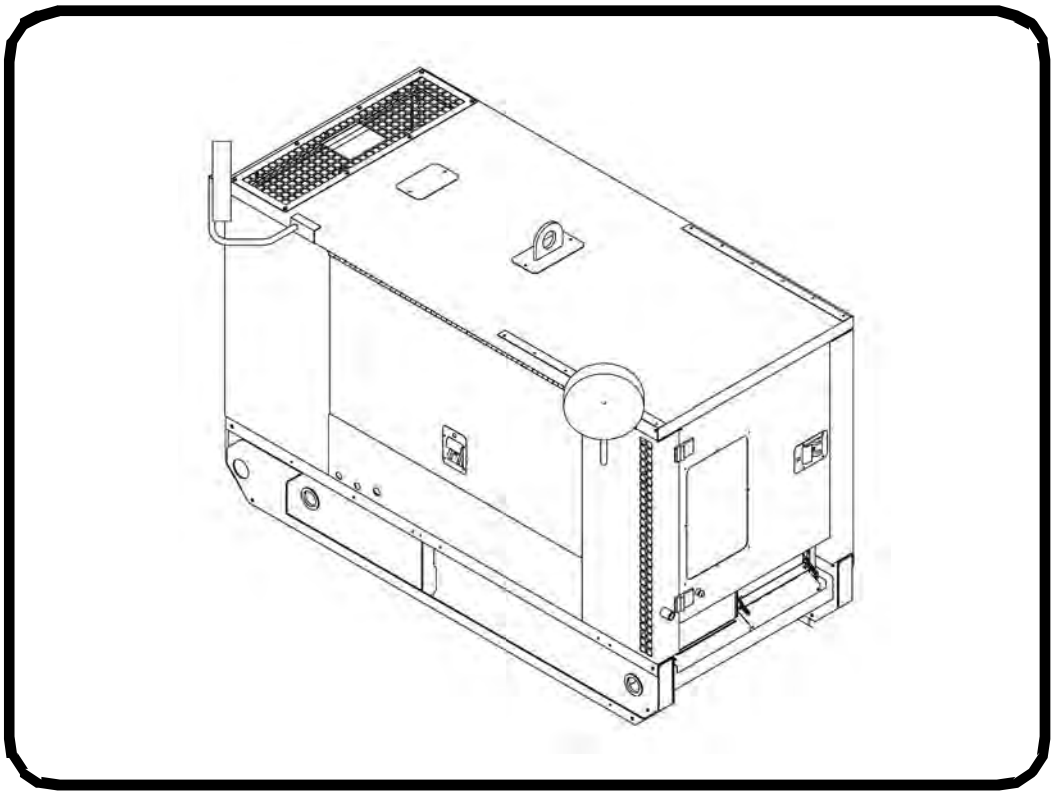
Service Manual
Heater Generator Set

(HG40) S/N B14F00101 & Above



6990758 (8-13)

Printed in U.S.A.

FEATURES AND ACCESSORIES

Standard Items

The heater generator set is equipped with the following standard items:

- Control Panel Mounted Voltage Selector Switch (VSS).
- Safety Shutdown System.
- EPA Certified Engine.
- Advanced Engine Controller.
- Remote Auto Start / Stop Control.
- Hard Wire Panel.
- Twist Lock Receptacles.
- Individual Circuit Breakers.
- Easy To Read Analog Gauges.
- Corrosion Resistance Enclosure.
- High Capacity On Board Fuel System.
- Sound Reducing Insulated Enclosure.

ENGINE AIR CLEANER

Replacing Air Filter Element

⚠ WARNING

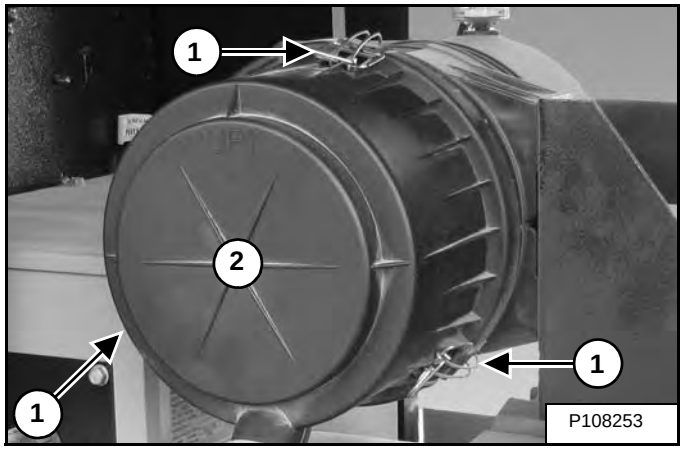
UNEXPECTED ENGINE STARTUP CAN CAUSE SERIOUS INJURY OR DEATH

Never inspect or service unit without first disconnecting battery cables to prevent accidental starting.

W-2950-1112

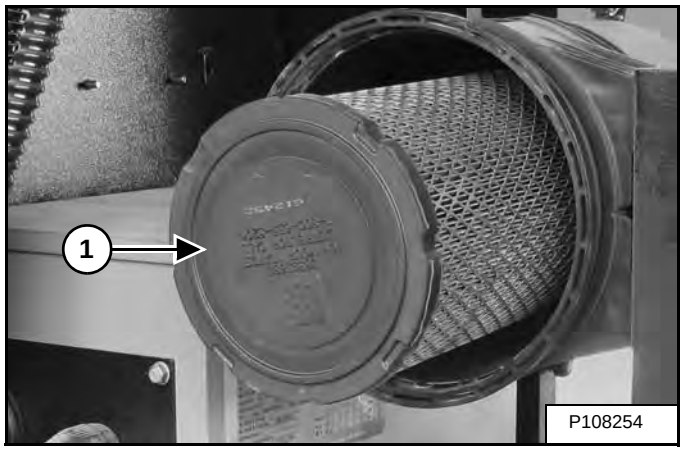
Open the back panel door (right hand side if facing control panel).

Figure 10-40-1



Open the three latches (Item 1). Remove the air cleaner cover (Item 2) **[Figure 10-40-1]**.

Figure 10-40-2



Remove the air filter element (Item 1) **[Figure 10-40-2]**.

NOTE: Make sure all sealing surfaces are free of dirt and debris.

Install new air filter element. Push all the way in until it contacts the base of the housing.

Install the air cleaner cover (Item 2) and secure the three latches (Item 1) **[Figure 10-40-1]**.

Fuel Filter(s)

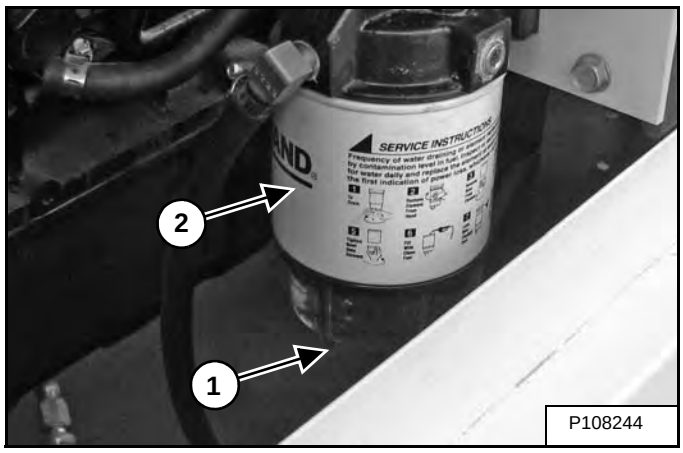
Replace the fuel filter(s) every 500 hours of operation.

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-30-1.)

Stop engine and open the front panel door.

Removing Water

Figure 10-60-2



Loosen the drain (Item 1) **[Figure 10-60-2]** at the bottom of the fuel / water separator filter element to remove trapped water.

Securely tighten the drain.

⚠ WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

W-2103-0508

Close the front panel door.

Replacing Fuel / Water Separator Filter

See the SERVICE SCHEDULE for the correct service interval. (See SERVICE SCHEDULE on Page 10-30-1.)

Stop engine and open the front panel door.

Remove the fuel / water separator filter element (Item 2) **[Figure 10-60-2]**.

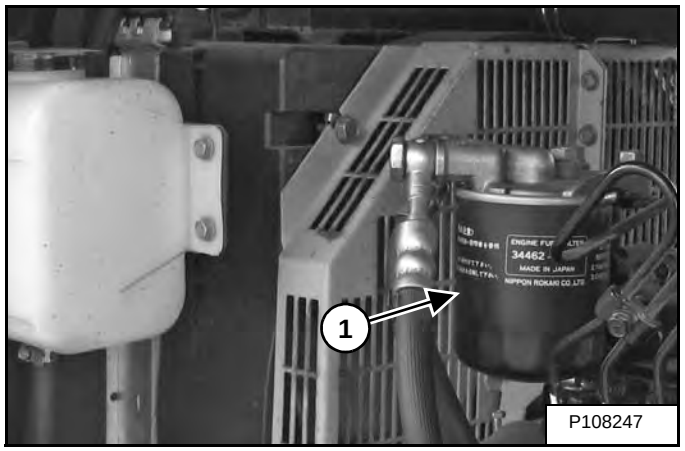
Clean the area around the fuel / water separator filter housing. Apply a small amount of fuel to the seal of the new fuel / water separator filter. Install fuel / water separator filter and hand tighten.

NOTE: Do not add fuel to the new fuel / water separator filter before installing.

Remove air from the fuel system. (See Removing Air From The Fuel System on Page 10-60-4.)

Fuel Filter

Figure 10-60-3



Remove the fuel filter element (Item 1) **[Figure 10-60-3]**.

Clean the area around the fuel filter housing. Apply a small amount of fuel to the seal of the new fuel filter. Install the fuel filter, and hand tighten.

NOTE: Do not add fuel to the new fuel filter before installing.

Remove air from the fuel system. (See Removing Air From The Fuel System on Page 10-60-4.)

MAINFRAME

ENCLOSURE 20-10-1
Roof Panel Removal And Installation 20-10-1
Side Door Removal And Installation 20-10-2
Control Panel Door Removal And Installation 20-10-3
Side Panel Removal And Installation 20-10-3
Left Rear Corner Panel Removal And Installation 20-10-4
Right Rear Corner Panel Removal And Installation 20-10-5

ALTERNATOR
G2

SUP
BLK T2
BLK T3
BLK T7
BLU T4

EXCITATION WIRING
E- E+ X1 X2 Z1 Z2

AVR
R438LS
X2 Z1 X1 Z2 F+ F- SH 220V 0V
238A 239A 208B 209B

VOLTAGE ADJUST
R2 1000
247
238 239
TB1 7 8 9 10
208A 209A

VSS** VOLTAGE SELECTOR SWITCH

NOT USED
225
238
239
204F
204G
242G

LAST USED
250

TO EM-C 106A
TO S1-30

OCR

S10 VOLTMETER SWITCH
OFF
L1-L2 L1-L0
L2-L3 L2-L0
L1-L3 L3-L0

S11 AMMETER SWITCH
OFF
L3 L1
L2

M4 FREQUENCY
M5 AC VOLTS
M6 AC AMPS

T1 2400 VA
277V
120V

CB1 CB2 CB3 CB4 CB5

NEUT HOT NEUT HOT

CT1 CT2 CT3

N L0 L1 L2 L3

NOTE: ALL WIRES 18 AWG UNLESS MARKED.
NOTE: ALL 18-14 AWG WIRES YELLOW UNLESS MARKED.
** NOTE: VSS SHOWN IN 480/277 HIGH-WYE CONNECTIONS.

Printable Version Click Here

AC GENERATOR SCHEMATIC

Asphalt Heater Troubleshooting

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

WARNING

AVOID INJURY OR DEATH

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0807

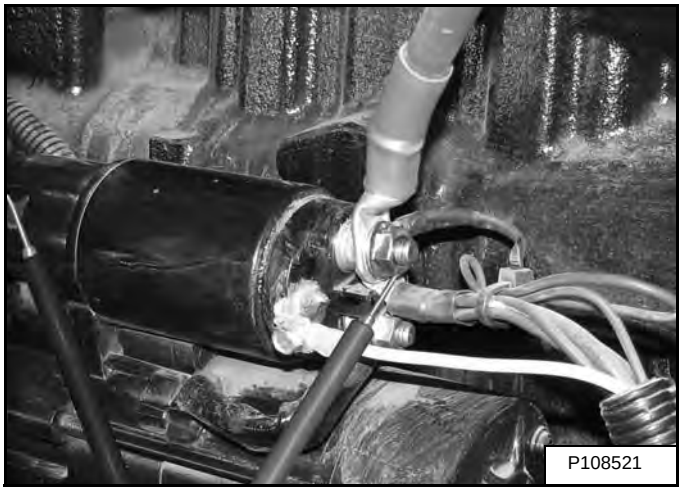
PROBLEM	CAUSE
Infrared element not heating.	1, 2, 3, 4, 5

KEY TO CORRECT THE CAUSE
1. Broken element.
2. Loose / broken wire connection.
3. Asphalt heater circuit breaker tripped.
4. Heater generator set main breaker tripped.
5. Blown fuse.

CHARGE ALTERNATOR (CONT'D)

Alternator Voltage Testing

Figure 30-30-7



Open rear panel door.

Turn the engine on and run at idle. With a voltmeter, check the voltage between the B+ terminal and ground at the starter **[Figure 30-30-7]**.

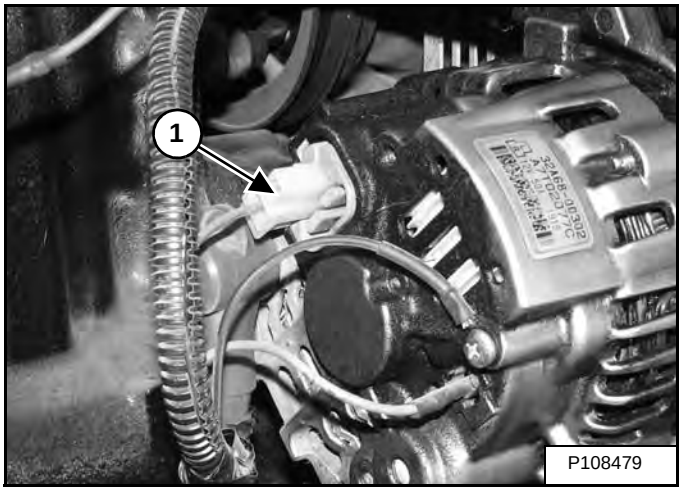
The voltage must be higher than 13.5 volt but lower than 14.7 volt at 21°C (70°F) (Alternator Temperature).

If the voltage is higher that 14.7 volt, proceed to the following high voltage test.

If the voltage is lower than 13.5 volt, run the engine at high idle and recheck voltage. If voltage is still below 13.5 volt, proceed with the following low voltage test.

Low Voltage Testing

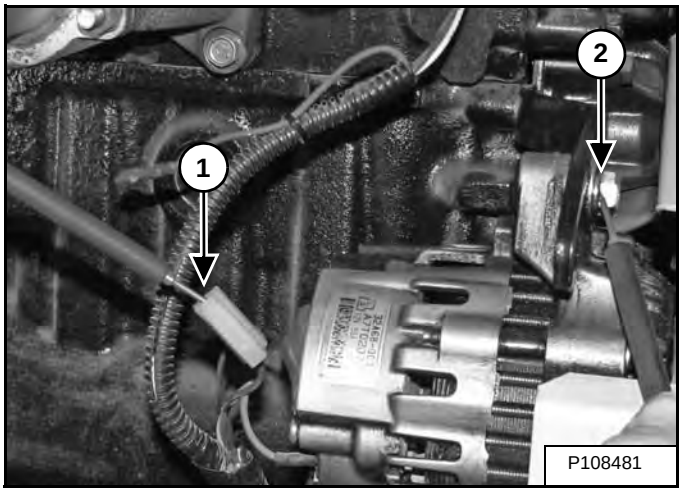
Figure 30-30-8



Turn engine OFF and remove the L & S terminal connector (Item 1) **[Figure 30-30-8]** from the alternator.

Turn the battery disconnect switch to the ON position.

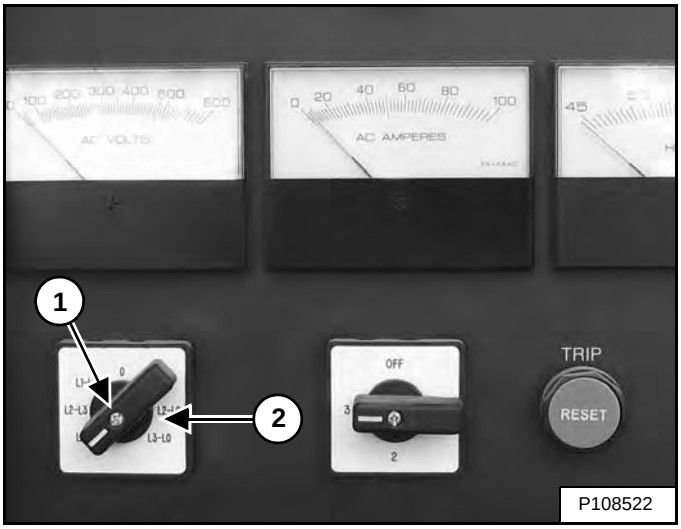
Figure 30-30-9



Check the voltage across the “L” terminal (Item 1) and ground (Item 2) **[Figure 30-30-9]**. The voltage should be what the battery voltage is. If not, check wire harness, relay and fuses. If the wire harness, relay and fuses are okay remove alternator for replacement or repair.

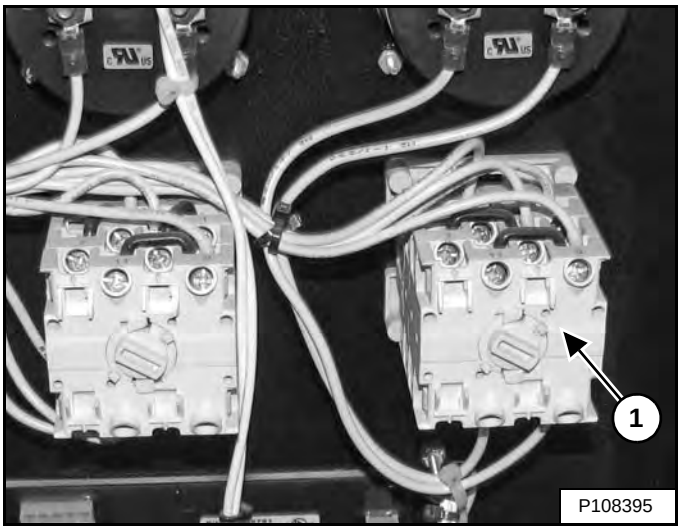
Voltage Output Switch Removal And Installation

Figure 30-50-7



Remove the screw (Item 1) **[Figure 30-50-7]** and knob.

Figure 30-50-8

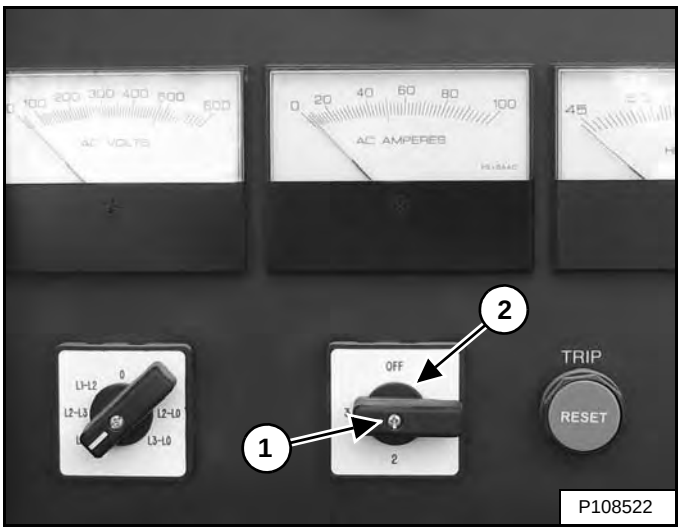


Remove the nut (Item 2) **[Figure 30-50-7]** and remove the voltage output switch assembly (Item 1) **[Figure 30-50-8]** from the control panel.

NOTE: Service work on the voltage output switch assembly should only be performed by a qualified technician. Use only genuine Bobcat parts if repair is necessary.

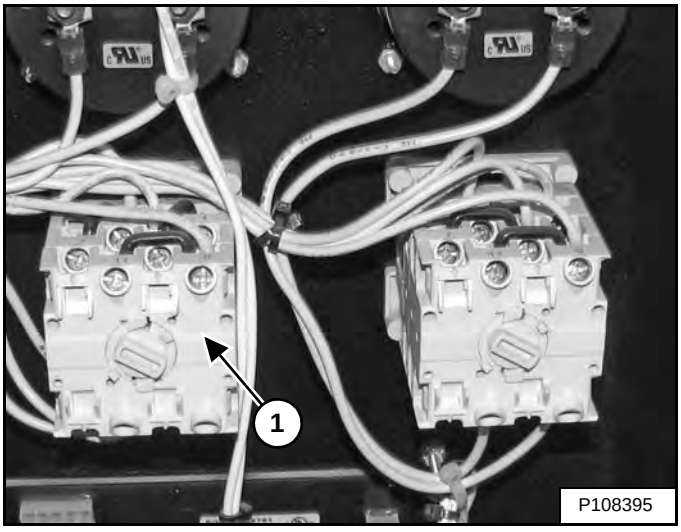
Amperage Output Switch Removal And Installation

Figure 30-50-9



Remove the screw (Item 1) **[Figure 30-50-9]** and knob.

Figure 30-50-10



Remove the nut (Item 2) **[Figure 30-50-9]** and remove the amperage output switch assembly (Item 1) **[Figure 30-50-10]** from the control panel.

NOTE: Service work on the amperage output switch assembly should only be performed by a qualified technician. Use only genuine Bobcat parts if repair is necessary.

Continuity Testing

⚠ WARNING

UNEXPECTED ENGINE STARTUP CAN CAUSE SERIOUS INJURY OR DEATH

Never inspect or service unit without first disconnecting battery cables to prevent accidental starting.

W-2950-1112

⚠ WARNING

ELECTRICAL SHOCK CAN CAUSE SERIOUS INJURY OR DEATH

- **Always treat electrical circuits as if they were energized.**
- **Disable start control before attempting any repair service. Disconnect all leads to electrical power requirements and disconnect battery to prevent startup.**

W-2953-1112

Turn engine off and disconnect the battery.

Open the front panel door (left hand side if facing control panel).

Remove the transformer cover. (See **[Figure 30-60-1]**.)

With robes not touching anything, the meter should see a reading of infinity or OL.

Open circuit: When the circuit is not complete, meaning that no voltage is able to flow through. This can be caused by a blown fuse, resistor or a switch.

Closed circuit: When the circuit is complete, meaning that voltage is able to flow through it.

A simple continuity test on a light switch that is not wired to anything. With the switch off, probe the terminals. You should not get a reading on your tester. But, when you turn the switch on, you will notice that the tester will read zero and the beep should be heard, signaling that the circuit is closed or complete.

Figure 30-60-5

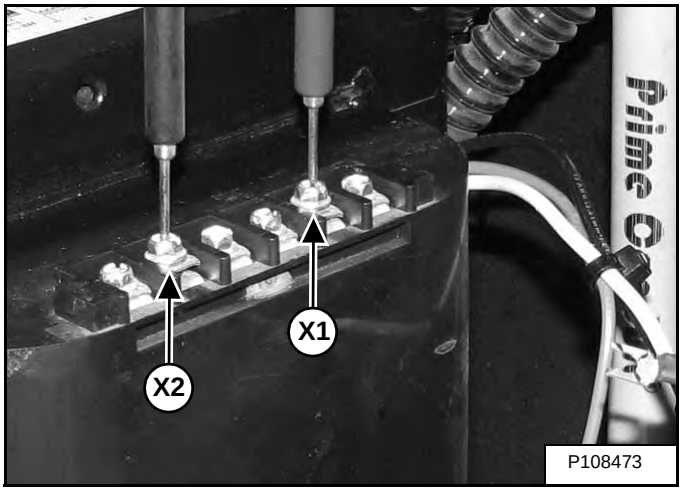
Use a test meter to test transformer continuity **[Figure 30-60-5]**.

NOTE: Set meter to read ohm. With robes not touching anything, the meter should see a reading of infinity or OL.

Open the front panel door (left hand side if facing control panel).

Remove transformer wires. (See **[Figure 30-60-3]**.)

Figure 30-60-6



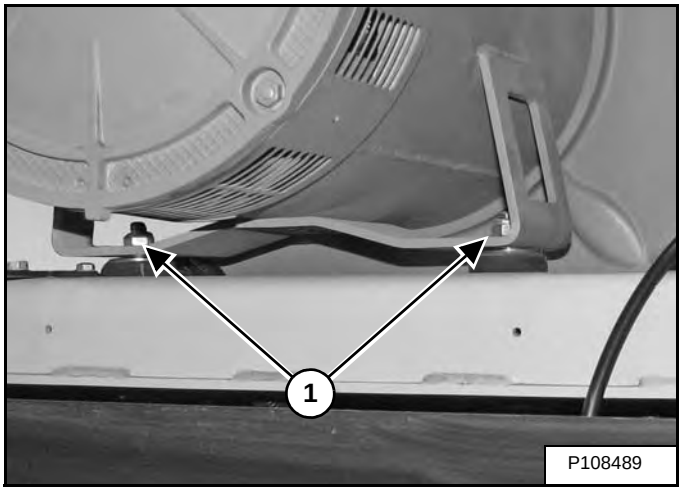
Test for continuity between X1 and X2 **[Figure 30-60-6]** of the transformer. The meter should have a reading of infinity or OL.

NOTE: If the meter is showing a reading above infinity or OL, replace the transformer.

GENERATOR (CONT'D)

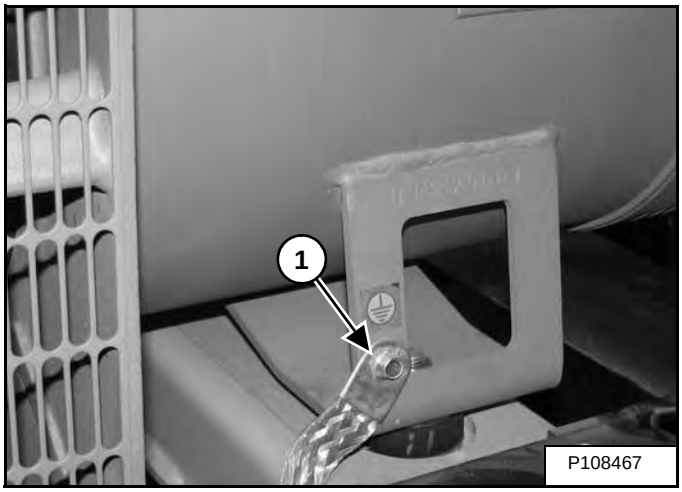
Installation (Cont'd)

Figure 40-10-17



Align and install the two mounting bolts (Item 1) **[Figure 40-10-17]**, nuts and washers.

Figure 40-10-18



Install the ground strap (Item 1) **[Figure 40-10-18]**.

Install the control panel. (See Control Panel Removal And Installation on Page 30-50-7.)

Install the right rear corner panel. (See Right Rear Corner Panel Removal And Installation on Page 20-10-5.)

Install the left rear corner panel. (See Left Rear Corner Panel Removal And Installation on Page 20-10-4.)

Install the control panel door. (See Control Panel Door Removal And Installation on Page 20-10-3.)

Install the side panel(s). (See Side Panel Removal And Installation on Page 20-10-3.)

Install roof panel. (See Roof Panel Removal And Installation on Page 20-10-1.)

Install the side door panel(s). (See Side Door Removal And Installation on Page 20-10-2.)

Install and connect the battery. (See Removal And Installation on Page 30-20-1.)

R438 Adjustments (AREP System)

⚠ WARNING

MODIFICATION OR ALTERATION OF THIS MACHINE CAN RESULT IN SERIOUS INJURY OR DEATH
Never alter or modify this machine without approval from the manufacturer.

W-2949-1112

⚠ WARNING

AVOID INJURY OR DEATH
Voltage selection, adjustment, and electrical connections shall be performed only by qualified personnel.

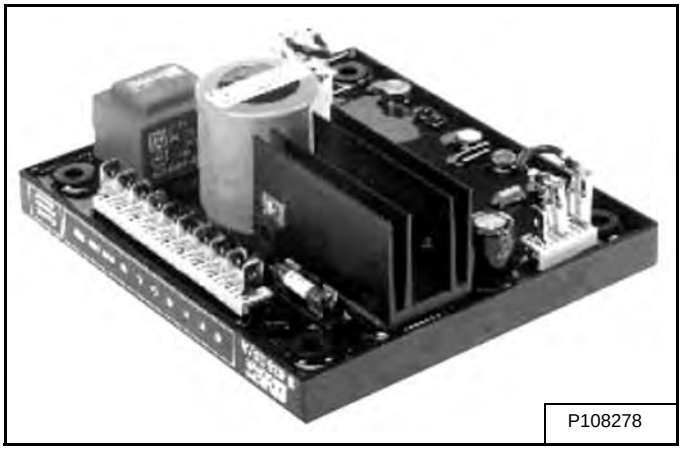
Do not turn voltage selector switch while engine is running.

W-2955-1112

NOTE: The generator must be stopped (or the power switched off) in order to reset the protection.

- Fuse F1 on input side (X1, X2).
- Voltage detection: 5 VA isolated via transformer. 0-110V terminals = 95 to 140V, 0-220V terminals = 170 to 260V, 0-380V terminals = 340 to 520V.
- Voltage regulation ± 1% (R448: ± 0.5%).
- Rapid or normal response time via strap ST2.
- Voltage adjustment via potentiometer P2. Other voltages via step down transformer.
- Current detection: (parallel operation): C.T. 2.5VA cl1, secondary 1A (Option).
- Quadrature droop adjustment via potentiometer P1.
- Under speed protection (U/f) and LAM. Frequency threshold adjustable via potentiometer P4 on older models. Strap ST5 is connected for LAM operation. 25% or 13% voltage drop via strap ST10.
- Potentiometer P5, Max. excitation current adjustment via P5: 4.5 to 10A.
- 50/60 Hz selection via strap ST3.

Figure 40-10-25



R438 (AREP System) **[Figure 40-10-25]**.

1. Initial potentiometer settings (See Factory Rated No-Load Values on Page 40-10-19.).

NOTE: Remote voltage adjustment potentiometer: center (ST4 strap removed).

2. Install a D.C. analogue voltmeter (needle dial) cal. 50V on terminals E+, E- and an A.C. voltmeter cal. 300 - 500 or 1000V on the alternator output terminals.
3. Make sure that the ST3 strap is positioned on the desired frequency (50 or 60 Hz).
4. Voltage potentiometer P2 at minimum, fully to anti-clockwise (CCW).
5. Turn the V/Hz potentiometer P4, fully to clockwise (if equipped with P4).
6. Stability potentiometer P3 approximately 1/3 of travel anti-clockwise (CCW).
7. Start the engine and set its speed to a frequency of 48 Hz for 50 Hz, or 58 for 60 Hz.
8. Adjust the output voltage to the desired value using P2.

Electrical Checks Prior to First Use

NOTE: Under no circumstances should an alternator, new or otherwise, be operated if the isolation is less than 1 mega ohm for the stator and 100,000 ohm for the other windings.

There are three possible methods for restoring the minimum values.

Method #1

Dry out the machine for 24 hours in a drying oven at a temperature of approximately 110°C (230°F).

Method #2

Blow hot air into the air input, having made sure that the machine is rotating with the exciter field disconnected.

Method #3

Run in short-circuit mode (disconnect the AVR).

- Short-circuit the output phases using connections capable of supporting the rated current (try not to exceed 6A / mm2).
- Insert a clamp ammeter to monitor the current passing through the short-circuit connections.
- Connect a 48 volt battery in series with a rheostat of approximately 10 ohm (50 watts), to the exciter field terminals, respecting the polarity.
- Open fully all the alternator orifices.
- Run the alternator at rated speed. Adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections.

NOTE: Prolonged Standstill - The use of space heaters, as well as turning over the machine from time to time is recommended to avoid these problems.

NOTE: Space heaters are only effective if they are working continuously while the machine is stopped.

Mechanical Checks Prior to First Use

Before starting the machine for the first time, check that:

- All bolts and screws are tight.
- The cooling air is drawn in freely.
- The protective grilles and housing are correctly in place.
- The standard direction of rotation is clockwise as seen from the shaft end (phase rotation in order 1 - 2 - 3).
- For counterclockwise (CCW) rotation, swap 2 and 3.
- The winding connection corresponds to the site operating voltage. (See Checking The Winding on Page 40-10-20.)

Specifications (Cont'd)

Thermostat

Valve Opening Temperature	76,5 ± 2°C (169 ± 35°F) (Standard)
Valve Lift (@9 mm (0.354 in) or more)	90°C (194°F)

Relief Valve

Valve Opening Pressure	304 - 402 kPa (3 - 3,96 bar) (44.09 - 58.32 psi)

Safety Valve

Valve Opening Temperature	1078,38 kPa (10,64 bar) (156.4 psi)

Fuel Injection Nozzle

Valve Opening Pressure (Swirl Chamber)	11769,77 - 12748,86 kPa (116,14 - 125,81 bar) (1707 - 1849 psi)
Spray Cone Angle (Swirl Chamber)	0 degrees
Oil Tightness Of Needle Valve Seat	Seat shall not hold test pressure 1965,1 kPa (19,4 bar) (285 psi) lower than valve opening pressure for 10 seconds.

Starter

No-Load Characteristics	
Terminal Voltage	11V
Current	130A or less
Rotation Speed	3800 min^{-1}
Brush Length	18,0 mm (0.71 in)
Brush Spring Load (@ 26.5 - 36.3 N)	26,5 - 36,3 N (2,7 - 3,7 kgf) (6.0 - 8.2 lbf)
Allowable Limit	14.7 N (1.5 kgf) (3.3 lbf)
Commutator Radial Runout Allowable Limit	0,10 mm (0.004 in)
Commutator Diameter	32,0 mm (1.26 in)
Allowable Limit	31,4 mm (1.24 in)
Under Cutting Depth	0,4 - 0,6 mm (0.016 - 0.024 in)
Allowable Limit	0,2 mm (0.008 in)
IC Regulator Controlled Voltage @20°C (68°F)	A7TA0483A / 14,7 ± 0.3V

Alternator

IC Regulator Controlled Voltage @20°C (68°F)	A7TA0483A / 14,7 ± 0.3V
Output Characteristics (When Hot) 2500 min^{-1} or less (Current)	33A above
Output Characteristics (When Hot) 5000 min^{-1} or less (Current)	47A above
Brush Length	18,5 mm (0.73 in)
Allowable Limit	5,0 mm (0.20 in)

Magnetic Plug

Resistance Of Stop Solenoid ETR Type (RUN-ON) @12V	8 - 10.7 ohm
Resistance Of Stop Solenoid ETR Type (RUN-ON) @24V	33 - 43.4 ohm


Bobcat®

TECHNICAL SERVICE GUIDE SPECIFICATIONS (CONT'D)

Lubricating System Torques

Oil Gear Pump	28,0 - 38,0 N•m (21.0 - 28.2 ft-lb)
Oil Pan	10,0 - 13,0 N•m (7.2 - 9.4 ft-lb)
Oil Pan Drain Plug	34,0 - 44,0 N•m (25.3 - 32.5 ft-lb)
Relief Valve	44,1 - 53,9 N•m (32.5 - 39.8 ft-lb)
Safety Valve	64,0 - 74,0 N•m (47.0 - 54.2 ft-lb)

NOTE: For additional engine torques, (See Torque Values on Page 50-10-7.)

Inlet And Exhaust System Torques

Exhaust Manifold (Bolt Only)	27,5 - 33,3 N•m (20.3 - 24.6 ft-lb)
Exhaust Manifold (With Spacer)	15,0 - 22,0 N•m (10.8 - 15.9 ft-lb)

Electrical System Torques

Starter Terminal B	9,8 - 11,8 N•m (7.2 - 8.7 ft-lb)
Glow Plug (Swirl Chamber)	15,0 - 20,0 N•m (10.8 - 14.5 ft-lb)

Cooling System Torques

Thermostat Case	17,0 - 20,0 N•m (12.3 - 14.5 ft-lb)

NOTE: For additional cooling system information, (See ENGINE COOLING SYSTEM on Page 10-50-1.)

Cooling System

Coolant Type and Mix	50% Water and 50% Ethylene Glycol
Radiator Cap Pressure	97 kPa (1 bar) (14 psi)
Thermostat	Fully Open at 90°C (194°F)

NOTE: For additional cooling system information, (See ENGINE COOLING SYSTEM on Page 10-50-1.)