

15K and 25K PTO Standby Alternators



TECHNICAL MANUAL

15K and 25K PTO Standby Alternators

TM1119 (01SEP74) English

John Deere
Lawn & Grounds Care Division
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ENGLISH



15K AND 25K PTO STANDBY ALTERNATORS

Technical Manual
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(All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.)

SI (International System) Units of Measure

Metric equivalents have been included, where applicable throughout this technical manual.

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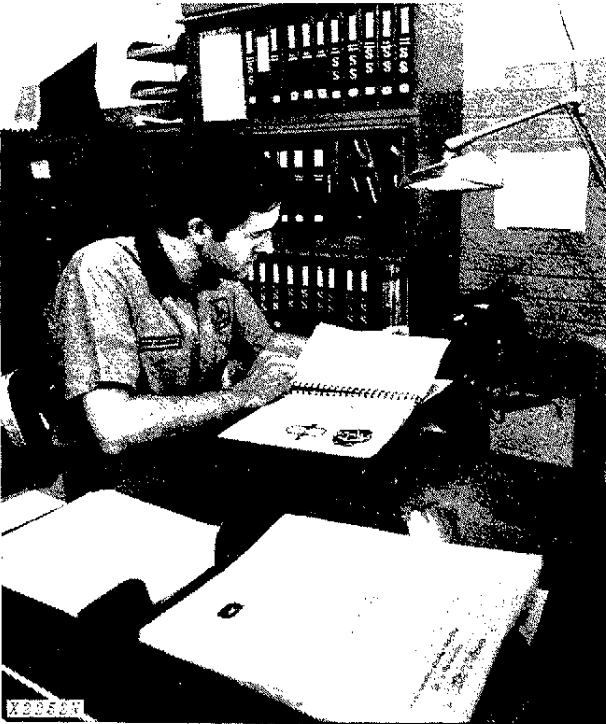
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GENERAL



Use FOS Manuals for Reference

This technical manual is part of a twin concept of service:

- **FOS Manuals**—for reference
- **Technical Manuals**—for actual service

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

Fundamentals of Service (FOS) Manuals cover *basic* theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

Technical Manuals are *concise* service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.



When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.



Use Technical Manuals for Actual Service

Some features of this technical manual:

- *Table of contents at front of manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the **shop where it is handy**. Refer to it whenever in doubt about correct service procedures or specifications.


Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

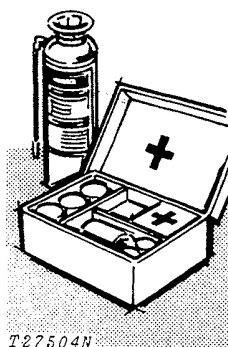
SAFETY



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INTRODUCTION

 This safety alert symbol identifies important safety messages in this manual and on the alternator. When you see this symbol, be alert to the possibility of bodily injury and carefully read the message that follows.



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Investigation of thousands of accidents shows that careless use of machinery causes nearly 1/3 of all accidents. Study the following safety precautions carefully and insist that they be followed by those working with you and for you.

Be prepared if an accident or fire should occur. Know where the first aid kit and the fire extinguishers are located—know how to use them.

Clothing worn by the operator should be fairly tight and belted. Loose jackets, shirts, or sleeves should not be permitted because of the danger of getting into moving parts.

Do not allow anyone to operate the alternator without proper instructions.

Be sure power shields and guards are in place and secured before starting work.

Before lubricating alternator always:

- (a) Disengage all power
- (b) Shut off tractor engine, and then
- (c) Wait until rotor stops.

Whenever the alternator is to be used, place the tractor transmission in the park position before dismounting.

Be sure tractor is in a well ventilated area.

Keep away from alternator when it is being raised by lift anchor.

Make certain only a qualified electrician does the electrical installations.

When working around electrical equipment, move slowly.

Do not lunge after falling tools.

Stop all power, and ground all high voltage points before touching wires.

Make certain that power cannot be accidentally restored.

Do not work on insufficiently grounded electrical equipment.

Do not examine live equipment when mentally or physically fatigued.

Do not touch electrical equipment while standing on metal floors, damp concrete or other well grounded surfaces.

Do not handle electrical equipment while wearing damp clothing (particularly wet shoes) or while skin is damp.

Be extra cautious when working with alternator during wet weather.

Do not take unnecessary risks.

Do not work alone.

GLOSSARY

ALTERNATING CURRENT—Electricity that flows in one direction, then in the reverse direction through its conductors. The current reverses at regular intervals as each wire becomes positive then negative, reversing polarity typically 60 times per second.

ALTERNATOR—A machine that generates AC current.

AMMETER—An instrument for measuring the *flow* of electrical current in amperes. Ammeters are usually connected in series with the circuit to be tested.

AMPERE—Current flowing in a given time under a pressure of one volt, when there is a resistance of one ohm in the circuit.

CIRCUIT—The course followed by an electrical current passing from its source through a succession of conductors, through a load, and back to its starting point.

CIRCUIT BREAKER—An automatic switch that opens its circuit upon detecting excess current. The circuit breaker replaces a fuse.

CONDUCTOR—Any material which conducts current readily. A material having low resistance.

CURRENT—Movement of electricity along a conductor. Current is measured in amperes.

DIODE—An electrical device that will allow current to pass through itself in one direction only.

DIRECT CURRENT—Current that always flows in the same direction.

ELECTRICITY—The flow of electrons from atom to atom in a conductor.

ELECTROMAGNET—A core of magnetic material, generally soft iron, surrounded by a coil of wire through which electrical current is passed to magnetize the core.

ELECTROMAGNETIC FIELD—The magnetic field about a conductor created by the flow of electrical current through it.

FUSE—A ribbon of fusible metal that burns and opens its associated circuit on detecting excess current.

GROUNDING WIRE—Usually green color and is used to ground electrical equipment and thus prevent electrical shock.

INSULATOR—A substance or body that resists the flow of electrical current through it. Also see "Conductor".

KILOVOLT AMPERE—Volts x Amperes of a generator at less than 100% power factor, divided by 1000.

KILOWATT—1000 Watts.

OHM—The amount of resistance in the circuit when there is one volt pressure.

MAGNETIC FIELD—That area near a magnet in which its property of magnetism can be detected. It is shown by magnetic lines of force.

MAGNETISM—The property possessed by certain substances (especially iron or steel) by which they exert forces of attracting or repelling.

MEGOHM—1,000,000 (one million) ohms.

NEGATIVE TERMINAL—The terminal to which current flows (as ordinarily conceived) in the external circuit.

OHMMETER—An instrument for measuring the resistance in ohms of an electrical circuit.

OPEN OR OPEN CIRCUIT—An open or open circuit occurs when a circuit is broken, such as by a broken wire or open switch, interrupting the flow of current through the circuit. It is analogous to a closed valve in a water system.

PARALLEL CIRCUIT—A circuit where the parts are so connected that the current divides between them.

POSITIVE TERMINAL—The terminal from which current (as ordinarily conceived) flows in the external circuit.

RECTIFIER—A device (such as vacuum tube, commutator, or diode) that converts alternating current into direct current.

REGULATOR—A device which controls the flow of current or voltage in a circuit to a certain desired level.

RESIDUAL MAGNETISM—The magnetism that remains in a piece of iron or steel when the magnetizing force is removed.

RESISTANCE—The opposing or retarding force offered by a circuit or component of a circuit to the passage of electrical current through it. Resistance is measured in ohms.

RESISTOR—A device usually made of wire or carbon which presents a resistance to current flow.

ROTOR—The rotating part of an electrical machine such as a generator, motor, or alternator.

SERIES CIRCUIT—A circuit in which the current has only one path to take.

STATOR—The stationary part of an alternator in which another part (the rotor) revolves.

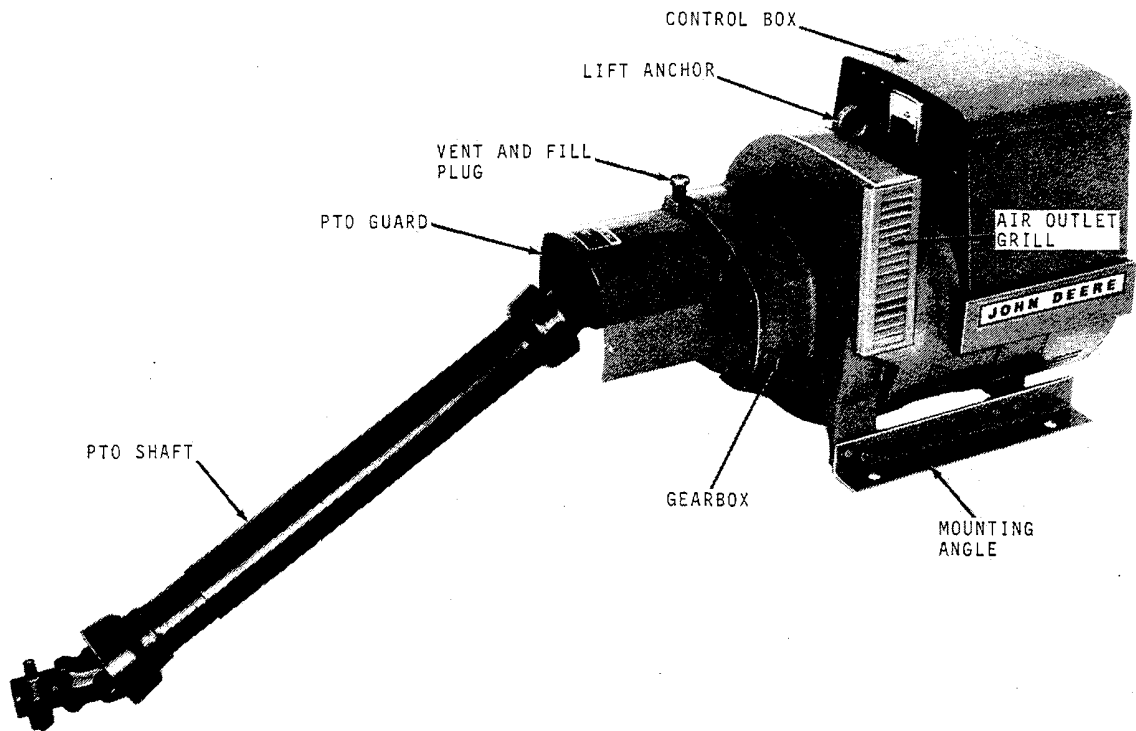
VOLT—Pressure required to force one ampere through a resistance of one ohm.

VOLTAGE DROP—The voltage required to force current through the resistance of line wires or the power consuming device.

VOLTMETER—An instrument for measuring the force in volts of an electrical current. This is the difference of potential (voltage) between different points in an electrical circuit. Voltmeters are connected across (parallel to) the points where voltage is to be measured.

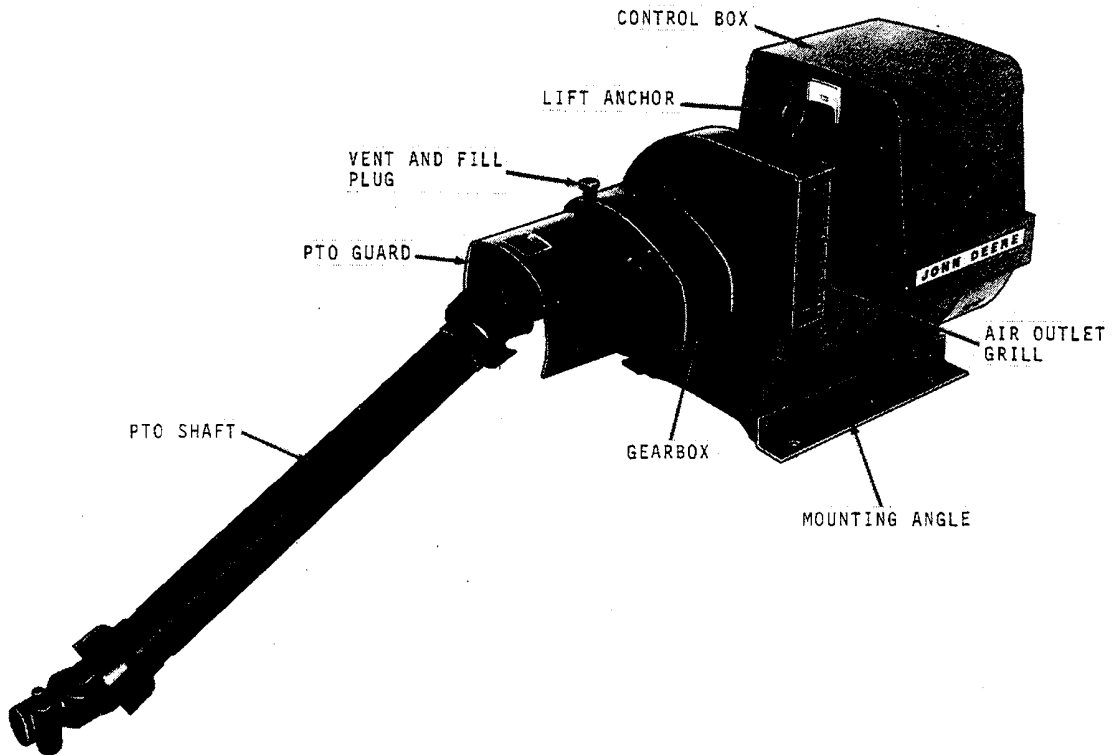
WATT—The amount of energy supplied to the circuit when one volt is forcing one ampere through one ohm resistance.

IDENTIFICATION VIEW



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Fig. 1-John Deere 15K PTO Standby Alternator



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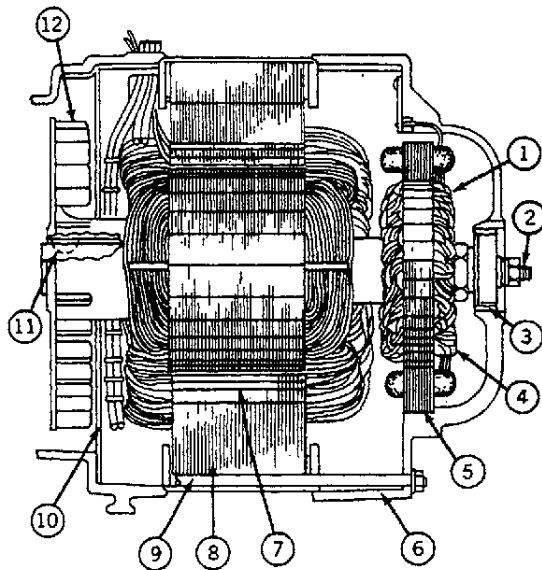
Fig. 2-John Deere 25K PTO Standby Alternator

THEORY OF OPERATION

The 15K and 25K alternators are four-pole, revolving field, brushless exciter, reconnectable models of drip-proof construction. Alternator design includes both single and three-phase, 60 hertz type alternators. The alternator is fastened to the gear case by the rotor through-stud which passes through the rotor shaft. A centrifugal blower, on the front end of the rotor shaft, circulates the alternator cooling air which is drawn in through the end bell cover and discharged through an outlet at the blower end.

A ball bearing in the end bell supports the outer end of the rotor shaft. The end bell and alternator stator housing are attached by four through-studs which pass through the stator assembly to the gear case alternator adapter. The brushless exciter stator mounts in the end bell while the exciter rotor and its rotating rectifier assemblies mount on the alternator rotor shaft.

The basic operation of the alternator and voltage regulator involves the stator, voltage regulator, exciter field and armature, a full wave bridge rectifier, and the alternator rotor. Residual magnetism in the alternator rotor and a permanent magnet embedded in one exciter field pole begin the voltage build-up process as the alternator set starts running. Single-phase AC voltage, taken from one of the stator windings, is fed to the voltage regulator as a reference voltage for maintaining the alternator output voltage. The AC reference voltage is converted to DC by a silicon controlled rectifier bridge on the voltage regulator printed circuit board and fed into the exciter field windings. The exciter armature produces three-phase AC voltage that is converted to DC by the rotating rectifier assembly. The resultant DC voltage excites the alternator rotor winding to produce the stator output voltage for the AC load.



1. Exciter Rotor
2. Rotor Through-Stud Bolt
3. O-Ring Seal
4. Rotating Rectifiers
5. Exciter Stator
6. End Bell
7. Rotor
8. Stator
9. Stator Through-Stud Bolt
10. Air Baffle
11. Key
12. Blower

Legend for Figure 3

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Fig. 3-Cross Section View of Alternator

LUBRICATION

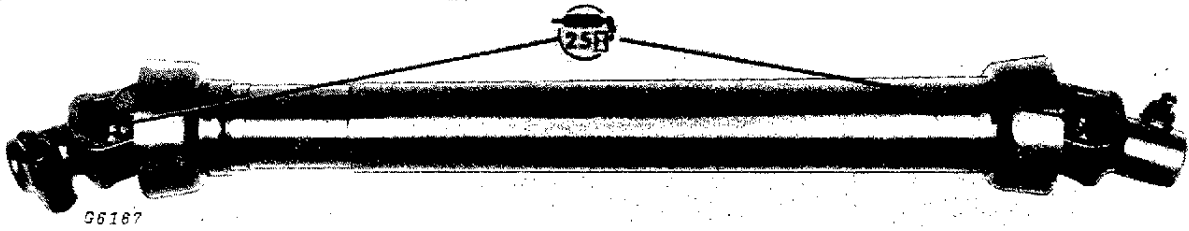


Fig. 4-PTO Shaft Lubrication

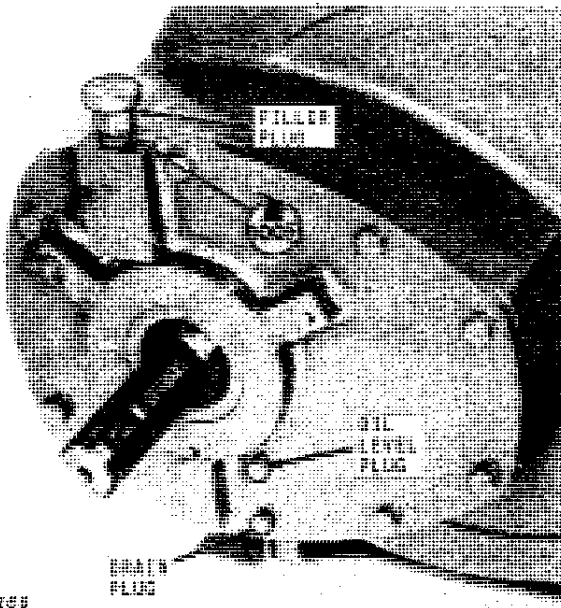


Fig. 5-Gear Box Lubrication

Fill gearbox with John Deere SAE 90 Multi-Purpose gear lubricant or equivalent. Remove the filler plug on top of gear box and the oil level plug from the face of gear box. Fill the gear box until the oil just begins to flow from the oil level plug hole. Replace both plugs.

The gear box capacity is 1 pint (0.473 l).

SERIAL AND MODEL NUMBERS

The serial and model numbers are located on the lower front left-hand side of control box.

SYMBOLS



Lubricate with John Deere Multi-Purpose Lubricant or an equivalent SAE multipurpose-type grease at hourly intervals indicated on the symbols.



Lubricate with John Deere SAE 90 Multi-Purpose gear lubricant or equivalent at hourly intervals indicated on the symbols.

LOCATING ALTERNATOR

Five factors must be considered when choosing the location for the alternator.

1. When operating under a heavy load the alternator creates heat. It is important to locate the alternator in a well ventilated area. If alternator is installed in a small room or compartment, provide a vent for exhausting air heated by the alternator. Heat is discharged from the drive-shaft end of alternator.

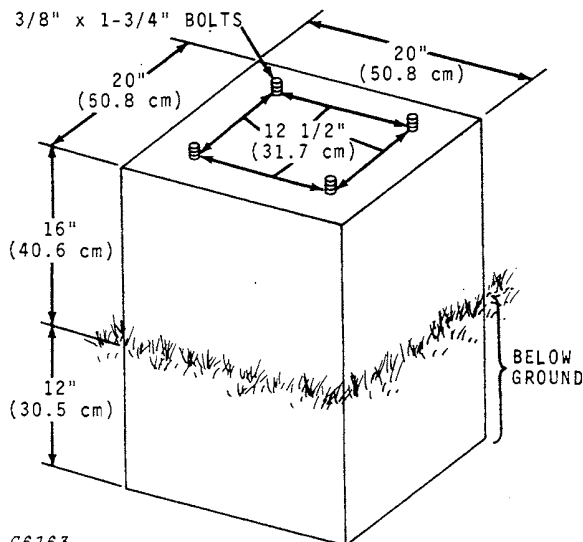
2. A proper location for the alternator should be free of dust or damp conditions. Alternator should be mounted under cover or inside a building for protection against the weather.

3. Twenty-four inches (60.96 cm) of space on all sides of the alternator should be allowed for service convenience.

4. Locate alternator as near as possible to farm use, power line terminal.

5. Locate the alternator for easy connection to tractor. PTO shaft from tractor to alternator should be as straight as possible.

CONCRETE FOUNDATION

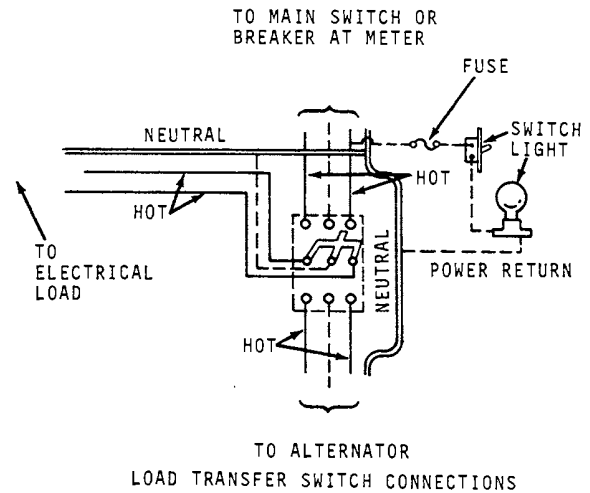


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Fig. 6-Concrete Foundation

The top surface of foundation block must be level and flat so that the mounting brackets will not be sprung when tightened down.

LOAD TRANSFER SWITCH AND POWER RETURN SIGNAL



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Fig. 7-Installing Load Transfer Switch and Power Return Signal

CAUTION: Only a qualified electrician should perform electrical wiring.

A double throw load transfer switch must be installed before alternator is used.

When a power failure occurs the load transfer switch can transfer load easily from the power line to the alternator.

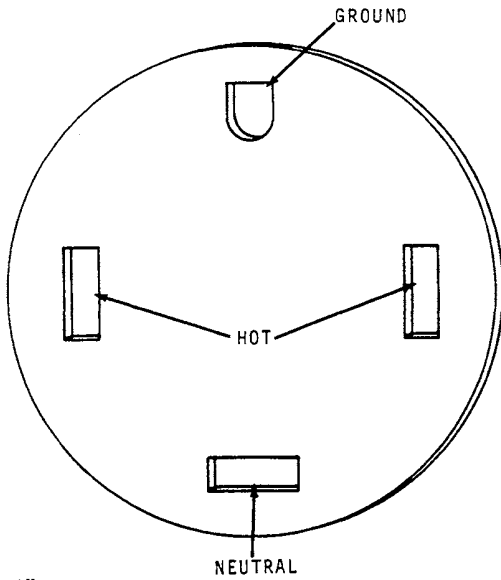
The load transfer switch should always be installed close to the main line switch. The load lines must connect to the center terminals of the transfer switch. The alternator leads and the main power source leads must be connected at opposite ends of the switch.

A power return signal in the form of a light or alarm can be installed to indicate when the power has been restored and the alternator can be disconnected.

Connect the power return signal across the regular power line, just ahead of the load transfer switch as shown in Fig. 7. Install an on-off switch and a fuse for the signal. When a power failure occurs, snap the signal switch to the ON position before putting the alternator into operation. When normal power returns the signal will operate and the alternator can be disconnected.

WIRE INSTALLATION TO ALTERNATOR

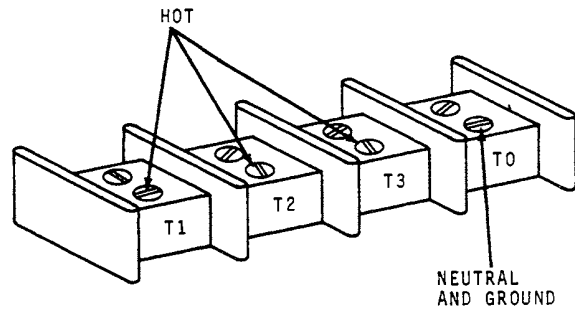
15K



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Fig. 8-Wire Installation of 15K

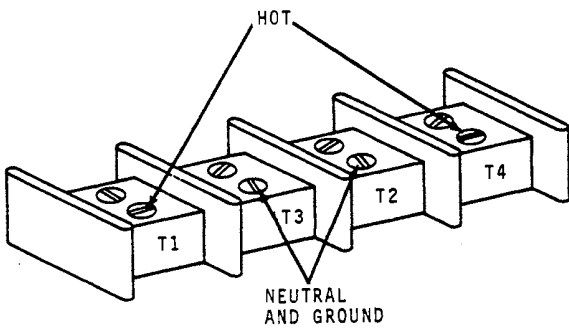
25K Three-Phase



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Fig. 10-Wire Installation of 25K Three-Phase

25K Single-Phase



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Fig. 9-Wire Installation of 25K Single-Phase