

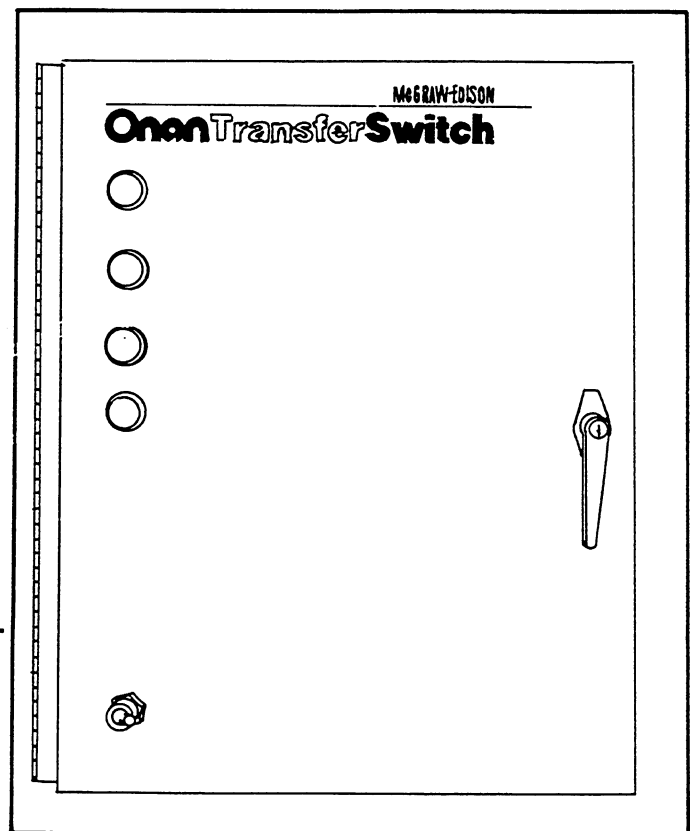
McGRAW-EDISON



# Operator's Manual

## OT II Switch

**GenSet-to-GenSet  
Automatic Control**



# Safety Precautions

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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** *This symbol is used throughout the text to warn of possible injury or death.*

**CAUTION** *This symbol is used to warn of possible equipment damage.*

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

Keep the transfer switch cabinet closed and locked. Make sure only authorized personnel have the cabinet and operational keys.

Due to high voltages of components within the cabinet which present a serious shock hazard, always have an electrician or authorized service representative perform any service or adjustments to the automatic transfer switch. If the cabinet must be opened

for any reason, move the operation selector switches on both generator sets to STOP and disconnect the starting batteries. If the instructions require otherwise, use extreme caution due to danger of shock hazard.

Before beginning adjustments to a generator set, move its operation selector switch to STOP and disconnect its starting batteries. Otherwise, accidental starting of the set might cause severe personal injury or death.

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**

**INCORRECT SERVICE OR REPLACEMENT OF PARTS MIGHT RESULT IN SEVERE PERSONAL INJURY AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.**

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# Introduction

## OPERATORS MANUAL

This operators' manual provides information necessary for operation of the Onan OT transfer switch. The manual includes installation, description, and operation chapters. A troubleshooting guide is also included. Operators should become familiar with this manual, especially the operation procedures which apply to their automatic transfer switch.

## TRANSFER SWITCH APPLICATION

This OT series transfer switch enables two generator sets to provide a prime power source system, each running at controlled, alternate times (system often referred to either as a plant-to-plant or a prime power system). The OT includes a change-over clock which is normally set to run one generator set for a week and then run the other generator set for a week. Figure 1 shows designated Generator Set #1 connected to load.

Prime power as used in this manual means generator sets provide total power for the load (no outside power source). These systems are usually used in remote areas where utility power source is unavailable, or it would require an expensive utility connection.

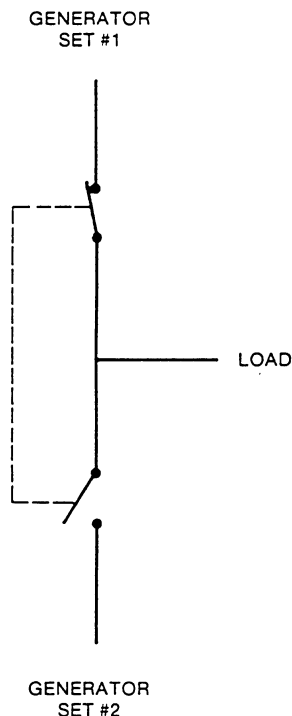


FIGURE 1. SERIES OT TRANSFER SWITCH

## MODEL IDENTIFICATION

Identify your model by referring to the Model and Specification number as shown on the nameplate. Electrical characteristics are shown on the lower portion of the nameplate. It is located inside the cabinet door on the control box cover.

If it is necessary to contact a dealer or the factory regarding the transfer switch, always give the complete Model, Spec, and Serial number as listed on the nameplate. Also give the number(s) of any options that may be listed on a label below the nameplate. This information is necessary to properly identify your unit among the many types manufactured.

A typical model number with explanation is given below.

OT	B	D	A	260	-	4X	U	/	31	01	E
1	2	3	4	5		6	7		8	9	10

1. Basic model series.  
OT indicates OT II transfer switch series.
2. Number of switched conductor poles.  
B-indicates 3-pole.
3. Basic control group.  
D-indicates generator set to generator set.
4. Enclosure type.  
A-indicates general purpose NEMA 1.
5. Ampere rating.
6. Voltage code and frequency.  
4X or 54X (50 Hz) = 277/480, 3-phase, 4-wire.
7. Agency Certification.  
U-Underwriters' Laboratories, Inc.
8. Control option group number.
9. Meter option group number.
10. Specification letter: advances with production modification.

# Installation

## LOCATION

Locating the transfer switch in the existing electrical circuit varies with application. A typical installation is shown in Figure 2.

Choose a vibration-free mounting surface. Avoid hot, moist, or dusty locations.

## MOUNTING

### Wall Mount, 40-100 Ampere

1. Install two mounting bolts in the wall for the bottom cabinet mounting keyholes.
2. With the shipping box standing so the cabinet is upright, carefully remove the top and sides of the box.
3. Raise cabinet and mount on the two mounting bolts in the wall.

#### **WARNING**

*Have sufficient manpower for lifting and mounting cabinet to prevent serious personal injury.*

4. Tighten two bottom mounting bolts.
5. Install two top mounting bolts and tighten.

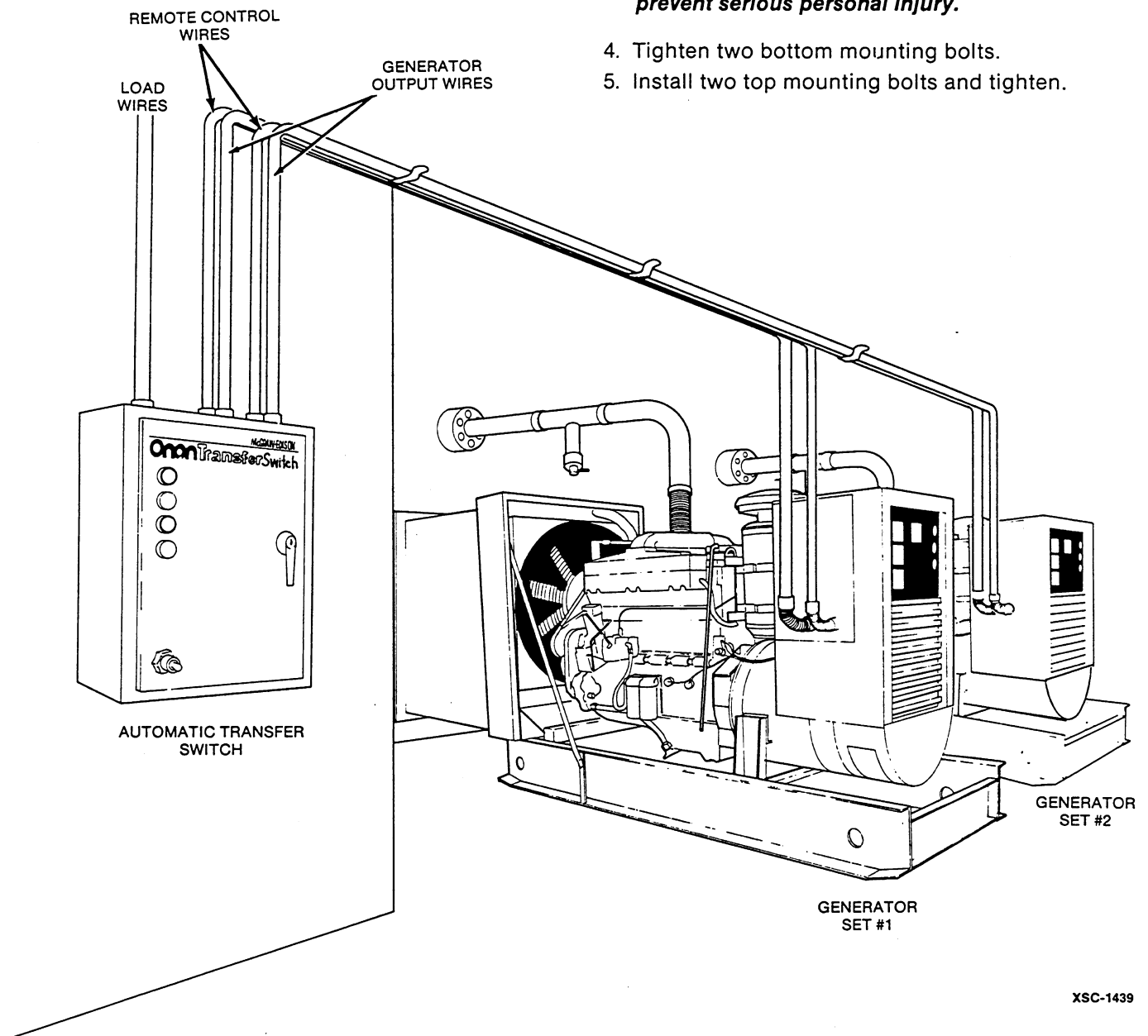


FIGURE 2. TYPICAL WALL MOUNT INSTALLATION

## Floor Mount, 150-1000 Ampere

1. With the shipping box standing so the cabinet is upright, carefully remove the top and sides of the box.
2. Connect a hoist or similar lift to the two lifting eyebolts on the cabinet top.

**WARNING** *Do not attempt to lift manually because of the danger of serious personal injury.*

3. Carefully raise the cabinet and move it to its installation location. Mounting bolts are usually placed in concrete when floor is poured. Bolts should protrude about one inch (25 mm) from floor. Secure the cabinet to the floor.

## WIRING

### General

Wiring must be performed by qualified personnel only. If using rigid conduit between the generator sets and the OT transfer switch, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator sets to absorb vibration. Run control circuit wiring in separate conduit from the AC wiring, otherwise induced currents could cause operational problems within the OT. When facing the front of the cabinet, knockouts can be made through the top, bottom, or right side of the cabinet.

**CAUTION** *Use extreme care to keep drill chips and fillings out of the relays, contacts, and other parts of the automatic transfer switch when mounting or connecting conduit. Also, screwdrivers should be used carefully to prevent damage to the resistors, coils, and contacts.*

### Generator Set and Load Connections

Perform wiring in the following sequence:

1. Test operation of the generator sets from their own controls.
2. Stop the generator sets and remove the negative lead from the cranking batteries to prevent starting.

**WARNING** *Failure to prevent the generator sets from starting before wiring procedures are performed presents a shock hazard and might cause serious personal injury or death.*

3. Connect wires of sufficient size to carry rated current from the load and generator sets to the transfer switch terminals marked A, B, and C (A and B on single-phase switches). Table 1 gives the type and maximum wire size the transfer switch will accept. Figure 3 shows transfer switch connections.

**TABLE 1. TERMINAL LUG CAPACITY**

**For Copper or Aluminum Conductors**

Switch Amp Rating	Number of Conductors	Size Range of Conductors
40	1	#0 AWG to #14 AWG
70	1	#0 AWG to #14 AWG
100	1	#0 AWG to #14 AWG
150	1	#6 AWG to 350 MCM
260	1	#4 AWG to 500 MCM
400	1	350 MCM to 1000 MCM
600	2	#2 AWG to 600 MCM
800	4	#4 AWG to 600 MCM
1000	4	#4 AWG to 600 MCM

For transfer switches with an AC ammeter, the load wires must pass through a transformer three times for 40-ampere OT, twice (two primary turns) for a 70- and 100-ampere OT, once (one primary turn) for any 150-through 1000-ampere OT. See Figure 4.

4. Neutral bar with lugs is standard on switches supplied with cabinet. See Table 2 for wire sizes.

OT transfer switches of 150 to 1000 ampere size are factory assembled with the load terminal lugs at the top. The load terminal lugs may be moved for a bottom connection using this procedure:

- A. Remove switch covers, and load cover on front connect units. See Figure 5. On 600 through 1000 ampere transfer switches, the end assemblies on each end of the actuator rod must be removed to facilitate removal of the switch cover.
- B. Remove nuts and lockwashers from jumper strap at center of switch (leave bolts in place). See Figure 5.
- C. Remove screw, lockwasher and flatwasher securing the standoff insulator to the mounting base.
- D. Reverse position of load strap and replace hardware removed in Step B. Be sure electrical joint compound is applied before assembly.
- E. Secure standoff insulator at bottom of switch with hardware removed in Step C.
- F. Torque screws and nuts to values shown in Figure 5.
- G. Replace load cover and switch covers.
- H. Replace end assemblies on actuator rod and torque screws to value shown (600 and 1000 ampere units only).

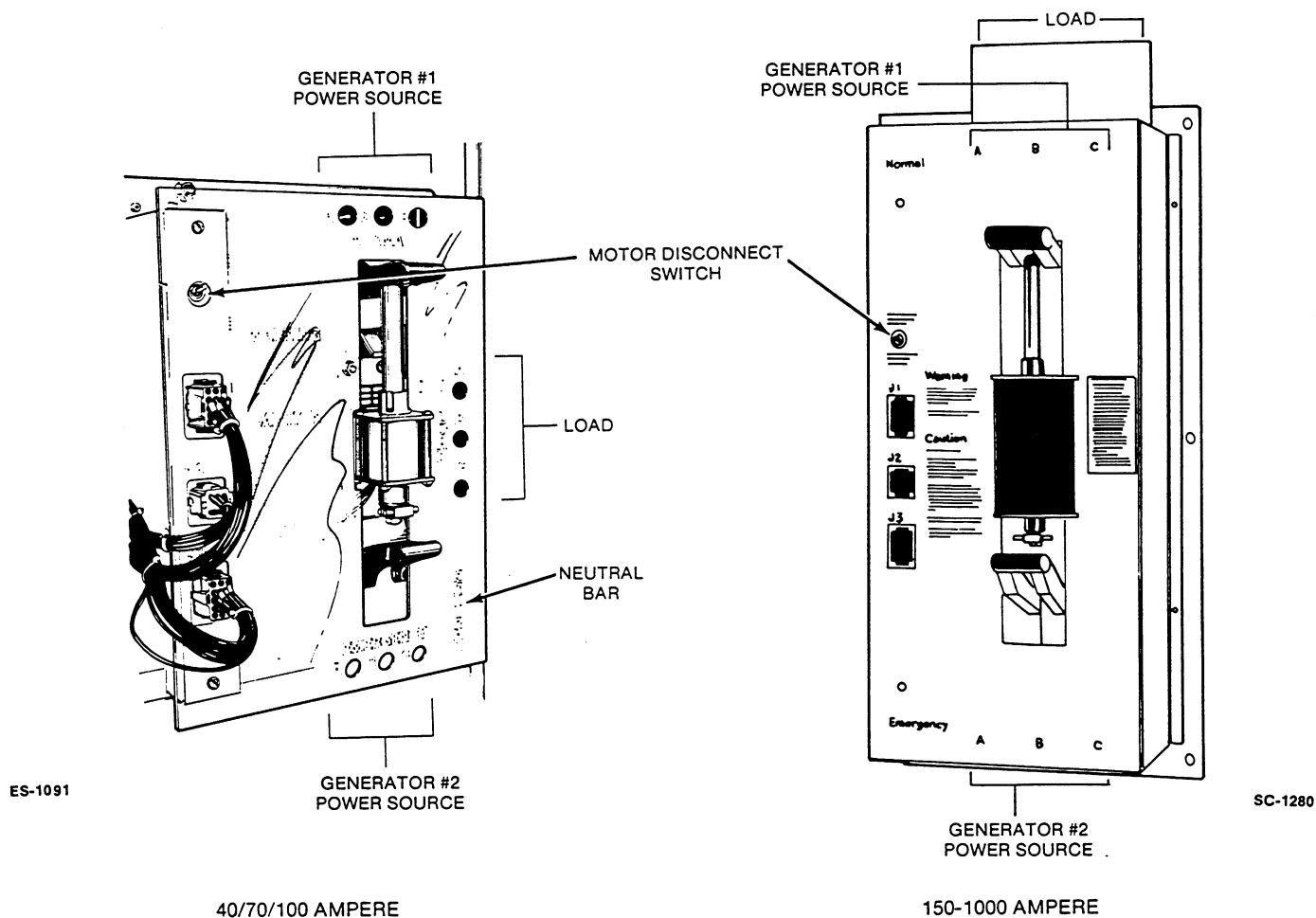


FIGURE 3. TRANSFER SWITCH WIRE CONNECTIONS

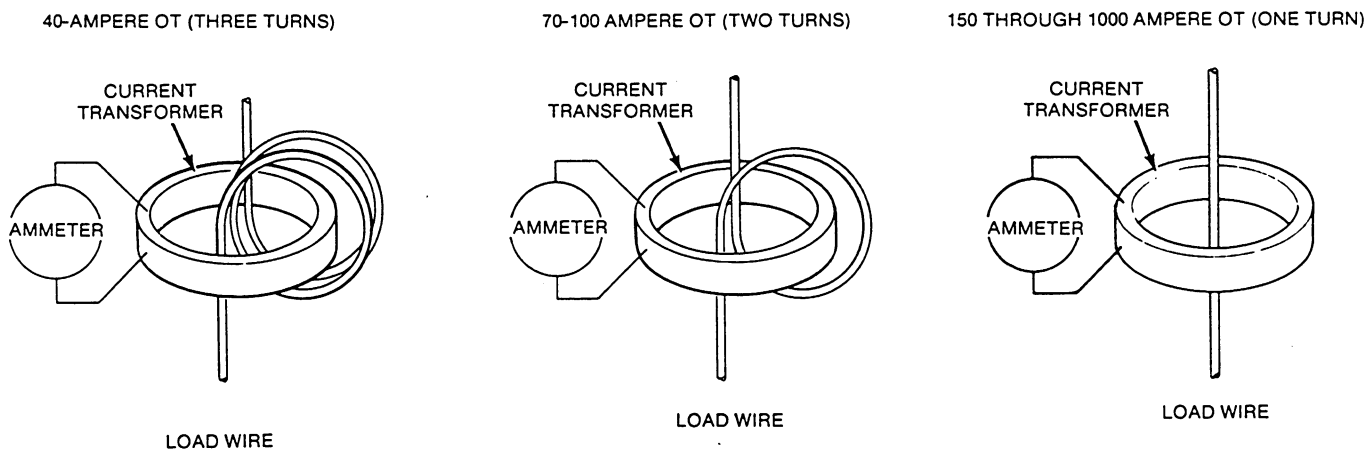
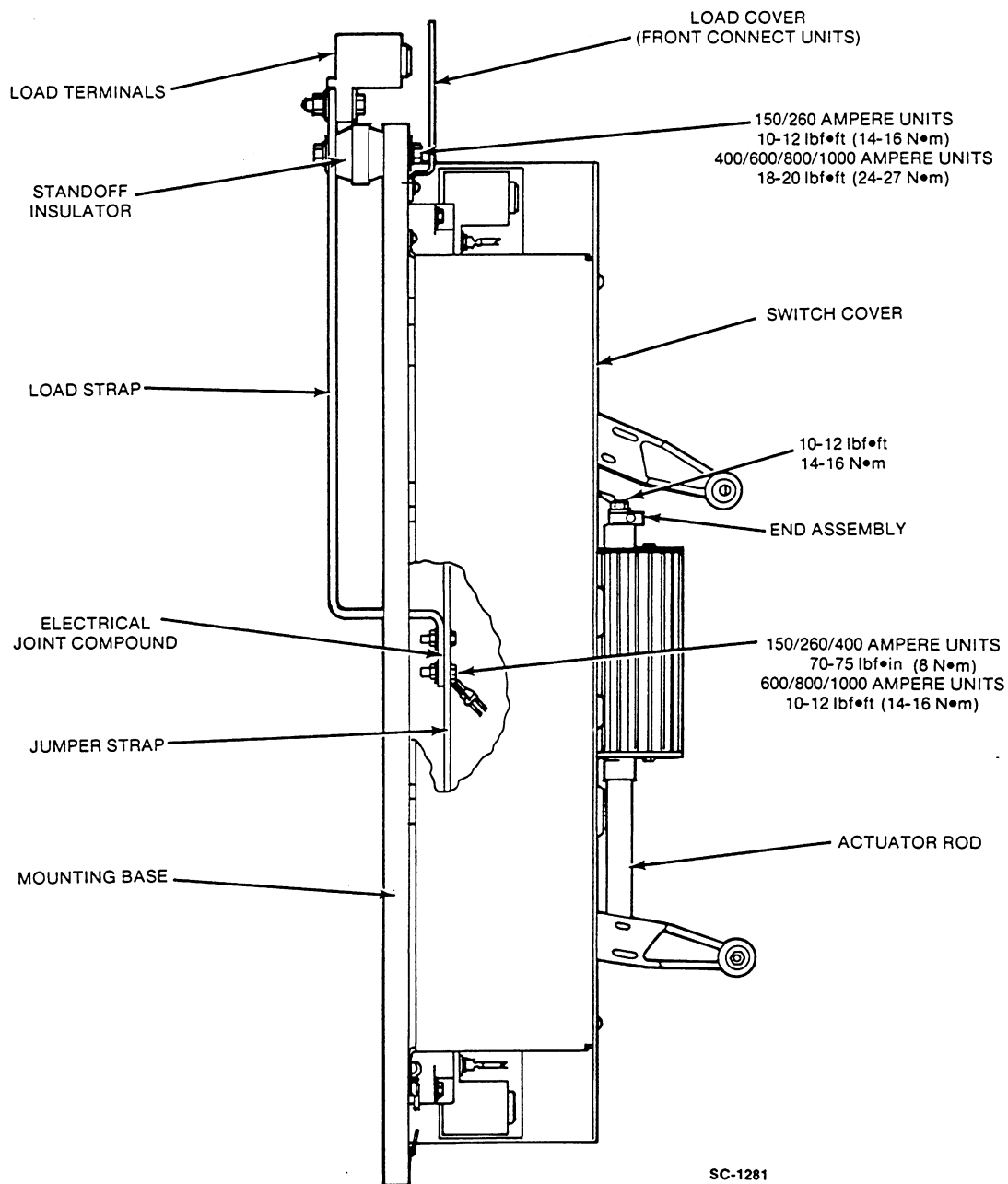


FIGURE 4. CURRENT TRANSFORMER WIRING

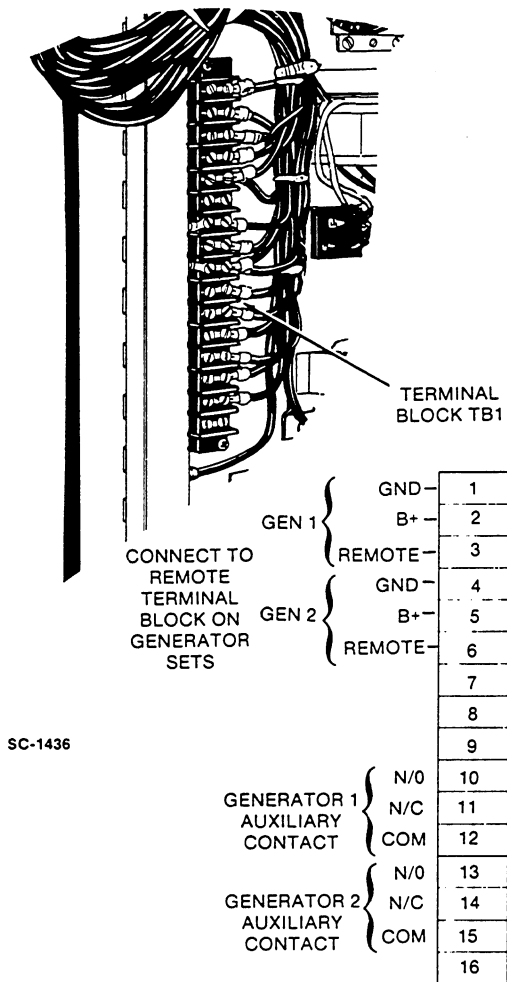


**FIGURE 5. TRANSFER SWITCH LOAD TERMINALS (SIDE VIEW)  
150-1000 AMPERE**



## Control Circuit Connections

**Remote Start-Stop Connections:** Use number 16 wire for up to 100 feet (30 m) with a maximum of 0.5 ohm per line. The control wires from the generator sets connect separately to TB1 as shown in Figure 6.



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FIGURE 6. WIRING TO CONTROL TERMINAL BLOCK

**Auxiliary Contacts (if used):** Auxiliary contacts are located on the Normal (generator #1) and Emergency (generator #2) sides of the transfer switch for external alarm or control circuitry. Connections for auxiliary contacts can be made on terminal block TB1 terminals 10 through 15. The contacts have ratings of 10 amperes at 480 VAC. Listed below are open and closed positions of auxiliary contacts with transfer switch to neutral position. Moving the transfer switch to Normal or Emergency only affects the corresponding auxiliary contacts.

### NORMAL (GEN #1) AUXILIARY CONTACT

TB1-10 — N/O  
TB1-11 — N/C  
TB1-12 — COM

### EMERGENCY (GEN #2) AUXILIARY CONTACT

TB1-13 — N/O  
TB1-14 — N/C  
TB1-15 — COM

## CLEANING OF CABINET

After mounting and wiring of cabinet are completed, clean the interior with a vacuum cleaner to remove any chips, filings, or dirt from the cabinet interior and components.

## CHECKOUT PROCEDURES

After installing the transfer switch, check setting of the change-over clock and relay time delays on the left inside wall of the cabinet (Figure 8). Do not connect starting batteries of the generator sets until these adjustments have been checked as follows:

**WARNING** *Failure to prevent the generator sets from starting before checkout procedures are performed presents a shock hazard and might cause serious personal injury or death.*

### Change-Over Clock

The change-over clock is factory set to run each generator set for one week periods. See Figure 7. If other time intervals are wanted, change setting using the following steps:

1. Open the OT cabinet.
2. Install a trip pin (*left-hand thread*) in the small spoked wheel for the days you want Generator Set #1 to operate (pins out, Generator Set #2 will operate).
  - a. For 168-hour (7-day) operation of one generator set and then 168-hour operation of the other generator set, install 7 trip pins in consecutive positions in the small spoked wheel.
  - b. For 24-hour (1-day) operation of one generator set and then 24-hour operation of the other generator set, install a trip pin in every alternate day in the small spoked wheel.

Store unused pins in the time pointer bracket.

3. Rotate the large dial *clockwise* until the correct time is aligned with the time pointer.
4. Turn the small spoked wheel *counterclockwise* until the correct day aligns with the pointer.

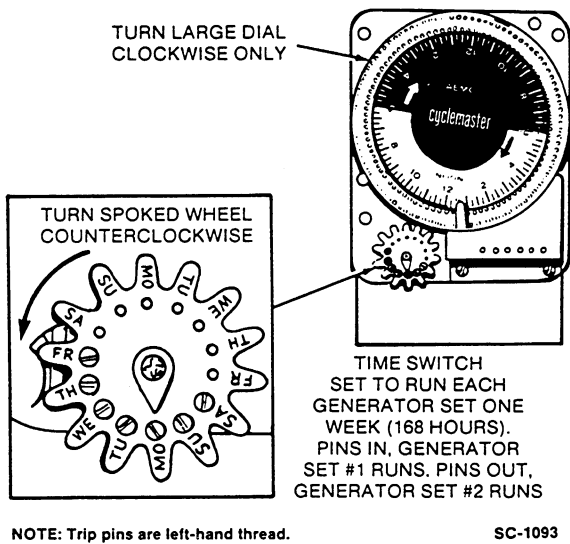


FIGURE 7. CHANGE-OVER CLOCK

### Programmed Transition (if equipped)

1. Locate the programmed transition time delay on the left inside wall of the cabinet (Figure 8). It normally has factory settings for a few seconds. If the setting is satisfactory, proceed to next check. Otherwise, proceed to Step 2.

2. The programmed transition has either a time range of 0.5 to 5 seconds, 1.5 to 15 seconds, or 5 to 50 seconds (three timers are available). Turn the knob clockwise to increase delay, counterclockwise to decrease time delay. Increments are marked on the knob.

Setting must be based on motor and load characteristics. Usually, electric motors up to and including 200 horsepower require a time delay of 0.5 second.

### Generator to Generator Converter

The converter assembly is shown in Figure 8. It contains three relays, two transformers, and two bridge rectifiers. Relay K10 connects the optional battery charger output to batteries of the generator set not running. It also initiates operation of either relay K11 or K12.

The time delay on dropout function of K11 and K12 is adjustable but should be left at maximum (10 seconds). Set the knob pointer on each relay at 10.

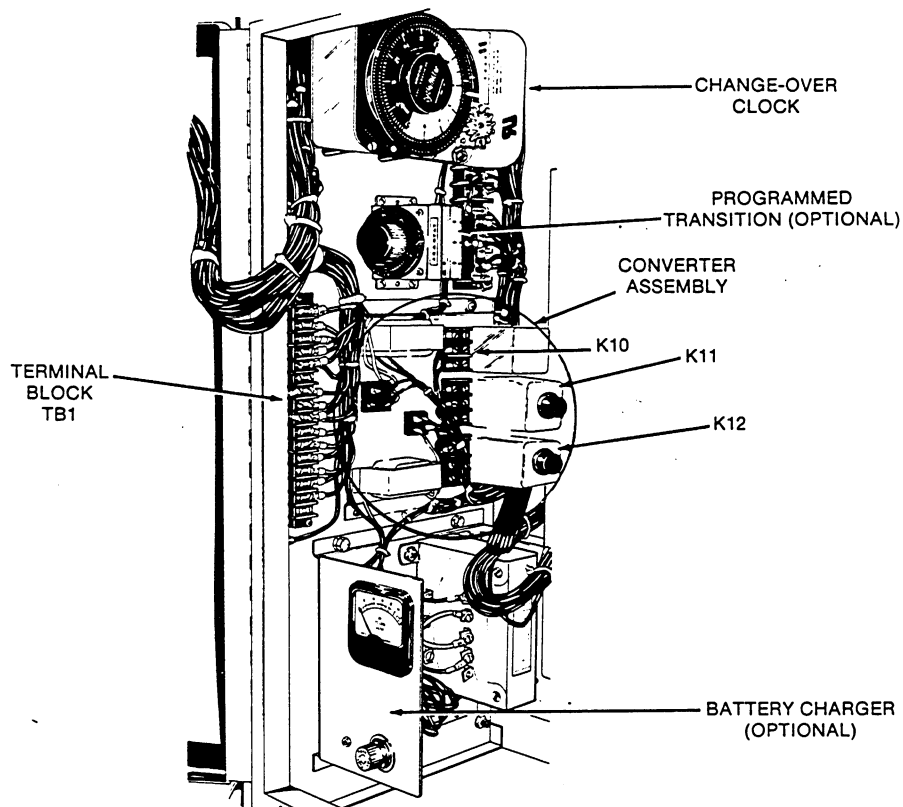


FIGURE 8. COMPONENT LOCATION

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## Check Switch Positions

Make sure the operation selector switch on the generator control panels are still in the Stop position. Do not change until instructed to later in the Starting Test.

1. Set the OT front door keyed priority switch to Auto position.
2. Set change-over for generator set #1 operation. Turn small spoked wheel counterclockwise so pins in the wheel are on bottom (Figure 7).
3. Motor disconnect switch must be in the up position for automatic operation (Figure 3). Close OT cabinet door.

## Starting Test

Check switch positions as outlined in the previous section before proceeding.

1. Connect starting batteries to the generator sets.
2. Move the operation selector switch on generator set #1 to Remote. The set should start and assume load after any time delays. The Generator 1 Running lamp and then the Generator 1 Loaded lamp on the OT front door should light.
3. Move the operation selector switch on generator set #2 to Run. It should start but not take over load. The Generator 2 Running lamp should light.
4. Note meters and general operating conditions. If okay, move the operation selector switch on generator set #2 to Remote (should shut down), and proceed to Test Transfer With Load.

## Test Transfer With Load

1. With generator set #1 carrying load, move the priority switch to Gen 2 position. Generator set #2 should start and take over load after any time delay on start and transfer. Note indicator lamps on the OT door. Generator set #1 should shut down after any time delay.
2. Move priority switch to Auto position. Generator set #1 should start and assume load after any time delays. Generator set #2 should shut down after time delay on stop.
3. Turn the small spoked wheel on change-over clock counterclockwise so pins in the wheel are on top (Figure 7). Generator set #2 should start and assume load after any time delays. Generator set #1 should shut down after time delay on stop.

### **WARNING**

*High voltages within cabinet and rear side of cabinet door present a shock hazard which might cause serious personal injury or death. Use care when opening cabinet door.*

4. Generator set #2 and the OT transfer switch are now in the normal operating mode. Generator set #2 will run until the change-over clock switches over to the other set. They can be left in this sequence or changed as outlined in the Operation section.

## Electronic Control Settings

The adjustments on the electronic modules are factory set and normally do not require field adjustment. If desired, the Pickup, Dropout and Time Delay settings may be adjusted to other than factory settings as outlined below. However, the calibration (Cal) adjustments should be changed only if the nominal voltage is significantly different than the nameplate rating, or when installing a replacement sensor module.

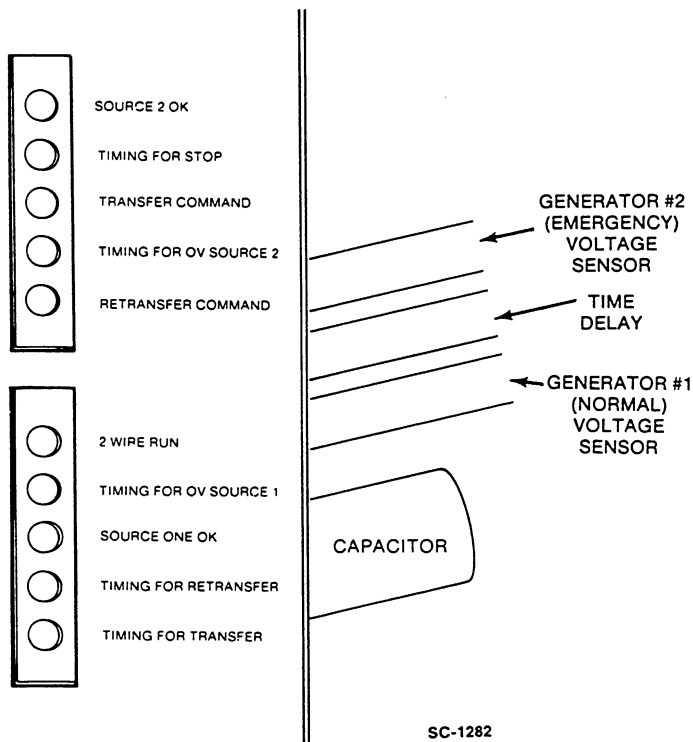
**CAUTION** *Haphazard setting of the module calibration (Cal) adjustments may result in abnormal operation of the transfer switch.*

Complete all installation procedures before any adjustments are made. All adjustments are made with a screwdriver through openings in the module panels by turning a potentiometer (see Figures 10 and 11).

A separate voltage sensor is used for each power source. They are located one on each side of the time delay module (Figure 9).

Place the Motor Disconnect Switch (Figure 3) in the down position when making adjustments. Return switch to up position after adjustments are completed.

**WARNING** *High voltages are present within the control cabinet which might cause serious personal injury or death. Proceed with care!*



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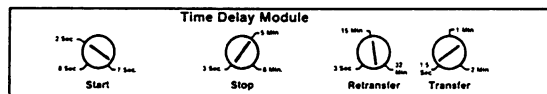
FIGURE 9. CONTROL PANEL LAMPS AND MODULES

**Time Delay Module:** The time delay module controls the following functions:

- Start time delay
- Stop time delay
- Transfer time delay
- Retransfer time delay

If other than factory setting is desired, align the slot on the potentiometer to the desired markings on the module panel. See Figure 12. Range of adjustments and factory settings are as follows:

DELAY	ADJUSTMENT RANGE	FACTORY SETTING
Start	0-6 seconds	2 seconds
Transfer	0-120 seconds	2 seconds
Retransfer	0-32 minutes	15 minutes
Stop	0-8 minutes	5 minutes

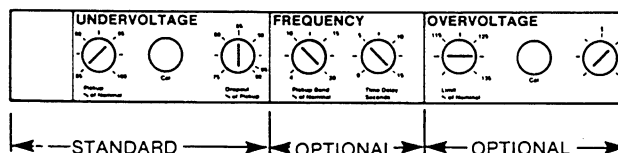


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FIGURE 10. TIME DELAY MODULE

**Undervoltage Sensor:** The standard voltage sensor modules monitor the power source for an undervoltage condition. The undervoltage range of adjustment is shown below. If other than factory setting is desired, align the slot on the potentiometer to the desired markings on the module panel.

FUNCTION	ADJUSTMENT RANGE	FACTORY SETTING
Dropout	75% to 98%	85%
Pickup	85% to 100%	95%



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FIGURE 11. VOLTAGE/FREQUENCY SENSOR MODULE

If necessary, the undervoltage sensor for either generator #1 (Normal) or generator #2 (Emergency) sources may be calibrated as follows (see Figure 9 for location):

1. Ensure that nominal voltage is present on all phases of the source being calibrated. On voltage sensors with the frequency sensing option, the source frequency must be within the limits set by the Frequency Pickup Bank potentiometer.
2. Turn the Undervoltage Pickup and Dropout potentiometers on the voltage sensor fully clockwise.
3. Turn the Undervoltage calibration (Cal) potentiometer fully clockwise. The Source OK lamp corresponding to source sensor being calibrated should be on (Source One OK-generator #1 source, Source 2 OK-generator #2 source). If the Source OK lamp fails to come on, and the voltage sensor has an overvoltage sensing option, turn overvoltage Limit and Cal potentiometers fully clockwise.
4. Turn the Cal potentiometer counterclockwise until the Source OK lamp turns off.
5. Slowly turn the Cal potentiometer clockwise until the Source OK lamp just turns on again.
6. The Undervoltage sensor is now calibrated. If the Overvoltage sensor was adjusted in Step 3, then recalibrate it by using the Overvoltage Sensor calibration procedure.

After calibration, reset the Pickup and Dropout potentiometers to the factory settings or to desired setting.

**Overvoltage Sensor:** The optional overvoltage sensor detects when the source voltage has exceeded the overvoltage limit.

If other than factory setting is desired, align the slot on the potentiometer to the desired markings on the module panel. See Figure 11. Range of adjustments and factory settings are shown below.

FUNCTION	ADJUSTMENT RANGE	FACTORY SETTING
Limit	105 to 135%	110%
Time Delay	0 to 2 minutes	5 seconds

The overvoltage pickup point is fixed at 5 percent below the Limit setting. The adjustable dropout Time Delay overrides momentary overshoots in voltage.

If necessary, the Overvoltage sensor may be calibrated as follows:

**If the Undervoltage sensor has not been calibrated, do so before proceeding.**

1. Ensure that nominal voltage is present on all phases of the source being calibrated (generator #1 or generator #2). On voltage sensors with the frequency sensing option, the source frequency must be within the limits set by the Frequency Pickup Band potentiometer.
2. Turn the overvoltage Limit and Time Delay potentiometers fully counterclockwise.
3. Turn the Overvoltage Cal potentiometer fully clockwise. The Source OK lamp for the selected source should light (Figure 9).
4. Turn the Cal potentiometer counterclockwise until the Source OK lamp turns off.
5. Slowly turn the Cal potentiometer clockwise until the Source OK lamp just turns on again.

After calibration, reset the Overvoltage Limit and Time Delay potentiometers to the desired values.

**Frequency Sensor:** The optional frequency sensor detects when the source frequency is within an acceptable band. This band is centered about the nominal system frequency (50 or 60 hertz).

If other than factory setting is desired, align the slot on the potentiometer to the desired markings on the module panel. See Figure 11. Range of adjustments and factory settings are shown below.

FUNCTION	ADJUSTMENT RANGE	FACTORY SETTING
Pickup Band	$\pm 4$ to $\pm 20\%$	$\pm 10\%$
Time Delay	0 to 15 Seconds	5 Seconds

The dropout bandwidth is always 2.5% wider (on each end) than the pickup bandwidth. The adjustable dropout Time Delay allows the control to ignore momentary dips or rises in frequency.

# Description

The transfer switch does the work of opening and closing the contacts that transfer the load between Generator Set #1 and Generator Set #2. The transfer switch is a pair of multipole, single throw, electromechanical switches, that are mechanically interlocked to prevent simultaneous closing to both power sources. The principal parts of the transfer switch are the contact assemblies and the linear actuator.

Standard items and features of the transfer switch are covered in the first part of this section. Descriptions of options and accessories appear in the second part.

## CABINET

The standard Onan OT cabinet meets requirements of the National Electrical Manufacturers Association (NEMA) for a "Type 1" cabinet. This type is designated as a general purpose, indoor cabinet. Exterior items on a typical OT cabinet are shown in Figure 12.

**WARNING** *High voltages within cabinet and rear side of cabinet door present a shock hazard which might cause serious personal injury or death. Use care when opening cabinet door.*

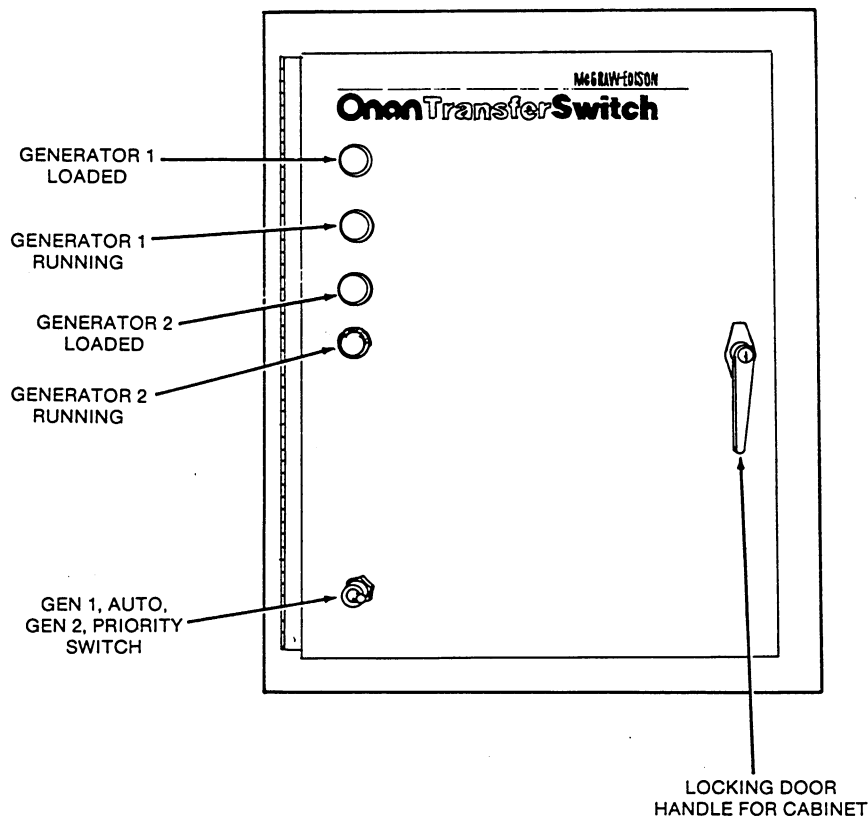
## Indicator Lamps

Four indicator lamps are located on the cabinet door. One set of lamps, Generator 1 Running and Generator 2 Running, indicate if the generator sets are running. Another set of lamps, Generator 1 Loaded and Generator 2 Loaded, indicate which generator set is connected to the load.

## Priority Switch

This switch has three positions. In the Auto position, the change-over clock setting determines which generator set has priority to run and assume load. This is the normal operation position of this switch.

In the Gen 1 and Gen 2 positions, the operator selects the generator set having priority to run and assume load regardless of change-over clock setting. The selected set will run continuously unless it faults on undervoltage, or optional overvoltage and frequency modes.



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FIGURE 12. CABINET WITHOUT OPTIONS

## TRANSFER SWITCH

The transfer switch does the work of opening and closing the contacts that transfer the load between generator #1 and generator #2. The transfer switch is mechanically interlocked to prevent simultaneous closing to both power sources. The main parts of the transfer switch discussed here are the contact assemblies, linear actuator, motor disconnect switch, and auxiliary contacts.

### Contact Assemblies

The contact assemblies actually make and break the current flow. When closed to either Generator Set #1 or Generator Set #2 power source, these contacts are mechanically held. A mechanical interlock prevents the contact assemblies from closing to both power sources at the same time.

### Linear Actuator

The linear actuator moves the contact assemblies from the Generator Set #1 power source to the Generator Set #2 power source and back again as required. The linear actuator is a linear induction motor that acts upon an actuator rod, which moves the contact assemblies. Operation of the linear actuator is electrical and is initiated automatically with automatic transfer switches. Manual operation of the transfer switch is possible by applying direct manpower to the transfer switch handles. Refer to manual operation in the *Operation* chapter.

### Motor Disconnect Switch

The motor disconnect toggle switch opens and closes the linear actuator circuit. It is located on the transfer switch panel as in Figure 14. It is placed in the down position for manual operation and the up position for automatic operation.

### Auxiliary Contacts

Auxiliary contacts are provided on the Normal (Gen #1) and Emergency (Gen #2) side of the transfer switch. They are actuated by operation of the transfer switch during transfer and retransfer. The auxiliary contacts have current ratings of 10 amperes at 480 VAC.

## ELECTRONIC CONTROL

This section describes the standard electronic control. A description of the basic circuits follows.

### Starting Circuits

The starting circuit is a basic supervisory function of the OT control. Water-cooled Onan generator sets use a two-wire start control.

Although the logic is more involved, the two-wire starting circuit can be thought of as a single pole, single throw switch. A closed switch signals the generator set to start. An open switch signals the electric generator set to stop. The starting battery of the generator set provides the operating voltage.

### Time Delays

**Start Time Delay:** is adjustable from zero to six seconds. This brief time delay (factory set at two seconds) prevents generator set starting from power interruptions of short duration. Timing starts the moment of power interruption. If the duration of interruption exceeds the delay time, the transfer switch signals the other generator set to start.

**Stop Time Delay:** is adjustable from zero to eight minutes, is factory set for five minutes. It begins timing when the load is retransferred to another power source. At the end of delay, the stop signal is sent to the generator set. This time delay allows the generator set to cool down at no load before stopping.

**Transfer Time Delay:** begins when generator voltage and frequency reach the settings of the control. After the delay, the transfer switch transfers the load to the generator power source. This brief time delay (factory set at two seconds) allows the generator set to stabilize before load is applied. It has an adjustable range of zero to two minutes.

**Retransfer Time Delay:** is factory set for 15 minutes and begins when the priority source voltage and frequency return. After the delay, the transfer switch can retransfer the load to the priority source. The delay allows the priority source to stabilize before retransfer. It has an adjustable range of 0 to 32 minutes.

### Undervoltage Sensing

If the monitored source voltage falls to the dropout point, a signal from the time delay module transfers the load to the other power source (if present and within acceptable limits). The time delay module logic looks at the source OK signals from both sources and decides which one to transfer to after the appropriate time delay. The undervoltage sensor only decides if the source it is monitoring is OK. The standard OTII has undervoltage sensing for all phases of the generator power sources.

The sensors are factory set to pick up at 95 percent of the nominal voltage and drop out at 85 percent. The pickup setting is adjustable from 85 to 100 percent of the nominal voltage, and the dropout setting from 75 to 98 percent of the pickup voltage.

**Change-Over Clock:** The change-over clock initiates generator set starting and operation for preset alternate days or alternate weeks. This clock function applies only if the priority switch on the front door is set in the Auto position.

Setting of the clock is covered in the Installation section of this manual under Checkout Procedures.

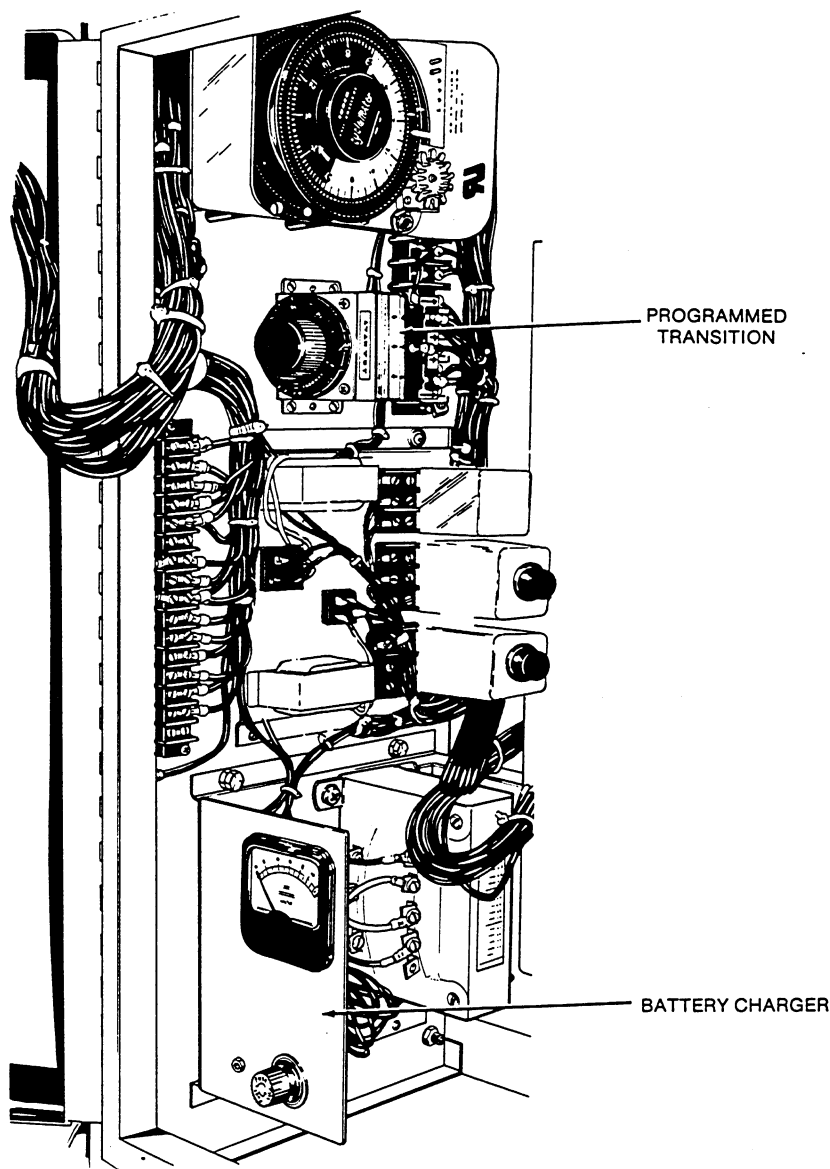


FIGURE 13. OT OPTIONS WITHIN CABINET

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## Options

**Frequency Sensing:** Optional frequency sensing for the power source detects when frequency is within an adjustable bandwidth ( $\pm 4$  to  $\pm 20\%$ ). If the frequency goes above or below the bandwidth, the automatic transfer switch will initiate transfer of load to the other source. An adjustable dropout time delay allows the control to ignore momentary dips or rises in frequency.

**Overvoltage Sensing:** Optional overvoltage sensing of all lines is available along with undervoltage and frequency sensing.

The overvoltage sensing limit is adjustable from 105 to 135 percent of the nominal voltage, and is factory set at 110 percent. The overvoltage pickup point is fixed at 5 percent below the limit setting. An adjustable time delay overrides momentary overshoots in voltage.

## Programmed Transition

Programmed transition is an optional feature of Onan Series OT transfer switches, see Figure 13. Programmed transition is the capability of the transfer switch to assume a mid-transition position, for an adjustable interval of time, when the load is neither connected to the Generator Set #1 power source nor to the Generator Set #2 power source. This feature allows residual voltages in a motor load to decay to an acceptable level before transition is completed. The length of time that the transfer switch is in the mid-position can be adjusted from 0.5 to 5 seconds. The proper adjustment is a function of the motor and its connected load.

**Battery Charger:** An OT automatic transfer switch can be equipped with either a float battery charger or a trickle battery charger. See Figure 13. Both can be used with lead-acid or nickel-cadmium batteries. The transfer switch automatically connects the charger to the generator set that is not running.

**Float Battery Charger:** A float-charge battery charger regulates its charge voltage to continuously charge without damage to the battery. As the battery approaches full charge, the charging current automatically tapers to zero amperes or to steady-state load on the battery. The battery charger has an ammeter for indication of charging current and has a fuse for protection of the battery charger circuit.

For 12-volts, the battery charger option is available either as a 2-ampere or a 10-ampere battery charger. For 24 volts, the battery charger option is available either as a 2-ampere or a 6-ampere battery charger.

**Trickle Battery Charger:** Available for 12-volt battery systems, the trickle charger has an adjustment knob for setting the trickle charge from 5 to 300 milliamperes. It has an ammeter on the front and also has a fuse for circuit protection.

**Meters:** Onan has meter options as operating indicators of the power sources. These include an AC voltmeter, AC ammeter, frequency meter, and running time meter.

**AC Voltmeter:** The voltmeter measures line-to-line voltage of the generator power source. For three-phase voltages, a selector switch is included.

**AC Ammeter:** The ammeter measures the line currents of the generator source output. For three-phase systems, a selector switch is included.

**Frequency Meter:** This meter measures the output frequency of the generator power source in hertz.

**Running Time Meter:** Running time meters record the time each generator set has run in hours and tenths of an hour.

# Operation

## AUTOMATIC OPERATION

The transfer switch is set for automatic operation by placing control switches in the positions given below. The generator sets must also be set for automatic operation.

Motor Disconnect switch (on transfer switch cover)- up position (Figure 14).

Priority switch (on transfer switch door)- Auto position.

Operation selector switch on engine control box- Remote position.

## MANUAL OPERATION

The transfer switch has operator handles for manually transferring of the load. Use the following procedure:

**WARNING** *Some terminals within the transfer switch cabinet and door present a shock hazard which might cause serious personal injury or death if touched. For this reason, stay clear of exposed terminals while performing manual operation of the transfer switch.*

1. Open the cabinet door of the transfer switch.
2. Move the motor disconnect switch to the down position (Figure 14).
3. **Transfer** - from the generator #1 (Normal) to generator #2 (Emergency) power source:
  - A. Pull the upper manual operator handle down.
  - B. Push the lower manual operator handle down.

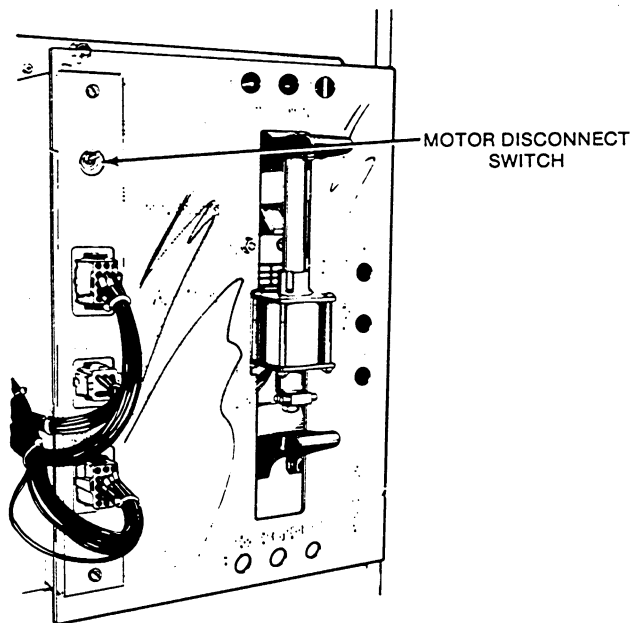
**Retransfer** - from generator #2 (Emergency) to generator #1 (Normal) power source:

- C. Pull the lower manual operator handle up.
  - D. Push the upper manual operator handle up.
4. Before moving the Motor Disconnect switch back to the on or up position, remember the transfer switch will transfer load to the active power source (if both power sources are available), transfer will occur to source selected by the priority switch on transfer switch door, or to source timed by change-over clock.

### WARNING

*Automatic transfer switch operation results in rapid movement of the manual operator handles and presents a hazard of serious personal injury. Keep hands clear of handles when switching back to automatic operation.*

5. Move the Motor Disconnect switch to the up position.
6. Close the cabinet door.



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FIGURE 14. MOTOR DISCONNECT SWITCH LOCATION

# Troubleshooting

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**WARNING** *High voltages within cabinet and rear side of cabinet door present a shock hazard which might cause serious personal injury or death. Use care when opening cabinet door.*

## GENERATOR SET SCHEDULED FOR DUTY CYCLE DOES NOT START

1. Check setting of change-over clock in transfer switch cabinet.
2. Check for a generator set overcrank condition.
3. Check position of operation selector switch on engine control. It should be set at Remote for two-wire starting.
4. Check generator set. Start with start-stop switch on engine control. If it does not crank, check starting batteries. If it cranks but does not start, check fuel supply. Refer to generator set operators manual.

## GENERATOR SET SCHEDULED FOR DUTY CYCLE STARTS BUT DOES NOT ASSUME LOAD

1. Has transfer-retransfer time delay completed cycle?
2. Check generator output voltage. Is it above the voltage setting.
3. Is the control panel disconnect plug inserted completely into the receptacle?
4. Check undervoltage sensor pickup voltage setting. It should have a setting in most cases of 95% of nominal voltage.
5. Check position of transfer switch motor disconnect switch (should be up). See Figure 14.

## GENERATOR SET STARTS WHEN NOT SCHEDULED

1. Check positions of operation selector switches on engine controls. They should be at Remote for two-wire starting.
2. Check change-over clock setting.
3. Is control panel disconnect plug inserted completely into receptacle?
4. Check voltage sensor settings. If okay, starting may be due to momentary voltage dips of the other generator set. Pick-up voltage setting may have to be reduced slightly.

## GENERATOR SET CONTINUES TO RUN AFTER COMPLETING DUTY CYCLE

1. Check position of operation selector switch on engine control. It should be at Remote for two-wire starting.
2. Has stop time delay completed cycle? The start-stop time delay may be defective. Stop generator set with the start-stop switch on engine control.

## BATTERY CHARGER FAILS TO CHARGE (IF EQUIPPED)

Check battery charger fuse on the battery charger. Replace if necessary with correct fuse.

**WARNING** *Ignition of explosive battery gases might cause severe personal injury. Do not smoke while servicing batteries.*

## BATTERY LOSES WATER

Battery charger float voltage could be too high. Call Onan service representative.

## BATTERY LOSES CHARGE

Battery charger float voltage could be too low. Call Onan service representative.

# Parts and Service Information

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Because of the individuality of each automatic transfer switch, contact the dealer from whom you purchased this equipment for service and parts. Remember to give the complete model and serial number when requesting service or parts information. Also note if the cabinet contains a modification

label inside which lists any added options. If it does, give the information listed on the label to your dealer too. The wiring diagrams furnished with your Series OT transfer switch should be kept with your instruction manual.



