

KATOLIGHT[®]

KATOLIGHT BY MTU ONSITE ENERGY

P.T.O. Driven Alternator

Owner & Operator Manual



Dependable Power Solutions . . . It's All We Do!

MTU Onsite Energy Corporation

100 Power Drive / Mankato, MN 56002-3229

A Tognum Group Company

Phone 507.625.7973 Fax 507.625.2968 Toll Free 800.325.5450

www.mtuonsiteenergy.com

CAUTION:

Please read and understand the contents of this Owner & Operator Manual completely prior to operating your PTO Driven Alternator.

Failure to do so could result in serious personal injuries, damage to property or damage to alternator.

Save This Warranty Record

Model No. _____

Serial No. _____

Date Purchased _____

Purchased From _____

WHEN ORDERING PARTS OR ASKING FOR INFORMATION,
ALWAYS PROVIDE A MODEL AND SERIAL NUMBER.

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Cut on dotted line. Fill out warranty validation. Fold in half and secure with a piece of tape. Mail.

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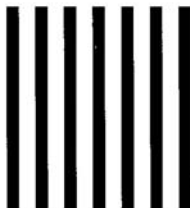
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**Katolight by MTU Onsite Energy
Five Year PTO Driven Alternator Standby Limited Warranty**

LIMITED WARRANTY: Your Katolight by MTU Onsite Energy Product has been manufactured and inspected with care by experienced craftspeople. If you are the original consumer, MTU Onsite Energy warrants, for the limited warranty period indicated below, each product to be free from defects in materials and workmanship, and will perform under normal use and service from valid start-up performed by MTU Onsite Energy. This Limited Warranty shall apply only when the product has been properly installed, serviced, and operated in accordance with the applicable MTU Onsite Energy instruction manuals. If this Limited Warranty applies, the liability of MTU Onsite Energy shall be limited to the replacement, repair, or appropriate adjustment of the product, at MTU Onsite Energy's option. This Limited Warranty does not apply to malfunctions caused by normal wear and tear, or by damage, unreasonable use, misuse, repair, or service by unauthorized persons.

LIMITED WARRANTY PERIOD: PTO Driven Alternator complete with Gear Box: Parts for five (5) years from the date of invoice by factory, including labor for the first two (2) years from the date of invoice by factory. Accessories: Parts and labor for one (1) year from the date of invoice by factory. For a description of accessories and items excluded from this Limited Warranty, review the listings on the reverse side of this document.

TO OBTAIN WARRANTY SERVICE: Warranty service may only be performed by MTU Onsite Energy authorized service providers. **Service provided by unauthorized persons will void this Limited Warranty. Non-MTU Onsite Energy replacement part(s) will void this Limited Warranty.** Contact your nearest MTU Onsite Energy Service Representative to obtain warranty service. For assistance in locating your nearest authorized service representative, contact MTU Onsite Energy, Attention: Service Department, 100 Power Drive, Mankato, MN 56001, (507) 625-7973.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED. NO WARRANTIES SHALL BE IMPLIED OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE, INCLUDING BUT NOT LIMITED TO A WARRANTY OF MERCHANTABILITY OR A WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

MTU ONSITE ENERGY SHALL NOT BE LIABLE FOR ANY CLAIM GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT AT ISSUE, AND IN NO EVENT SHALL MTU ONSITE ENERGY BE LIABLE FOR ANY SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES. STATE LAWS REGARDING THE RIGHTS OF CONSUMERS MAY VARY FROM STATE TO STATE.

1. The following items are not considered nor will they be covered under this Limited Warranty. If there are questions as to coverage under this Limited Warranty, it is advisable to contact the factory in advance of filing a claim.
 - a. Normal maintenance costs, including but not limited to adjustments, loose and/or leaking fittings or clamps, and tune-ups performed during start-up or anytime thereafter.
 - b. Non-MTU Onsite Energy replacement part(s) will void this Limited Warranty.
 - c. Products that are modified in any form without the written consent of MTU Onsite Energy will void this Limited Warranty.
 - d. Shipping damage of any type.
 - e. Any installation errors or damage of the equipment when shipped as ordered.
 - f. Any overtime travel or labor to make repairs under warranty.
 - g. Any special access fees required to gain access to MTU Onsite Energy equipment, including but not limited to any training or safety policy requirements to gain access.
 - h. Additional costs associated with inaccessible installations, including but not limited to removal and reinstallation of the generator set.
 - i. Rental equipment used during warranty work including but not limited to generators, rigging equipment such as a crane or boom truck, load banks and special test equipment above factory requirements.
 - j. Misuse or abuse during installation and thereafter.
 - k. Normal wear and tear, maintenance, and consumable items that are not required as part of a warranty repair. Consumable items include but are not limited to belts, hoses, coolant, oil, filters, and fuses.
 - l. Acts of nature or acts of God such as lightning, wind, flood, or earthquake.
 - m. Any damage due to situations beyond the control of the manufacturing of the product or workmanship of the product.
 - n. Installation or operation outside the guidelines as stated in the Installation Guide and Owners Manual.
 - o. Misapplication of the equipment such as usage outside the original design parameters as stated on the nameplate of the equipment.
 - p. Shaft or spline damage caused by improper shaft alignment.
 - q. Damage from improper storage when not in use.
 - r. Any repair labor time that is determined to be excessive, e.g., two or more people performing a one-person job.
 - s. Any expenses associated with investigating performance complaints in which no defect is found.
 - t. Any associated costs for replacing components that are found not to be defective.
2. The accessories that are limited to one (1) year parts and labor from invoice date include but are not limited to:
 - a. Tap changing switches
 - b. Circuit breakers
 - c. Cords and receptacles.
 - d. Trailer
 - e. PTO Shaft
 - f. Manual Transfer Switches.

Rev:20070201

Katolight by MTU Onsite Energy Corporation
100 Power Drive / Mankato, MN 56001 / USA / A Tognum Group Company
Phone: (507) 625-7973 / www.mtuonsiteenergy.com

IMPORTANT WARRANTY VALIDATION

This card must be filled out and returned within 10 days of purchase.

Model No. _____ Serial No. _____

Customer/Owner Name: _____

Address _____

County _____ City _____

State _____ Zip _____

E-Mail: _____ Phone: _____

I heard about MTU Onsite Energy Corporation Standby Power from:

Friend Radio Newspaper

Magazine Farm Show Other _____

Purchased from: (Dealer Name) _____

City _____ State _____ Zip _____

Date Purchased: _____

I will use my MTU Onsite Energy unit in the following applications:

General Farm Dairy Farm Beef Farm

Hog Farm Poultry Farm Hatchery

Household Other _____

OPERATING INSTRUCTIONS AND SERVICE INFORMATION

For MTU Onsite Energy Corporation KLM SERIES

PTO Driven Alternators

MODELS

1-Phase KLM1-25, KLM1-40, KLM1-50, KLM1-60, KLM1-75, KLM1-100

3-Phase KLM3-45, KLM3-55, KLM3-65, KLM3-85, KLM3-105, KLM3-135

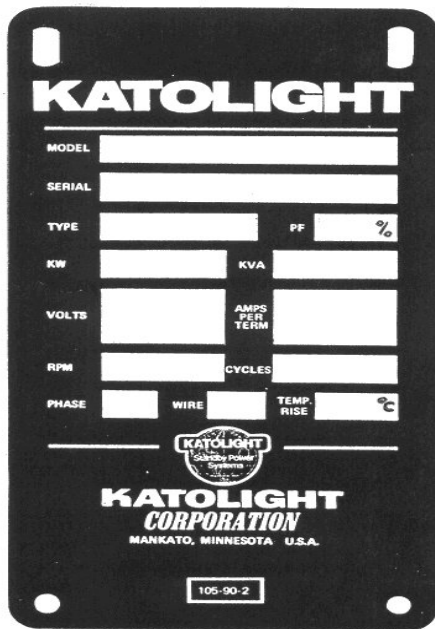
Read this book before operating the alternator and save for future reference.

Write the Model number, Type number and Serial number of the alternator in the spaces below. Be sure to give these numbers when ordering parts or corresponding about the alternator.

Alternator Model:

Serial Number:

MTU Onsite Energy Corporation
100 Power Drive,
Mankato, MN 56001
Phone: (507) 625-7973 / Fax: (507) 625-2968
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ALTERNATOR DATA

The alternators described in this manual are 1800 RPM revolving field brushless type with Automatic Voltage Regulation. Output voltage may be varied by turning the voltage adjust potentiometer.

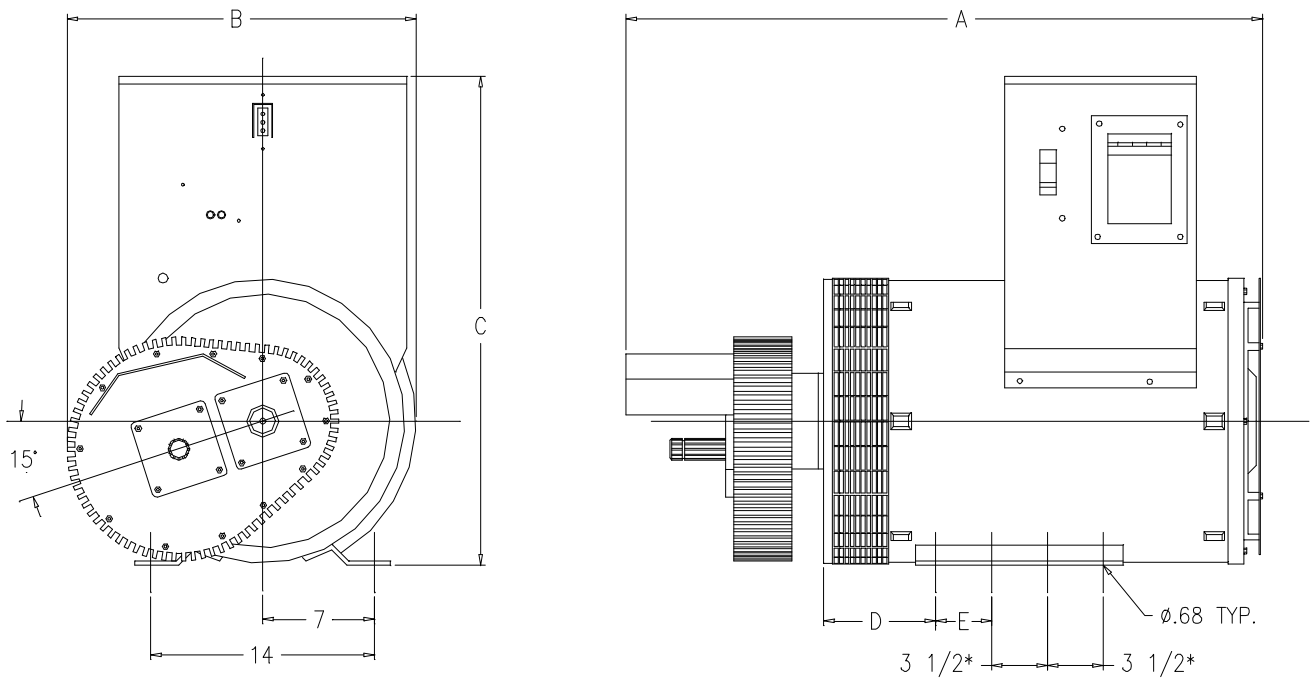
Standard equipment includes: Speed Monitor Light, Automatic Voltage Regulator, Brushless Revolving Field Type Alternator, Mainline Circuit Breaker, 15 Amp 120 Volt 3 Wire Duplex Receptacle, 50 Amp 240 Volt 4 Wire Receptacle, Full Load Connector, PTO / Gearbox, Safety Shield, Lifting Eyes, Helical Gears, Mounting Base, Gear Lube, Grounding Terminal, 1800 RPM Slow Speed, Rodent Screen & Drip Proof Design.

3-Phase Model Selection Chart

Model No.	KVA @ .8pf	Momentary Surge Watts	Minimum Required HP	Circuit Breaker Amps			Phase	Wire
				120/208	120/240	277/480		
KLM3-45	56,250	135,000	72	150	150	70	3	12
KLM3-55	68,750	165,000	85	200	175	80	3	12
KLM3-65	81,250	195,000	100	225	200	100	3	12
KLM3-85	106,250	255,000	131	300	250	125	3	12
KLM3-105	315,000	315,000	160	350	300	150	3	12
KLM3-135	405,000	405,000	202	450	400	200	3	12

1-Phase Model Selection Chart

Model No.	Watts	Momentary Surge Watts	Minimum Required HP	Volts	C.B Amps	Phase	Wire
KLM1-25	25,000	75,000	35	120/240	100	1	3
KLM1-40	40,000	120,000	65	120/240	175	1	3
KLM1-50	50,000	150,000	78	120/240	200	1	3
KLM1-60	60,000	180,000	92	120/240	250	1	3
KLM1-75	75,000	225,000	113	120/240	300	1	3
KLM1-100	100,000	300,000	151	120/240	400	1	3



Model No.	A	B	C	D	E
KLM1-40	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM1-50	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM1-60	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM1-75	42 ⁵ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM1-100	45 ⁷ / ₁₆	22 ⁹ / ₁₆	33 ⁷ / ₈	11 ⁵ / ₁₆	3 ¹ / ₂
3-PHASE					
KLM3-45	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM3-55	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM3-65	38 ¹¹ / ₁₆	22 ⁹ / ₁₆	29 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM3-85	42 ⁵ / ₁₆	22 ⁹ / ₁₆	33 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM3-105	42 ⁵ / ₁₆	22 ⁹ / ₁₆	33 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂
KLM3-135	45 ⁷ / ₁₆	22 ⁹ / ₁₆	33 ⁷ / ₈	7 ¹³ / ₁₆	3 ¹ / ₂

Model No.	A	B	C
KLM1-25	32 ⁵³ / ₆₄	16 ⁴⁵ / ₆₄	24 ⁹ / ₃₂

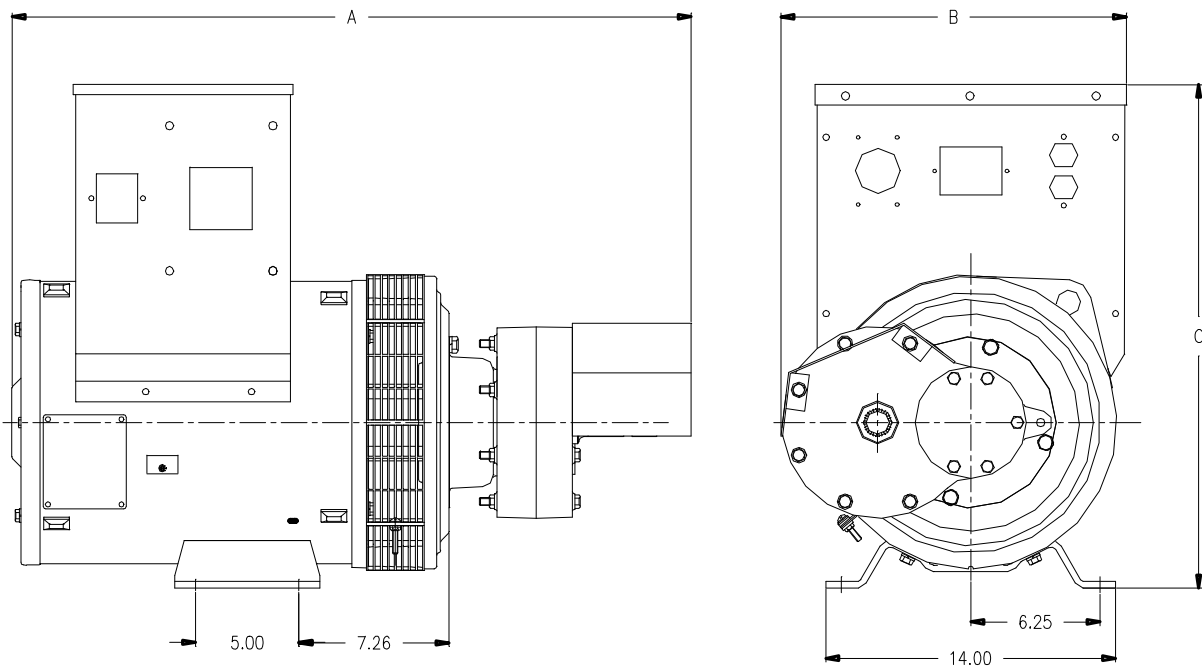


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INTRODUCTION

Before any MTU Onsite Energy PTO Driven Alternator is shipped from the factory the alternator is inspected and tested for performance. All units are load tested prior to shipment. Carefully unpack the unit and visually inspect it for damage. If it is damaged, check with the transportation carrier for adjustment of the damage. Before placing the unit in operation, check the gearbox gear lube level. If empty, or below the level check plug and fill with EP90 weight gear oil to check plug level.

If upon installation a new alternator does not work properly, check all electrical connections and the alternator speed before concluding the alternator is defective.

DETERMINING YOUR SPECIFIC LOAD

The load can be determined by adding the wattage requirements for each light, appliance and motor which will be operated by the unit. The following chart lists approximate running or operating watts required for various electrical appliances.

**TABLE B
APPROXIMATE WATTS REQUIRED
FOR ELECTRICAL APPLIANCES**

APPLIANCE	WATTS
Lamp Bulbs	See wattage on bulbs
Radio	40 - 200
Television	150 - 300
Vacuum Cleaner	200 - 750
Automatic Washer	400
Air Conditioner (3/4 Ton)	1,250
Refrigerator	325
Food Freezer	300
Furnace (Oil)	700
Deep Well Pump	2,000
Electric Range	600 - 10,000
Hot Plate (per burner)	600 - 1,200
Toaster	600 - 1,130
Water Heater	1,500 - 5,000
Glow Heater	600 - 1,200
Heating Pad	40 - 80
Sun Lamp	250 - 1,000
Flat Iron	600 - 1,200
Laundry Dryer	4,750
Electric Heat System	5,000 - 20,000

Check all appliance nameplates for exact ratings.

HOW ELECTRIC MOTORS ARE CLASSIFIED, AND WHAT THEIR RATINGS MEAN

Electric motors require more current (amperes) starting than running. Split-phase motors are difficult to start and require 5 to 10 times as much current to start as to run, dependent on the NEMA code letter rating. Capacitor motors require 2 to 4 times as much current to start as to run. Repulsion Start Induction Motors require 1½ to 2½ times as much current to start as to run.

The chart below shows the approximate current required to run and start 120 volt, 60 cycle, NEMA Code F induction motors under average load conditions.

Horse Power	Running Amperes	Starting Amperes
1/6	4.4	7 to 15
¼	5.8	10 to 15
1/3	7.2	15 to 25
1/2	9.8	20 to 30
1	16.0	40 to 50

The NEMA code letter assigned by the motor manufacturer will govern the starting (locked rotor) current surge. The chart below shows the NEMA code letters and their corresponding range of multipliers for the starting current requirement in amperes.

NEMA Code letter Motor Rating	Kilovolt-Amperes per Horsepower (Locked Rotor)
A	0 - 3.14
B	3.15 - 3.54
C	3.55 - 3.99
D	4.0 - 4.49
E	4.5 - 4.99
F	5.0 - 5.59
G	5.6 - 6.29
H	6.3 - 7.09
J	7.1 - 7.99
K	8.0 - 8.99
L	9.0 - 9.99
M	10.0 - 11.19
N	11.2 - 12.49
P	12.5 - 13.99
R	14.0 - 15.99
S	16.0 - 17.99
T	18.0 - 19.99
U	20.0 - 22.39
V	22.4 - and up

Here is a formula for amps:

**The starting current for 1 h.p.
Code F 230 V.A.C.**

$$1 \times 5.6 = 5.6 \text{ KVA inrush}$$

$$\text{Amp} = \frac{\text{KVA}}{\text{Volts}} = \frac{5.6^{10^3}}{230} = 24.3 \text{ amp inrush or starting}$$

Because the heavy surge of current required for starting motors is needed only for an instant, the alternator will not be damaged if it can bring the motor up to speed in a few seconds. If difficulty is experienced in starting motors, turn off all other electrical loads and, if possible, reduce the load on the electric motor.

NOTE

IN APPLICATIONS WHERE SEVERAL MOTORS ARE TO BE STARTED, EXCESSIVE OVERLOAD MAY BE AVOIDED BY STARTING THEM ONE AT A TIME. START THE MOTOR THAT REQUIRES THE HIGHEST RUNNING AND STARTING CURRENT FIRST.

INSTALLING THE ALTERNATOR

Provide sufficient ventilation. Do not operate tractor driven alternator in a non-ventilated area. Do, however, provide protection from heavy snow or dust which may plug air cleaners and ventilation openings.

For best operation, the following factors should be taken into consideration:

1. Dirt - Dust particles and dirt can cause excessive wear, not only to bearings but to all rotating parts of the alternator.
2. Moist or wet conditions are hazardous. In addition, all electrical equipment should be protected from excessive moisture which deteriorates insulation and causes short circuits.

The generator must be stored properly. Protect it from moisture and dirt. If the unit is to be left in the open, it should be covered whenever it is not in use. All ventilating openings should be cleaned periodically and kept clear and open while operating.

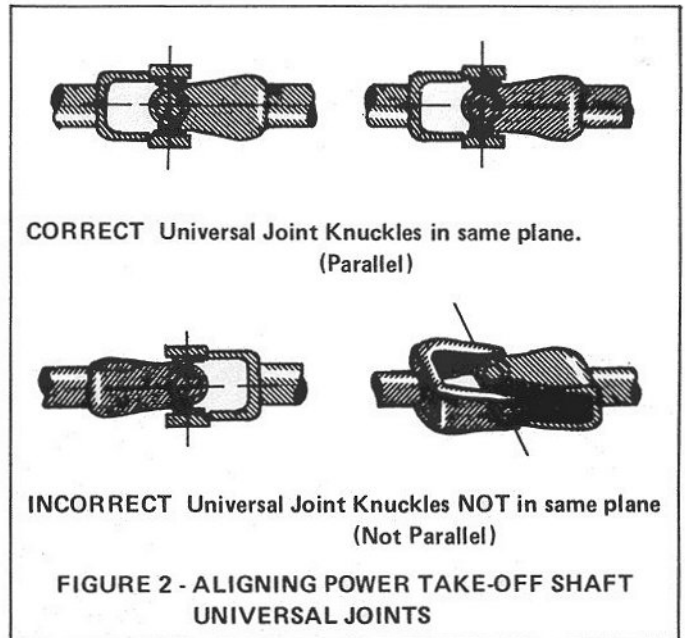
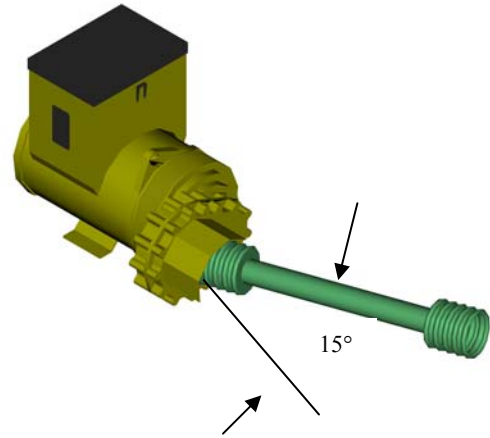
MOUNTING THE ALTERNATOR

The alternator must be solidly bolted to a foundation, platform or bed of a trailer. The feet on the alternator must contact the foundation or trailer bed. If space is left between a mounting foot and the foundation or trailer, shim it to take up the space and then insert and tighten bolts.

ALIGNING ALTERNATOR WITH TRACTOR POWER TAKE-OFF

The double universal joint construction of the power take-off drive shaft allows for considerable angular misalignment between the gearbox and the tractor power take-off shaft. As shown in Figure 1 the angular misalignment of the universal joints, if at all possible, should not be more than 15 degrees. If the power take-off drive shaft is taken apart, make certain the drive shaft universal joint knuckles are in time with one

another as shown in Figure 2. If the drive shaft universal joint knuckles are not in time, chattering will occur which will cause a flicker in the electrical output. The same flicker will also occur if the angle of the drive shaft from the alternator to the tractor power take-off is more than 15 degrees. Make certain the power take-off shaft lock pin is properly engaged and the removable power take-off shaft shields are installed before operating the unit.



CONNECTING ALTERNATOR TO LOAD

- Load can be taken from receptacles or by connecting the Alternator into an existing service through the full load connector plug.
- Load taken from receptacles should not exceed the respective receptacle rating and should never exceed the alternator rating. The 120 VAC duplex receptacle is rated for 15 amps and the 240 VAC receptacle is rated at 50 amps. Both receptacles and the full load plug are protected by individual overload protection circuit breakers.

- Load taken from the full load cord set should not exceed the full load rating of the alternator.
- When the Alternator is connected into an existing service normally supplied by commercial power an approved TRANSFER SWITCH MUST BE USED. Check your local electrical code requirements before you make any connections.

INSTALLING GROUND WIRE

Ground the Alternator frame and Neutral leg to a solid earth ground. Follow local electrical code regulations enforced in your area with regard to neutral bonding to ground requirements. The ground wire should not be smaller than the load line. A ground stud terminal is supplied for this connection.

GEARBOX LUBRICATION

Check oil level. Fill with EP90 Gear oil if necessary. Maintain oil level slightly below check plug. DO NOT OVERFILL. Overfilling will cause heating and seal damage.

LAST CHECK BEFORE STARTING THE ALTERNATOR

Before starting the alternator for the first time, the unit should be inspected as follows:

1. Check electrical connections to load. (Refer to the electrical connection diagrams.)
2. Using the gearbox splined input shaft, turn the alternator manually and visually inspect for foreign objects that may have gotten into the unit during shipping and/or crating.
3. Check gearbox oil level.
4. Check alignment of PTO shaft.
5. Make sure all protective covers and guards are in place.
6. Make sure alternator input speed matches tractor pto speed.

OPERATING THE ALTERNATOR

1. Open the mainline circuit breaker or make sure the transfer switch is **NOT** in the emergency position. Starting the alternator with the load applied is not recommended.
2. When the alternator is used, **ALWAYS** start the tractor with the engine idling, engage the power take-off, and let the clutch out slowly. Caution must be taken with electrically engaged power take-off drives. A special PTO shaft incorporating a "friction / overrunning combination clutch feature" is required to protect the quick start / stop PTO electronic engagement from damaging the generator drive system. Contact your tractor manufacturer and / or MTU Onsite Energy for recommendations and requirements before operating your MTU Onsite Energy PTO alternator on an electronically engaged PTO drive system.
3. Make certain unit is at rated speed and producing desired voltage. Procedures for reading speed monitor light and voltage are contained in the following paragraphs. Speed may dip slightly when load is applied and therefore, tractor throttle setting with full

load applied may have to be increased slightly from no load setting. The load can now be applied to the alternator by closing the mainline circuit breaker or by transferring the transfer switch into the emergency position.

4. Speed Monitor. When the alternator is being driven at proper speed (1800 RPM), the Green light on the Speed Monitor will come on. At 1800 RPM, the alternator puts out 60 Hertz (60 cycles per second). The Green light goes off and the upper or lower red light comes on if the speed is too high or too low. The Green light stays on as long as the alternator output is between 59 and 61 Hertz. Motors will run satisfactorily if power frequency is within 5% of their nameplate value, as far as torque and heating are concerned. But note that on induction motors and synchronous motors, speed varies in proportion to frequency, hence any equipment that depends on frequency for timing will not be accurate if alternator speed is off.
5. Using the Speed Monitor.
 - a. When starting up the PTO Alternator, watch the Speed Monitor.
 - b. While the unit is coming up to speed, the bottom RED light will come on; continue to increase speed until the Green light comes on.

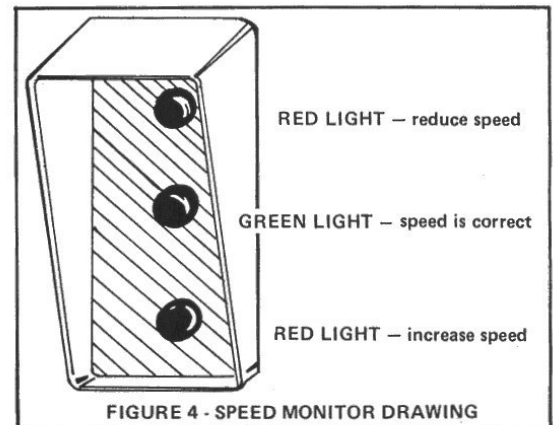


Figure 3

- c. After load is applied, it may be necessary to readjust the speed to the green light position by increasing the tractor throttle.
- d. Check the Speed Monitor periodically while the unit is in operation, especially after adding or taking off load. If the top red light comes on, reduce speed; if the bottom red light comes on, increase speed. How to Verify Speed Light Operation.

Plug a standard analog wall clock into the 120-volt receptacle of the alternator. Run the generator and compare the second hand sweep around the face of the clock to the second hand of a wristwatch or stop watch. When the alternator is at 60 Hz the clock and wristwatch should match. If the clock runs faster than the wristwatch the alternator speed is too fast. If the clock runs slower than the wristwatch the alternator speed is too slow.

Speed Chart

61Hz = Clock will gain 1 second per minute of operation or 1

minute per hour of operation

59 Hz = Clock will lose 1 second per minute of operation or 1 minute per hour of operation.

6. Shutting the alternator down. Caution must be taken when disengaging the PTO driven alternator. To disconnect the electrical load prior to shutting down the alternator, open the mainline circuit breaker or make sure the transfer switch is **NOT** in the emergency position. Bring the tractor from rated speed to idle (approximately 800 RPM) before disengaging. Failure to follow this procedure could result in damage to alternator or alternator gearbox.

CAUTION:

DO NOT OPERATE TRACTOR IN NON-VENTILATED AREA.

STOP TRACTOR BEFORE FILLING WITH FUEL.

IN APPLICATIONS WHERE ALTERNATOR IS CONNECTED TO SERVICE WHICH IS NORMALLY SUPPLIED BY COMMERCIAL POWER, INSTALL A TRANSFER SWITCH. THIS PRECAUTION PROTECTS PERSONNEL SERVICING COMMERCIAL POWER LINES.

AVOID CONTACT WITH ALTERNATOR VOLTAGE. WHENEVER MAKING ELECTRICAL CONNECTIONS OR REPAIRING ALTERNATOR, FIRST STOP UNIT.

CHECKING ALTERNATOR OUTPUT VOLTAGE

To check the voltage, use a good quality AC Voltmeter - inexpensive meters often have an error of 10% or more. For best results, choose a meter that will indicate the desired voltage at about 3/4 of full scale, For example: to read 240 volts AC, use a 0 to 300 volt AC meter.

For personal safety, connect the meter to the generator before starting the engine.

WARNING: DANGEROUS VOLTAGES ARE PRESENT IN THIS UNIT!

VOLTAGE REGULATOR FUNCTION

Unless the alternator's output voltage is kept within narrow limits, equipment that is powered by it may not operate properly and may be damaged. Motors are usually designed to run satisfactorily only when the voltage at their terminals is within 10% of the nameplate value. In particular, motors will have their torque reduced and will overheat if they are operated at too low a voltage. If the voltage is too high it will cause some devices to burn out.

The purpose of the voltage regulator is to keep the alternator voltage at very near its set value. It does this by supplying the proper amount of direct current to the exciter field, according to the needs of the alternator. An increase in load normally causes the alternator voltage to decrease; the regulator senses this drop in voltage and increases the exciter field current just enough to bring the voltage back up. A decrease in load has the opposite effect - it causes the alternator voltage to go up; the voltage regulator senses this and reduces exciter field current so as to bring the alternator voltage back down to the set value.

The voltage regulator has an adjustment for setting the

alternator voltage. This voltage is set at the factory and should require no further adjustment. However, should conditions exist which cause voltage output to change, voltage adjustment can be made with a screwdriver. Refer to the voltage regulator manual for instructions on voltage adjustment, regulator service, etc.

VOLTAGE REGULATOR REPLACEMENT

If the voltage regulator is defective it must be replaced and cannot be repaired. To reconnect properly, refer to the wiring diagram in the installation section. All connections are made at the terminal strip on the regulator.

EXCITER FIELD VOLTAGE

When there is a problem with the alternator, it is often useful to check the Voltage Regulator output to the exciter field. This voltage can be read at terminals F+ and F- on the regulator. The values should be taken from units running at rated speed (1800 rpm) and rated output voltage with NO LOAD. Exciter field voltage will normally be lower at no load than when the alternator is loaded. Note that DC meters are required to measure the exciter field voltage and current. Polarity must be observed.

ELECTRICAL SERVICE AND MAINTENANCE

ROTATING RECTIFIER ASSEMBLY MAINTENANCE AND TEST PROCEDURE

Individual rectifiers, or the complete rectifier assembly can be accessed by removing the end bracket opposite the drive end of the unit. Remove the end bracket to expose the bearing and rotating rectifier assembly for test, assembly or service, Refer to Figure 4.

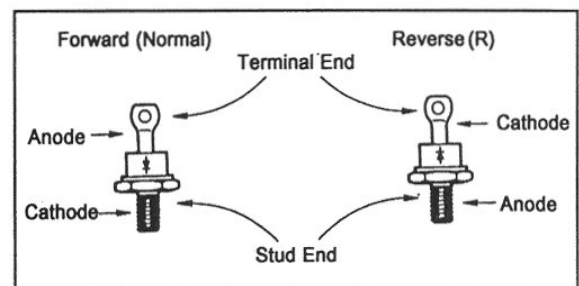


Figure 4

- A. Stud type diodes may be tested in the field without unsoldering and removing the load from the diode terminal. Remove the diode load lead terminal lug from its terminal post, and insure that it is not making contact with any adjacent metallic part. An ohmmeter or a battery-light continuity tester may be used to find a short or open condition in the diode. Connect the positive test lead to the anode, and the negative lead to the cathode, take a reading, reverse the test leads and take a reading. These checks should indicate one of three conditions: 1. Good diode: Will have a much greater reverse resistance (positive lead on cathode) than forward resistance (negative lead on cathode). Typical reverse resistance will be 30,000 -

300,000 ohms or greater, while typical forward resistance will be less than 10 ohms. The continuity tester will have the light "on" in one direction, and "off" in the other.

2. Shorted condition: ohmmeter reading will be zero, or very low in both directions. Continuity tester light will be on in both directions.

3. Open condition: ohmmeter will have a maximum (infinity) reading in both directions. Continuity tester light will be dark (off) in both directions.

CONSTANT EXCITATION (12V BATTERY) TEST

THEORY: The generator output voltage is dependent on generator speed, generator design, load, and exciter input current. If the generator speed and exciter input are known, the output voltage at no load can be measured and compared to the design value. Problems can be isolated to either the generator or regulator system by using this test.

TEST PROCEDURE:

1. Shut the generator set down.
2. Connect a voltmeter to the generator output.
3. Disconnect the F1 and F2 leads at the regulator.
4. Connect a 12 volt battery capable of supplying 1 amp to the F1 and F2 leads.

CAUTION: Beware of arcing when connecting leads. Stay clear of battery vents. Escaping hydrogen gas can explode. If hazardous conditions exist - use a suitable switch to connect or disconnect the battery.

5. With no load on the generator, (Main breakers open) run generator at rated speed (1800 rpm - 60 Hz or 1500rpm - 50 Hz).
6. Measure the generator output voltage.
7. Shut generator down.
8. Disconnect battery (see caution - Step 3).

Conclusion: If voltage output is near nominal, the main generator and exciter are operating properly. If voltage output is less than 50% of nominal, the problem is in the generator. Continue testing diodes, surge suppressor, windings.

REPLACEMENT OF DIODES

If a diode tests bad, replace all the diodes, or the complete rectifier assembly. Remove the diode leads to the main rotor

terminal posts, along with the plastic lead wire clamps. The individual diodes are "stud type", retained by 1/3-20 hex head nuts and a lock washer. Prior to installing a replacement diode on the heat sink, run a bead of a thermal-electrical contact compound around the base of the diode. The threads should not be coated. Torque the diodes to 27-30 inch-pounds. Do not over tighten.

REPLACEMENT OF THE RECTIFIER ASSEMBLY

Remove the bearing from the main shaft. Disconnect the exciter rotor and main rotor leads. Remove the hold-down screws which secure the rectifier assembly to its mounting. The rectifier assembly is then free for removal.

To replace, reverse the procedure. Check all connections. Always install a new bearing.

RESTORING RESIDUAL MAGNETISM

The cores of the alternator and exciter fields retain a certain amount of magnetism after the power plant has been shut down. This residual magnetism must be present to begin the voltage build-up process when the power plant is started up again. If residual magnetism is lost due to a long idle period or some other cause, it will be necessary to flash the field. This is done by connecting a 12-volt battery across the exciter field for 15 - 30 seconds. Proceed as follows:

1. Disconnect the two exciter field leads from voltage regulator terminals F+ and F-. The field leads should be marked F2 and F1.
 2. * Disconnect regulator power leads 3 & 4 from voltage regulator.
 3. Connect the negative terminal of a 12 volt battery to lead F1.
 4. Connect the positive terminal of the battery to lead F2 for a few seconds.
 5. Start the engine and bring the unit up to speed.
 6. There should be voltage at the alternator output - up to 200 volts AC line-to-line, more or less. If there is still no voltage, contact your local factory representative.
 7. If voltage is now present, shut down the unit, disconnect the battery and connect the exciter field to the voltage regulator, F2 to F+ and F1 to F-.
 8. Reconnect power leads 3 & 4.
 9. Start up the engine and bring it up to speed; check output voltage.
- * Refer to the voltage regulator manual for regulator connections, regulator operation, etc.