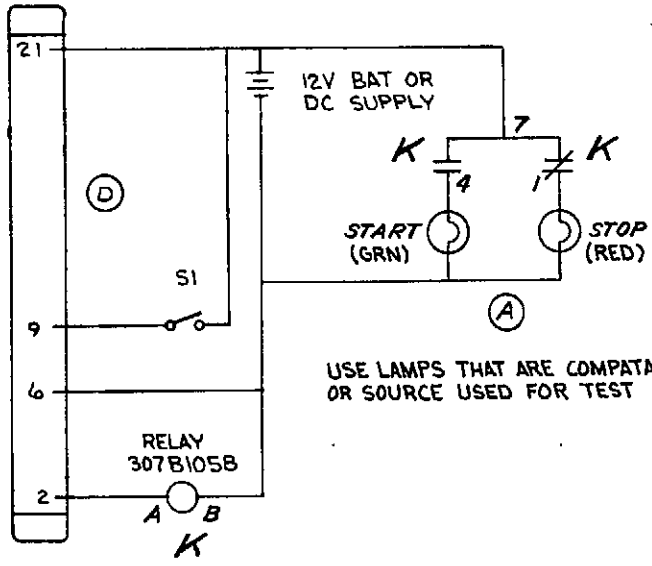
QTY	*BULK	DESCRIPTION OR MATERIAL
		Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
		TITLE: TEST PROCEDURE (24V TO 12V CONVERTER)
		MODEL: ATSC, ATSD & ATSE
		DWG NO. 539-0194

DWG SIZE B

FORM BE071

539-0195 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	ADDED TEST LAMPS	3-C	JV	VB	7-6-72
B	WAS #332 A 1267	4-A	WFM	JF	9-27-73
C	ADDED NOTE No. 6	2-B	RS	LDR	6-21-78
D	UPDATED TEST BOARD HOOK-UP	4-C	RS	CDR	6-21-78



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST

NOTES

1. PLUG 12 V T.O. START-STOP 300C921 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP
     OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY;
   - 5.1 START
     TURN START ADJ CLOCKWISE. CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP
     TURN STOP ADJ CLOCKWISE. OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES
6. (C) HOLDING CURRENT
   - 6.1 REDUCE VOLTAGE TO ½ RATING. CR14 SHALL STAY IN POSITION.

300C921	539B196
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES... ±
DECIMALS
2 PLACE ±
3 PLACE ±
HOLES... +.006 −.002

539-0195

DR	JTM
CKR	WJB
ENGR	JIM VINT
LAMP REL	
PROG REL	JV 7-14-72

ITEM	PART NO.	DWG SIZE	QTY	BULK	DESCRIPTION OR MATERIAL
50	954 Relay				
	price	tp	pur	inc	
	weld	sa	hrg	gd	qc
	sec	punch	crank	ck	po
DATE	6-13-72	sc	—		

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

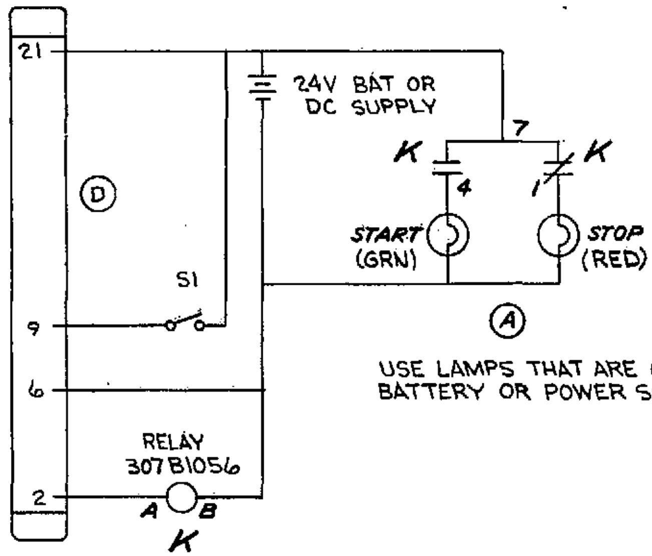
TEST PROCEDURE 12V (START - STOP)

ATSC, ATSD & ATSE

539-0195 DWG SIZE B

539-0196 DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	ADDED TEST LAMPS	3-C	JV	WB	7-6-72
B	WAS # 332A1267	4-A		CP	9-27-73
C	ADDED NOTE Nº 6.	2-B	RS	CDR	6-21-78
D	UPDATED TEST BOARD HOOK-UP	4-C	RS	CDR	6-21-78



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

NOTES:

1. PLUG 24 V T.D. START-STOP 300C922 INTO TEST FIXTURE.
2. APPLY 24 TO 30 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START: CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP: OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY;
   - 5.1 START: TURN START ADJ CLOCKWISE, CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP: TURN STOP ADJ CLOCKWISE, OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES.
6. (C) HOLDING CURRENT:
   - 6.1 REDUCE VOLTAGE TO ½ RATING. CR14 SHALL STAY IN CONDUCTION

300C922	539B195
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± / DECIMALS
ANGLES... ± / 2 PLACE ±
HOLES....+ .006 − .002 / 3 PLACE ±

539-0196

SEPIA FROM
DR JTM
CKR WJB
ENGR JIM VINT
SAMP REL
PROD REL JV 7-14-72
PROD REL
DATE 6-13-72 SC —

ITEM | PART NO. | DWG SIZE | QTY | *BULK | DESCRIPTION OR MATERIAL

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

TEST PROCEDURE 24V (START - STOP)

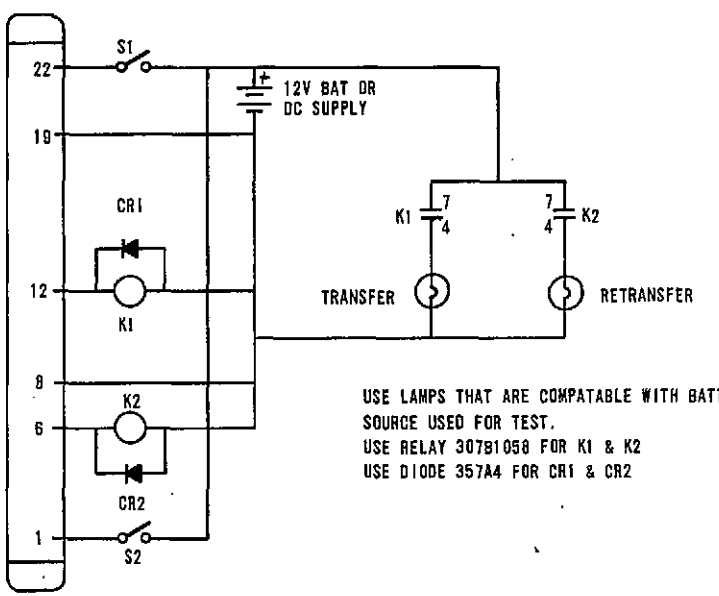
ATSC, ATSD & ATSE

DWG NO. 539-0196 DWG SIZE B

FORM 85071

539-0199 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS # 332-1267	A-4	[illegible]	cf	9-27-73
B	WAS # 332-1271	4-A	cf	CIP	6-4-79
A	WAS # 33-1269	4-A	[illegible]	CIP	6-4-79



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST.
USE RELAY 30791058 FOR K1 & K2
USE DIODE 357A4 FOR CR1 & CR2

(B) TEST CONNECTOR 332-2107 (A)
(A) TERMINALS 332 2108 (A)

NOTES:

1. PLUG 12 V T.D. TRANSFER 300C924 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN TRANSFER ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   4.1 TRANSFER
   CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K1 PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
5. FACTORY SET TIME DELAY:
   5.1 TRANSFER
   TURN TRANSFER ADJ CLOCKWISE. CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.

	539-201
NEXT ASSY	539-200
	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES. . . ±
HOLES. . . . + .006
DECIMALS
2 PLACE ±
3 PLACE ±

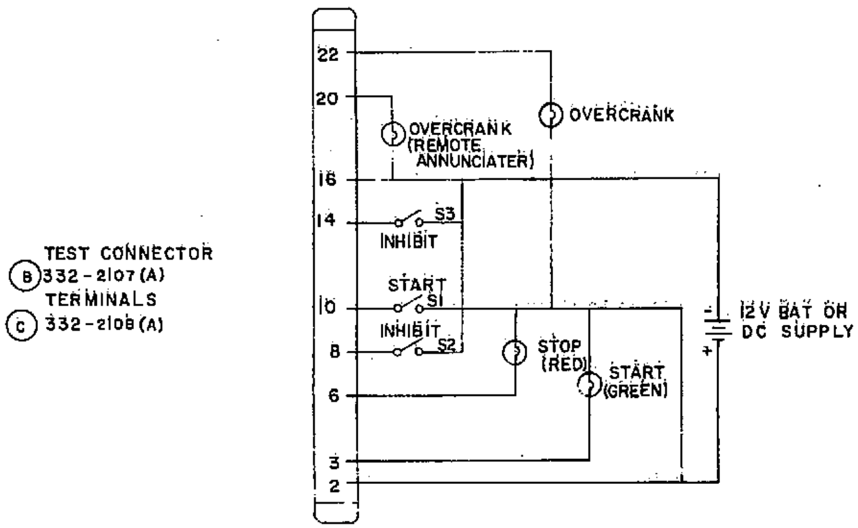
539-0199

SEPIA FROM
DR J. MORK
CKR W.I.B.
ENGR JIM VINT
SAMP REL
DATE 7-27-72

ITEM	PART NO.	DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
	OSC relay / price / tp / pur / me				Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld / sa / hsg / gd / qc				TEST PROCEDURE 12 V (TRANSFER)
	sec / punch / crank / ck / po				
	DATE 7-27-72 / sc —				539-0199

539-0202

LTR	REVISIONS	ZONE	ENG	CKR	DATE
SUPSD'S	DWG SAME NO. "B" SIZE DATED				7-31-72
A	NOTE 7 TIME WAS 150 SEC.	2-B	JN	CDK	6-28-77
B	WAS *332-1271	4-C		C/P	6-5-79
C	WAS *332-1269	4-C		C/P	6-5-79



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST

NOTES:

1. PLUG 2-3 WIRE CONVERTER 300C0926 INTO TEST FIXTURE.
2. SET SELECTOR SWITCH ON CONVERTER IN NORMAL POSITION. PLACE S1, S2, S3 AND CLOCK SWITCH IN OPEN POSITION.
3. APPLY 12-15 VDC. STOP LIGHT SHOULD GO ON.
4. MEASURE MINIMUM OVERCRANK TIME DELAY (POT R-7, MAX CCW).
   - 4.1 CLOSE CLOCK SWITCH, CLOSE SWITCH S1; STOP LIGHT GOES OFF, START LIGHT GOES ON. AFTER TIME DELAY, START LIGHT OFF AND OVERCRANK LIGHT ON. TIME DELAY MUST BE LESS THAN 5 SEC.
   - 4.2 OPEN SWITCH S1, PUSH RESET SWITCH ON CONVERTER AND OPEN CLOCK SWITCH. (NOTE: OBSERVE RESET ACTION DURING THIS STEP).
5. INHIBIT: SET CRANK TIME FOR 5-10 SEC., CLOSE SWITCH S2 DURING START.
   - 5.1 START LIGHT SHOULD GO OUT WHEN S2 IS CLOSED, AND SHOULD NOT LIGHT AFTER TIME DELAY. OPEN S2.
   - 5.2 REPEAT FOR S3, SAME RESULTS.
   - 5.3 OPEN S1, S2, S3 AND CLOCK SWITCH.
6. HAND CRANK: PLACE SELECTOR SWITCH ON CONVERTER IN HAND CRANK POSITION; BOTH STOP AND START LIGHTS SHOULD BE OFF. CLOSE CLOCK SWITCH, OVERCRANK LIGHT SHOULD NOT COME ON AFTER TIME DELAY.
7. (A) MEASURE MAXIMUM OVERCRANK TIME DELAY. (R-7 MAX CW)
   - 7.1 CLOSE CLOCK SWITCH AND SWITCH S1; STOP LIGHT GOES OFF, START LIGHT GOES ON. START LIGHT GOES OFF AND OVERCRANK LIGHT GOES ON AFTER TIME DELAY. THIS TIME DELAY MUST BE GREATER THAN 90 SEC.
   - 7.2 OPEN SWITCH S1, OPEN CLOCK SWITCH.
8. ADJUST POT R-7 FOR 75 ±5 SEC TIME DELAY. (NOTE: FOLLOW STEP 7.1 BUT ADJUST TO 75 ±5 SEC.)
9. STOP POSITION: PLACE SWITCH ON CONVERTER IN STOP POSITION; STOP LIGHT SHOULD BE ON AND START LIGHT SHOULD BE OFF.
   - 9.1 RETURN SWITCH ON CONVERTER TO NORMAL POSITION, OPEN ALL SWITCHES ON TESTOR, TURN OFF POWER AND REMOVE CIRCUIT BOARD.

539-0202

64

NEXT ASSY | SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ± ; ANGLES ± ; HOLES +.005 -.002 ; DECIMALS: 2 PLACE ± ; 3 PLACE ±

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539-0202

DR ML · CKR CDR · DATE 10-12-73

ITEM | PART NO. | DWG SIZE | QTY | BULK | DESCRIPTION OR MATERIAL

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

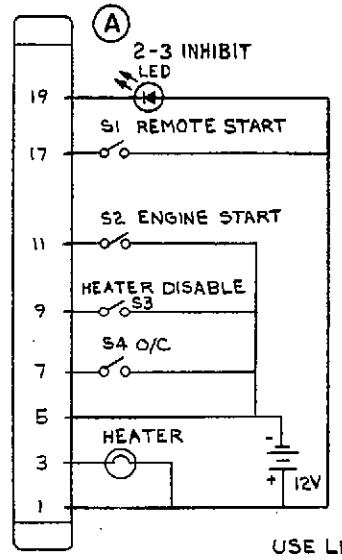
TEST PROCEDURE (2 TO 3 WIRE CONV)

ATSE

539-0202 · DWG SIZE C

539-0241 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS DIFFERENT TYPE LIGHT	4-C		W3	4-11-74
B	WAS 75 SECONDS	2-C	JM	CPR	6·5·77
C	WAS * 332-1271	4-A		CIP	6-4-79
D	WAS * 332-1269	4-A		CIP	6-4-79



USE LIGHTS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

(C) TEST CONNECTOR 332-2107 (A)
(D) TERMINALS 332-2108 (A)

NOTES:

1. PLUG TD PREHEAT 300-1072 INTO TEST FIXTURE.
2. APPLY 12-15VDC. NO LIGHTS SHOULD COME ON.
(B) 3. SET TIME DELAY. CLOSE S1 2-3 INHIBIT AND HEATER LIGHT SHOULD COME ON. SET ADJ. POT. SO INHIBIT LIGHT GOES OFF 60 ± 5 SECONDS AFTER S1 IS CLOSED.
4. AFTER INHIBIT LIGHT GOES OFF, CLOSE S2. HEATER LIGHT GOES OFF. INHIBIT LIGHT STAYS OFF.
5. OPEN S2, HEATER LIGHT TURNS ON, INHIBIT LIGHT STAYS OFF.
6. CLOSE S3, HEATER LIGHT GOES OFF, INHIBIT STAYS OFF.
7. OPEN S3, HEATER LIGHT TURNS ON, INHIBIT STAYS OFF.
8. CLOSE S4, HEATER LIGHT GOES OFF, INHIBIT STAYS OFF.
9. OPEN S4, HEATER LIGHT AND INHIBIT LIGHT TURN ON.
10. OPEN S1, BOTH LIGHTS GO OFF.

	539-0238	B
NEXT ASSY	SIMILAR TO	

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES . . . ±
HOLES . . . + .006 − .002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0241

SEPIA FROM
DR GTC
CKR WJB
ENGR
SAMP REL
PROD REL
PROD REL

ITEM	PART NO.				DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
95	relay	price	lp	pur	me			
	weld	sa	hsg	gd	qc			
	sec	punch	crank	ck	po			

DATE 10-18-73 SC

Onan
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

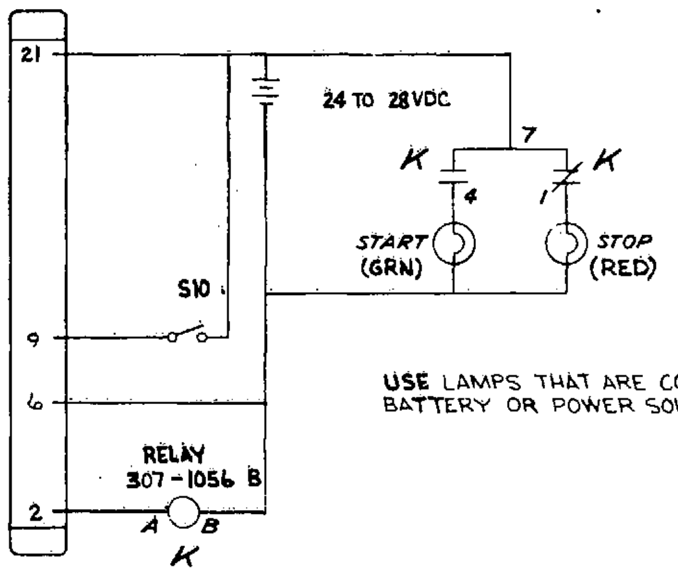
TEST PROCEDURE 12V (TD PREHEAT)

MODEL ATE
DWG NO. 539-0241
DWG SIZE B

FORM 81071

539-0281 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
	SUPSD DWG SAME NO. DTD 4-4-77 W/CHG				



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

NOTES:

1 PLUG 24V T.D START-STOP 300-1060 (C) INTO TEST FIXTURE

2 APPLY 24 TO 28 VDC

3 SET ALL SWITCHES IN OPEN (0) POSITION

4 MEASURE TIME DELAY

4.1 START:
CLOSE SWITCH S10 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MEASURED AT 8 SEC ± 1SEC

4.2 STOP:
OPEN SWITCH S10 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT: TIME MEASURED AT 8 SEC ± 1SEC.

5 FACTORY SET TIME DELAY;

5.1 START
RESET SWITCHES 1-4 (1.0.1.1) ON. OFF. ON. ON
AND MEASURE TIME DELAY TIME MUST EXCEED 5 MIN

5.2 STOP
RESET SWITCHES 5-8 (1 0 1 1) ON OFF. ON. ON
AND MEASURE TIME DELAY TIME MUST EXCEED 5 MIN

NEXT ASSY		SIMILAR TO	
300-1060	C	539-0371	B

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± | DECIMALS
ANGLES ± | 2 PLACE ±
HOLES + .005 − .002 | 3 PLACE ±

539-0281

SEPIA FROM 539-0371
DR DFO
CKR CDR
ENGR RSS 6-22-78
DATE 6-22-78
PROD REL RSS 6-22-78

ITEM | PART NO. | DWG SIZE | QTY | BULK | DESCRIPTION OR MATERIAL

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

TEST PROCEDURE 24V

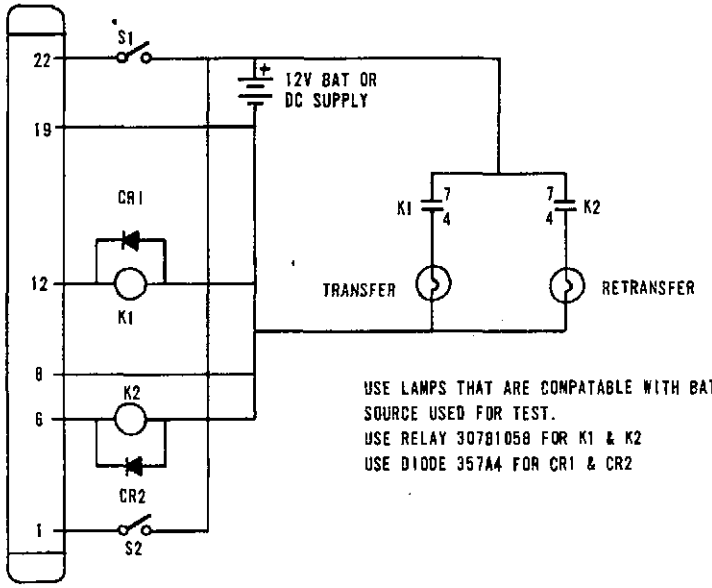
AT (PROGRAM TIMER)

DWG NO 539-0281 | DWG SIZE B

FORM 86071

539-0282 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS* 332-1271	4-A	-	CIP	6-4-79
B	WAS* 332-1269	4-A	JC	CIP	6-4-79



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST.
USE RELAY 30781058 FOR K1 & K2
USE DIODE 357A4 FOR CR1 & CR2

(A) TEST CONNECTOR 332-2107(A)
(B) TERMINALS 332-2108(A)

NOTES:

1. PLUG 12 V T.D. RETRANSFER/XFR 300C1188 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN TRANSFER ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   4.1 TRANSFER
   CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K1 PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
5. FACTORY SET TIME DELAY:
   5.1 TRANSFER
   TURN TRANSFER ADJ CLOCKWISE. CLOSE SWITCH S1. AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   5.2 RETRANFER:
   CLOSE SWITCH S2 AND MEASURE RETRANFER LED PULSE RATE. ADJ RETRANFER UNTIL LED HAS A PULSE RATE OF 10 PULSES IN A 10 SEC TIME SAMPLE. TIME DELAY 15 MIN ± 10%

300-1188	539-0199
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES . . . ±
HOLES . . . . +.006 −.002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0282

SEPIA FROM
DE DFO
CKR WJB
ENGR
SALES REL
PROD REL
PROD REL

ITEM	PART NO.	DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL

95 relay | price | tp | pur | me
weld | sa | hsg | gd | qc
sec | punch | crank | ck | pa
DATE 9-24-75 | sc —

Onan
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

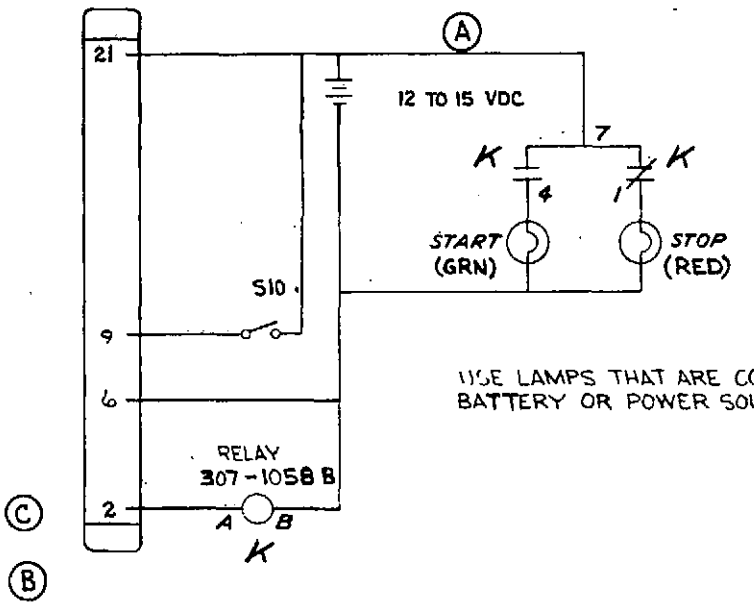
TEST PROCEDURE 12V RETRANSFER/XFR

MODEL ATSC, ATSD & ATSE

DRWG 539-0282

539-0371 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS 12V	3-C	RS	CDR	6-22-78
B	DELETED TEST CONNECTOR	4-B	RS	CDR	6-22-78
C	TERM 2 WAS 1 ; TERM 21 WAS 22	4-B	RS	CDR	6-22-78



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

NOTES:

1. PLUG 12 V T.D. START-STOP 300-1059 (C) INTO TEST FIXTURE
2. APPLY 12 TO 15 VDC.
3. SET ALL SWITCHES IN OPEN (0) POSITION
4. MEASURE TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S10 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MEASURED AT 8 SEC ± 1SEC
   - 4.2 STOP:
     OPEN SWITCH S10 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT: TIME MEASURED AT 8 SEC ± 1SEC.
5. FACTORY SET TIME DELAY:
   - 5.1 START
     RESET SWITCHES 1-4 (1,0,1,1) ON, OFF, ON, ON AND MEASURE TIME DELAY, TIME MUST EXCEED 5 MIN.
   - 5.2 STOP
     RESET SWITCHES 5-8 (1,0,1,1) ON, OFF, ON, ON AND MEASURE TIME DELAY, TIME MUST EXCEED 5 MIN.

68

300-1059 C			
NEXT ASSY	SIMILAR TO		
TOLERANCES UNLESS OTHERWISE SPECIFIED			
FRACTIONS ±	DECIMALS		
ANGLES . . . ±	2 PLACE ±		
HOLES . . . . + .006 − .007	3 PLACE ±		

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539-0371

SEPIA FROM 539-0238 | DR [illegible] | CKR EE | ENGR [illegible] | SAMP REL | PROD REL | PROD REL [illegible] | DATE 4-4-77

ITEM	PART NO.					DWG SIZE	QTY	BULK	DESCRIPTION OR MATERIAL
95	50K relay	price	tp	pur					
	weld	so	hsg	gd					
	sec	punch	crank	ck					

SC —

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 12V

AT (PROGRAM TIMER) | 539-0371 | DWG SIZE B

FORM 68071

AT'S WITH CONTROL PANEL GROUPS 51 THROUGH 55

Find the problem below and proceed to the page indicated. Then answer the questions in the chart on that page either "YES" or "NO." Refer to the number in the column and proceed to that step, etc.

INDEX

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2A.	Is control panel disconnect plug properly inserted into receptacle?	3A	—
3A.	Is test transfer switch S1 in the NORMAL position?	4A	—
4A.	Does automatic transfer switch have NORMAL and EMERGENCY indicating lamps?	5A	9A
5A.	Is the green NORMAL lamp lit?	6A	9A
6A.	Are contacts K1-CS closed to connect rated voltage across closing coil K1-CC?	8A	7A
7A.	Repair or replace K1-CS contacts.	—	—
8A.	Is closing coil K1-CC open circuited or is there an obstruction preventing transfer switch from closing?	—	—
9A.	Does automatic transfer switch have area protection equipment or remote test switch connected to terminals TB1-4 and TB1-5?	10A	12A
10A.	Jumper terminals TB1-4 and TB1-5. Does AT transfer load to line?	11A	12A
11A.	Check area protection equipment or remote test switch for malfunction (circuit must be closed for retransfer).	—	—
12A.	Is this a three-phase AT?	13A	16A
13A.	Jumper relay contacts K6 (3-5). Does this correct problem?	14A	16A
14A.	Clean contacts K6 (3-5). Does this correct problem?	—	15A
15A.	Replace relay K6.	—	—
16A.	Does AT have a retransfer time delay K10?	17A	20A
17A.	Jumper relay contacts K4 (5-6). Does this correct problem?	18A	20A
18A.	Clean contacts K4 (5-6). Does this correct problem?	—	19A
19A.	Replace relay K4.	—	—
20A.	Are relay contacts K3 (5-6), contacts K3 (3-4) for 480- and 600-volt system, closed and making good contact?	23A	21A
21A.	Clean contacts K3 (5-6), K3 (3-4) for 480- and 600-volt system. Does this correct problem?	—	22A
22A.	Replace relay K3.	—	—
23A.	Does AT have a programmed transition time delay assembly (located in rear of standard cabinet below transfer switch)?	24A	26A
24A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	25A	26A
25A.	Repair or replace time delay K11.	—	—

A.	(Continued)	YES	NO
26A.	Is transfer switch mechanically-held on generator side?	27A	31A
27A.	Are generator-side main contacts of transfer switch open?	31A	28A
28A.	Jumper normally-open K2 interlock contacts (in series with K2 tripcoil). Does transfer switch operate?	29A	30A
29A.	Repair or replace normally-open K2 interlock contacts.	—	—
30A.	Is K2 trip coil open-circuited or is trip coil mechanism obstructed?	—	—
31A.	Is rated voltage across closing coil K1-CC?	35A	32A
32A.	Does transfer switch operate if normally-closed K2-IC contacts are jumpered?	33A	34A
33A.	Repair or replace normally-closed K2-IC contacts.	—	—
34A.	Repair or replace cutout switch K1-CS.	—	—
35A.	Closing coil K1-CC is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Does AT have "NORMAL" and "EMERGENCY" indicating lamps?	3B	4B
3B.	Is "EMERGENCY" lamp lit?	23B	4B
4B.	Does AT have a transfer time delay K13?	5B	8B
5B.	Is time delay completed?	6B	—
6B.	Does transfer switch operate if terminal K13-1 is jumpered to K13-5 (jumper K13-1 to K13-2 for 480- or 600-volt system)?	7B	8B
7B.	Repair or replace transfer time delay K13.	—	—
8B.	Is transfer inhibit circuit connected to terminals TB6-11 and -12?	9B	11B
9B.	Does AT transfer load if terminal TB6-11 is jumpered to TB6-12?	10B	11B
10B.	Check for malfunction in inhibit circuit.	—	—
11B.	Does AT have a programmed transition time delay assembly (located in rear of standard cabinet below transfer switch)?	12B	14B
12B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6?	13B	14B
13B.	Repair or replace time delay K12.	—	—
14B.	Are contacts K3 (1-3), K3 (5-6) for 480- or 600-volt systems, closed and making good contact?	16B	15B
15B.	Replace relay K3.	—	—
16B.	Are line-side main contacts of transfer switch open?	20B	17B
17B.	Jumper normally-open K1 interlock contacts (in series with K1 trip coil). Does transfer switch operate?	18B	19B
18B.	Repair or replace normally-open K1 interlock contacts as needed.	—	—
19B.	Is K1 trip coil open-circuited or is trip mechanism obstructed?	—	—
20B.	Is rated voltage across closing coil K2?	26B	21B
21B.	Does transfer switch operate if normally-closed K1-IC contacts are jumpered?	22B	23B
22B.	Repair or replace normally-closed K2-IC contacts.	—	—
23B.	Is transfer switch mechanically-held on generator side?	24B	26B

B.	(Continued)	YES	NO
24B.	Does transfer switch operate if cutout switch K2-CS is jumpered?	25B	26B
25B.	Repair or replace cutout switch K2-CS.	—	—
26B.	Closing coil K1 (CC) is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

C.	Automatic transfer switch fails to start generator set during a power outage.	YES	NO
	AT-C AND AT-D (Two-Wire Start)		
1C.	Place automatic transfer switch selector switch S2 to TEST. Does generator set start?	6C	2C
2C.	Is selector switch on engine control in REMOTE position?	3C	—
3C.	Does generator set start, run and stop with switch located on engine control? Return switch to remote position.	4C	—
4C.	Jumper TB1-B+ to TB1-RMT. Check to ensure that voltage from GND to TB1-RMT is equal to battery rated voltage. Does engine crank?	5C	—
5C.	Check circuit from TB1-B+ through AT switch S2 (1-2) to TB1-RMT for loose connections or open circuit.	—	—
6C.	Does AT have a start time delay K7?	7C	8C
7C.	Has time delay K7 completed its delay?	8C	—
8C.	Does generator set start if terminal K7-1 is jumpered to K7-5?	9C	—
9C.	Replace relay K7.	—	—
	AT-E (Three-Wire Start)		
1C.	Place automatic transfer switch selector switch S2 to TEST. Does generator set start?	12C	2C
2C.	Has an engine overcrank occurred? Check overcrank button on AT control accessory panel.	3C	4C
3C.	See generator set manual.	—	—
4C.	Jumper terminal K5-1 to K5-2. Does generator set start and run?	5C	6C
5C.	Replace cranking limiter assembly.	—	—
6C.	Does AT have a preheat time delay for a diesel generator set?	7C	10C
7C.	Has preheat time delay completed its delay?	8C	—
8C.	Does generator set start and run if terminal TB1-H is jumpered to TB1-3?	9C	10C
9C.	Check preheat time delay circuit for an open and replace time delay if necessary.	—	—
10C.	Jumper contacts K4 (1-2). Does engine crank?	11C	—
11C.	Replace relay K4.	—	—
12C.	Move selector switch back to NORMAL. Does AT have automatic exercise clock?	13C	15C

C.	(Continued)	YES	NO
13C	Does generator start and run if exerciser contact M1-4 is jumpered to M1-5?	14C	15C
14C.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	--
15C.	Does AT have a start time delay relay K7?	16C	17C
16C.	Has time delay K7 completed its delay?	17C	--
17C.	Does generator set start if terminal K7-1 is jumpered to K7-5?	18C	—
18C.	Replace relay K7.	—	—

D.	**Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.**	YES	NO
1D.	Is control panel disconnect plug inserted completely into receptacle?	2D	—
2D.	Is test transfer switch S1 in closed (NORMAL) position?	3D	—
3D.	Is rated AC voltage present at transfer switch line terminals?	4D	—
4D.	Does automatic transfer switch have area protection equipment or remote test switch connected to terminals TB1-4 and TB1-5?	5D	7D
5D.	Jumper terminals TB1-4 to TB1-5. Does automatic transfer switch retransfer load to line (at end of retransfer time delay if used)?	6D	7D
6D.	Check area protection equipment or remote test switch for malfunction (circuit must be closed for retransfer).	—	—
7D.	Is automatic transfer switch a 3-phase AT?	8D	10D
8D.	Is rated AC voltage (nominal 220 with 480- or 600-volt system) present between terminals K10-6 and K10-8?	10D	9D
9D.	Replace phase protection relay K6.	—	—
10D.	Does AT have a retransfer time delay relay K10?	11D	13A
11D.	Has motor timer completed time delay period? Time delay expired if AC voltage is present between terminals K10-6 and K10-7.	16A	12D
12D.	Replace motor timer if it is stalled (does not time out).	—	—

E.	Automatic transfer switch delays transferring load to line until generator set stops after a power outage.	YES	NO
1E.	Does AT have a retransfer time delay K10?	2E	5E
2E.	Has time delay completed delay period? Time delay expired if AC voltage present between terminals K10-6 and K10-7 (with generator set running—K4 energized).	3E	—
3E.	Does transfer switch retransfer load to line if terminal K10-8 is jumpered to K10-7?	4E	5E
4E.	Repair or replace retransfer time delay K10.	—	—
5E.	Do relay contacts K3 (5-6), contacts K3 (3-4) for 480- or 600-volt system, close when the normal source voltage returns?	6E	7E
6E.	Clean K3 contacts. Does this correct problem?	—	7E
7E.	Replace relay K3.	—	—

F.	Generator set starts during normal power service.	YES	NO
1F.	Is operation selector switch S1 positioned at NORMAL?	2F	—
2F.	Is control panel disconnect plug inserted completely into receptacle?	3F	—
3F.	Does automatic transfer switch have an exerciser clock?	4F	5F
4F.	Is exerciser clock turned to exercise period?	—	5F
5F.	Is rated AC voltage present at transfer switch line terminals?	6F	—
6F.	Does AT have voltage sensor modification?	7F	9F
7F.	Record pick-up voltage dial settings with small pencil marks on the modules. Turn the pick-up voltage knobs to 90 or below. Does generator set stop (after time delay if applicable)? After test, return knobs to original settings.	8F	9F
8F.	Recheck the normal line voltage and output voltage of transformer for voltage sensor modification for lower than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
9F.	Is automatic transfer switch a 3-phase AT?	10F	12F
10F.	Is phase protection relay K6 energized and the contacts K6 (3-5) closed and making good contact?	12F	11F
11F.	Replace phase protection relay K6.	—	—
12F.	Does AT have a start time delay K7?	13F	14F
13F.	Measure for rated AC voltage (nominal 220 volts with 480- or 600-volt system) from terminal K7-L1 to K7-L2. If present, repair or replace start time delay relay K7.	—	—
14F.	Is start-stop relay K7 energized and are contacts K7 (1-5) open?	—	15F
15F.	Replace start-stop relay K7.	—	—

G.	Exerciser clock does not start generator set.	YES	NO
1G.	Does exerciser motor timer M1 operate?	2G	15G
2G.	Is operation selector switch S2 at NORMAL?	3G	—
3G.	Has overcrank condition occurred?	—	4G
4G.	Does generator set have two-wire starting?	5G	6G
5G.	Are contacts M1 (3-5) closed and making good contact to put battery voltage on TB1-RMT terminal during exerciser period? See instructions for exercise clock adjustments.	—	16G
6G.	Are contacts M1 (4-5) open and M1 (3-5) closed during exercise period? See instructions for exercise clock adjustments.	7G	16G
7G.	Jumper terminal K5-1 to K5-2. Does generator set start and run?	8G	9G
8G.	Replace cranking limiter assembly.	—	—
9G.	Does AT have a preheat time delay for a diesel generator set?	10G	13G
10G.	Has preheat time delay completed its delay?	11G	—
11G.	Does generator set start and run if terminal TB1-H is jumpered to TB1-3?	12G	13G
12G.	Check preheat time delay circuit for an open and replace time delay if necessary.	—	—
13G.	Jumper contacts K4 (1-2). Does engine crank?	14G	—
14G.	Replace relay K4.	—	—
15G.	Replace the exerciser clock.	—	—
16G.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—

H.	**Overcrank lamp does not light on overcrank condition (AT-E only).**	YES	NO
1H.	Has overcrank reset button popped out on control accessory panel?	2H	—
2H.	Is battery voltage present between terminals TB6-1 and TB6-9?	3H	4H
3H.	Check wire connections at overcrank lamp. Replace lamp if burned out.	—	—
4H.	Check cranking limiter K5 and replace if necessary.	—	—

Onan

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

Cummins Power Generation