

David Brown®

Service Repair Manual Electrical Equipment

Section H1 (Pub. 9-37222) August 1978



David Brown Tractors Ltd
A Tenneco Company
Affiliate of J I Case





This is a safety symbol which indicates important safety messages in this manual. When you see this symbol carefully read the message that follows. The safety symbol is shown when possible injury or death can occur.

Written in **Clear**
And
Simple
English

David Brown Tractors Ltd., will continue to improve their products. As a result, the specification details can have changed after this issue was made. Also, as the David Brown tractor is made to variable specifications for different uses and countries, this manual may give details of items which are not part of any specific tractor.

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SAFETY RULES



DANGER: Batteries release gases, keep sparks, flames and cigarettes away from batteries. Make sure there is a good movement of air in the area, especially when giving a battery a charge. If these instructions are not followed, combustion of the gases will occur and cause injury.



WARNING: When you remove a battery, disconnect the ground cable first. When installing a battery, connect the ground cable last. Failure to follow this procedure will cause sparks. These will cause combustion of the gases released from the battery and cause injury.



WARNING: Battery acid can cause bad burns. If acid comes into contact with any part of the body, wash with water. Flush eyes with water for 15 minutes. Permanent damage to the eyes will occur if these instructions are not followed.

For internal treatment, drink large quantities of water or milk. See a doctor as soon as possible.

Keep batteries away from children.



CAUTION: Electricity flows through metal. Never have a ring or metal watch band on your body when working near electrical equipment. Injury to the body will occur if these items come into contact with electrical connections.

BATTERY

HOW IT WORKS

The battery is made of groups of positive and groups of negative plates separated by insulation plates made of plastic.

All these are put into an electrolyte solution of sulphuric acid and distilled water inside a plastic case. The battery is given an electrical charge by connecting an external current supply to the terminals. The current moves from positive to negative. The positive plates change to lead peroxide and the negative change to spongy lead.

The battery keeps the charge in storage until needed. There will be a gradual loss of charge if the battery is not used. Internal damage will occur if the battery is kept in storage and not given a charge.

When an electrical circuit is connected to the battery terminals an electrical current flows from the battery. The current moves in the opposite direction to the charging current.

This is caused by a reaction between the electrolyte and the charged lead plates.

While the battery is releasing current the electrolyte is putting a deposit of sulphate on the plates. This causes the electrolyte to become weak and the battery voltage to decrease.

The battery must be given an electrical charge again to return the battery to a full charge. This is done by the dynamo or alternator while on the vehicle.

The battery is best given a charge from an external current, when the charge condition is less than 70%.

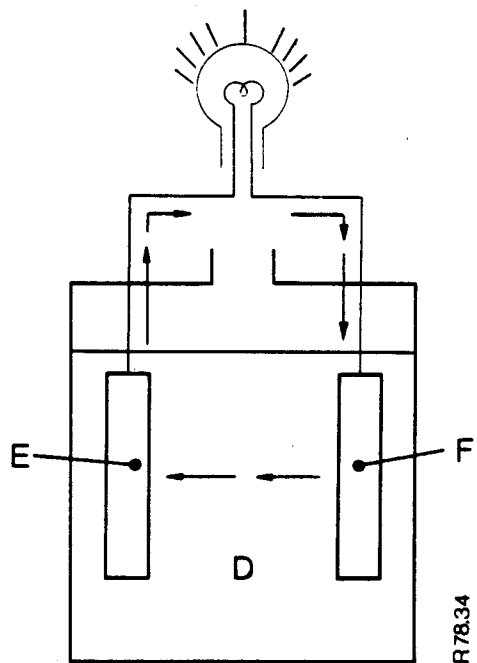
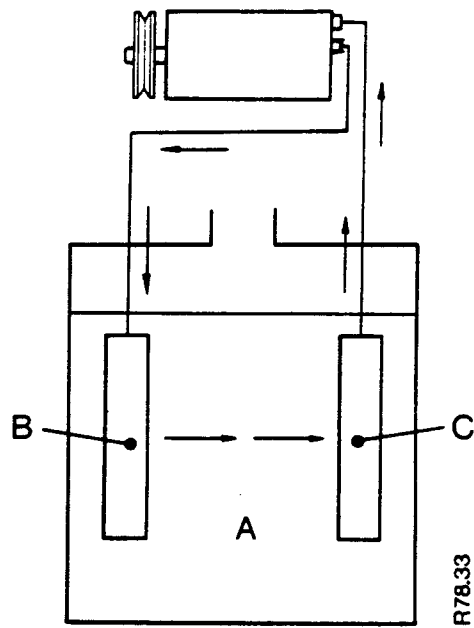


Figure H1
MATERIAL CHANGES

- | | |
|-----------------------------------|-----------------------------------|
| A. Charged battery. | D. Discharged battery. |
| B. Positive plate, lead peroxide. | E. Positive plate, lead sulphate. |
| C. Negative plate, spongy lead. | F. Negative plate, lead sulphate. |

FAULT FINDING

Equipment Needed

Hydrometer.

D.C. moving coil voltmeter (0–40 volts).

D.C. moving coil ammeter (5–60 amps).

Heavy Discharge Tester.

An extra battery, in good condition.

TEST 1: Specific Gravity

Use an hydrometer A to check the specific gravity of the electrolyte in each cell. The test will not show correct results if distilled water has just been added. The solution must be completely mixed.

Temperature correction

For every 10° Celcius **less** than 15° Celcius, subtract 0.007 from the specific gravity shown on the hydrometer.

For every 10° Celcius **more** than 15° Celcius, add 0.007 to the specific gravity shown.

For every 10° Fahrenheit **less** than 60° Fahrenheit, subtract 0.004 from the specific gravity shown.

For every 10° Fahrenheit **more** than 60° Fahrenheit add 0.004 to the specific gravity shown.

Example:

Specific gravity corrected to 15° Celcius (60° Fahrenheit) for temperatures **less** than 25° Celcius (77° Fahrenheit).

Full charge 1.270–1.290.

70% charge 1.230–1.250.

Discharged 1.110–1.130.

For temperatures **more** than 25° Celcius (77° Fahrenheit).

Full charge 1.210–1.230.

70% charge 1.170–1.190.

Discharged 1.050–1.070.

The battery must be given a charge if less than 70% charge is shown. If there is a difference of more than 0.040 between cells make a complete check of the battery.

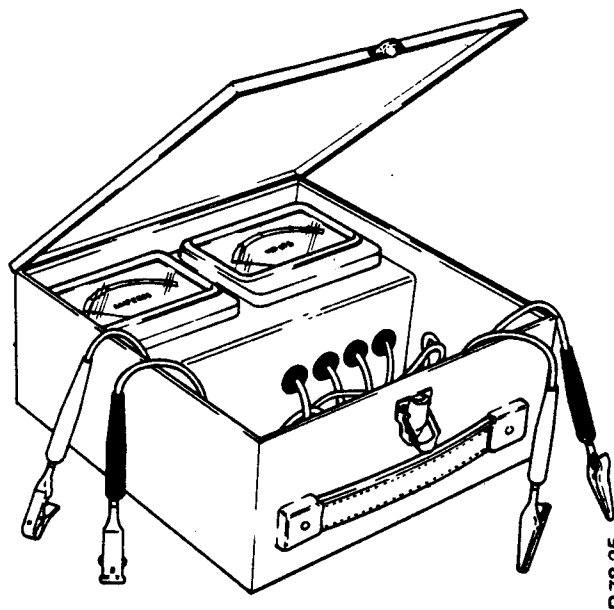
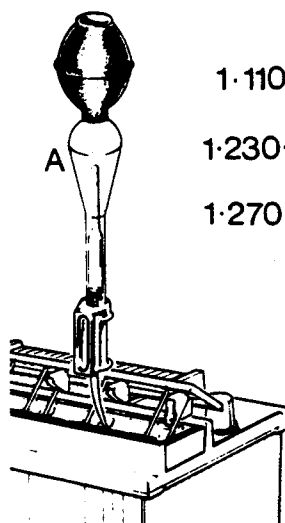


Figure H2
TEST METERS

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1.110–1.130	DISCHARGED
1.230–1.250	70% CHARGED
1.270–1.290	FULL CHARGE

Figure H3
SPECIFIC GRAVITY TEST
A. Hydrometer

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TEST 2: Discharge Rate

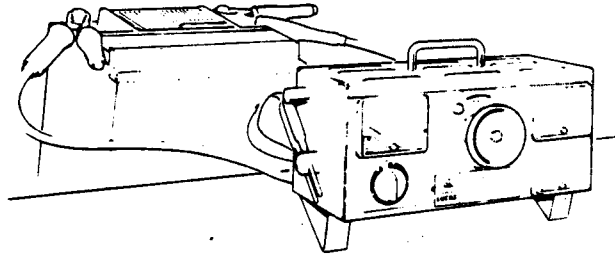
This test can be done to check battery condition if the results of TEST 1 are not acceptable.

1. Connect a Heavy Discharge Tester to the battery terminals.
Positive to positive, negative to negative.
2. Set the tester to an ampere setting three times the 20 hour rate of the battery.

Example: Battery capacity is 96 AH (ampere hour) at the 20 hour rate. Multiply the ampere hour by 3, the result is 288. Set the meter to 290 amperes.

3. After 15 seconds discharge at this rate, read the voltmeter.

If the voltmeter shows more than 9.6 volts after 15 seconds the battery is in good condition. If less than 9.6 volts, install a new battery or have it checked by a battery specialist.



R 78.37

Figure H4
BATTERY DISCHARGE TESTER

MAINTENANCE AND REPAIR

MAINTENANCE

1. Check the level of the electrolyte every 60 hours. Add only distilled water to the level of the splash guard.
2. Keep the battery clean and dry at all times, especially the top.
3. Apply petroleum jelly to the terminals to prevent oxidation. Corrosion between terminal and battery post will give a bad connection and bad starting. Make sure the terminals are tight.
4. Make sure the battery holding clamp is tight. Any vibrations can cause internal damage and a loss of battery efficiency.
5. Keep the battery tray clean. Wash off all corrosion with a solution of ammonia or soda and hot water. Apply acid resistance paint to all metal parts after all corrosion is removed.
6. Batteries in storage must be given a charge from time to time to keep a full charge. Damage will occur if a battery is in storage for a long time in a discharged condition. A discharged battery will freeze in cold conditions.
7. Batteries in use on vehicles must also be given a charge from an external supply every six months. A battery is not kept at full charge by the vehicle generating equipment.

BATTERY CHARGING

Rate: Set the equipment to $\frac{1}{10}$ th of the 20 hour rate of the battery.

Example: The battery is 60AH \div 10 = 6 amperes setting.

Filler Caps: These must be removed when giving a battery a charge.

Connections: Make sure the battery and equipment connections are clean and dry.

Make sure the connections are tight and safe from making sparks.



WARNING: When you remove a battery, disconnect the ground cable first. When installing a battery, connect the ground cable last. Failure to follow this procedure will cause sparks. These will cause combustion of the gases released from the battery and cause injury.

Electrolyte: Keep the electrolyte at the correct level, during the charge. Add only distilled water to the electrolyte. Fill to level of splash guard. Keep the top of the battery dry and free from electrolyte.

Stop the charge before trying to clean the battery top.



WARNING: Battery acid can cause bad burns. If acid comes into contact with any part of the body, wash with water. Flush eyes with water for 15 minutes. Permanent damage to the eyes will occur if these instructions are not followed.

For internal treatment, drink large quantities of water or milk. See a doctor as soon as possible.

Keep batteries away from children.

Specific Gravity: Check this with an hydrometer at one hour intervals during the charge. When

the specific gravity shows the same results on three checks following each other, the charge is complete.

Voltage: Check the battery voltage just before and after the start of the charge. If the voltage has not increased check the polarity of the connections.

Temperatures of Electrolyte: For batteries which operate in air temperatures of less than 25° Celcius (77° Fahrenheit), keep the electrolyte temperature to less than 38° Celcius (100° Fahrenheit).

For batteries which operate in air temperatures of more than 25° Celcius (77° Fahrenheit), keep the electrolyte temperature to less than 50° Celcius (120° Fahrenheit).

Gassing: This is the name for the release of oxygen and hydrogen gases from the battery. It increases when the battery is given a charge. All possible causes of sparks or flame must be kept away. Also make sure there is a good movement of air through the area.



DANGER: Batteries release gases, keep sparks, flames and cigarettes away from batteries. Make sure there is a good movement of air in the area, especially when giving a battery a charge. If these instructions are not followed, combustion of the gases will occur and cause injury.

Fast Charging

This must only be done in an emergency. It must not be repeated at regular intervals or damage will occur to the battery. The life of the battery will be decreased.

The battery temperature must not increase to more than 43° Celcius (110° Fahrenheit) during the charge. If the air temperature is more than this amount, a fast charge must not be given.

ELECTRICAL EQUIPMENT

A fast rate of charge can be used to increase the charge in a battery to 70%–80%. The rate of charge must be decreased gradually during the charge. The temperature will increase to more than the limit if this is not done. A normal rate of charge must be used to complete the charge, but the battery must first cool to 32° Celcius (90° Fahrenheit).

Spacing: There must be a space of not less than 25mm (1in) around all batteries.



DANGER: Before removing the connections from the battery always turn the equipment switch to 'OFF'. If the connections are removed first, a spark will occur and cause combustion of the gases.

Installing: Make sure the battery is clean and dry and the filler caps are installed correctly. The battery can then be installed on the tractor.



CAUTION: Electricity flows through metal. Never have a ring or metal watch band on your body when working near electrical equipment. Injury to the body will occur if these items come into contact with electrical connections.

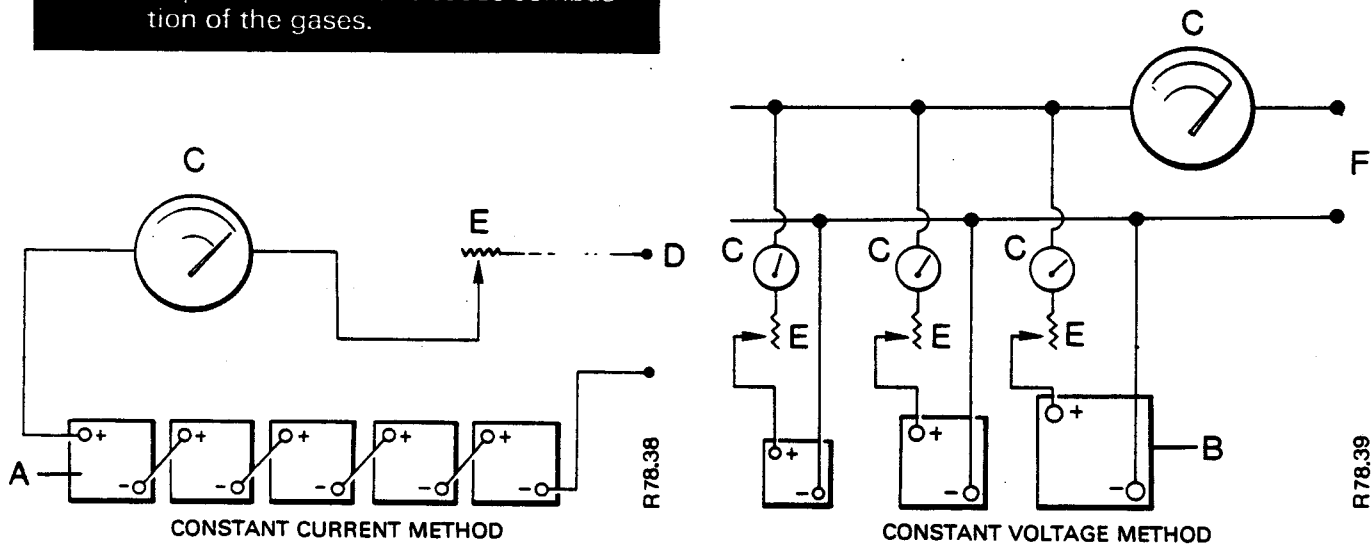


Figure H5
METHODS OF BATTERY CHARGING

- A. Batteries connected in series.
- B. Batteries connected in parallel.
- C. Ammeter.
- D. 110 volt DC supply.
- E. Resistance.
- F. Constant 110 volt DC supply.

NEW BATTERIES

Dry without a charge

Before the battery is given a charge it must be filled with electrolyte of the correct specific gravity.

Specific gravity changes with operating temperature, see FAULT FINDING, page H3. Manufacturers also give instructions with new batteries and these must be followed exactly.

When adding the electrolyte it must be done in two stages to prevent damage to the case. When the acid makes contact with moisture in the plates, heat is generated which can cause the damage.

First, the battery must be approximately half filled and then let it cool for 6–12 hours. Then add electrolyte to the correct level and let it cool for 2 hours. Then give the battery a charge as follows:

Set the charging rate to $\frac{1}{15}$ th of the 20 hour rate. Example: Battery 128AH \div 15 = 8 amperes charging rate.

The current must be kept constant and not interrupted for the period of the charge. The minimum period is about 48 hours. Check the specific gravity at one hour intervals. When

there is not any change after 5 checks following each other, the charge is complete.

Temperatures must not be more than the limits shown in the normal charge section, page H5.

Dry with a charge

These batteries are sent from the manufacturer with a full charge but without the electrolyte. The charge can decrease in storage.

Fill each cell with electrolyte of the correct strength according to the operating temperature. Check the specific gravity of the electrolyte after 20 minutes. The battery can be used immediately if the following conditions are correct.

Specific gravity has not decreased more than 0.010 and temperature has not increased more than 6° Celcius (10° Fahrenheit).

If the conditions are not correct the battery must be given a charge at the normal rate. The charge will be complete when the specific gravity shows no change after 3 checks at one hour intervals.

NOTE: For battery testing and temperature corrections see the FAULT FINDING section, page H3.

ALTERNATOR

HOW IT WORKS

When the starter key A is turned to the 'ACC' position, current from the battery H illuminates the 'no charge' warning lamp B. The current then goes through the slip rings and brushes to the rotor (field windings) C and returns to the battery.

NOTE: The field windings are on the rotor and not on the body as in the dynamo. The name for the stationary windings is stator.

When the rotor turns, the current in the windings generate an AC current in the stator windings F. This is changed into a DC current

by the rectifier bridge, it then goes to the battery. The AC voltage is changed by the diode trio E to a DC voltage which is sent to the regulator G. The diode trio also prevents the charge returning from the battery to ground through the alternator. A transistor circuit in the regulator controls the flow of DC current which flows through the rotor. When there is an increase in voltage, there is a decrease in current. When there is a decrease in voltage, there is an increase in current. In this way the regulator controls the output voltage of the alternator to keep the battery charge correct.

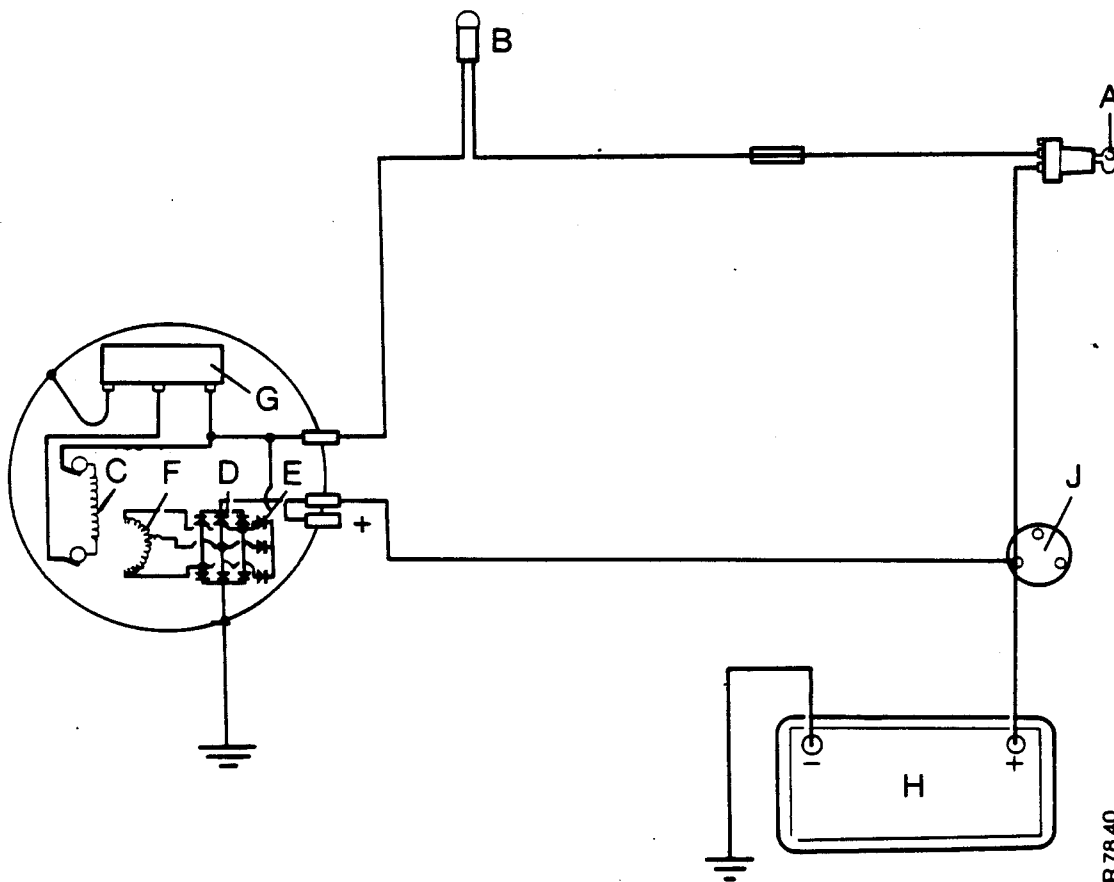


Figure H6
ALTERNATOR CHARGING CIRCUIT

- | | |
|------------------------------|---------------------|
| A. Starter key. | F. Stator windings. |
| B. Warning lamp. | G. Regulator. |
| C. Rotor windings. | H. Battery. |
| D. Diodes, rectifier bridge. | J. Solenoid. |
| E. Diode trio. | |

R 78.40

FAULT FINDING

LUCAS ALTERNATOR

(see page H13 for AC-Delco)

Equipment Needed

Voltmeter
Ammeter
Jumper wire

Check the condition of the battery before testing the alternator. A battery in good condition must be used.

IMPORTANT: Never disconnect wires when the alternator is running.

Make sure starter switch is in "off" position when the engine is not running. Always check polarity before connecting wires in an alternator circuit, especially battery terminals.

Never run the alternator with the wires disconnected.

Disconnect the alternator if electrical welding is to be done on the tractor.

TEST 1: Drive Belt

Check the belt for wear and damage. If wear or damage is found install a new drive belt.

Check the tension of the drive belt. This must be set to 1cm ($\frac{3}{8}$ in) of movement at the position shown in Figure H7. When checking this movement use only medium finger pressure.

A loose drive belt will decrease the efficiency of the alternator, and cause wear to the belt. A tight drive belt will cause damage to the bearings of the alternator.

TEST 2: Connections

Check that all wires are connected correctly and are clean and tight.

TEST 3: Wires

1. Disconnect the connector plug from the alternator.
2. Turn the starter key to the 'ACC' position.
3. Use a voltmeter to check if battery voltage is reaching the 'IND' (warning lamp) and '+' (positive) connections.

If the voltmeter does not show any voltage this is an indication that the circuit is broken. Repair before continuing the test.

4. If the voltmeter does not show a voltage at the 'IND' connection, it can be a failure of the warning lamp bulb. Install new bulb.

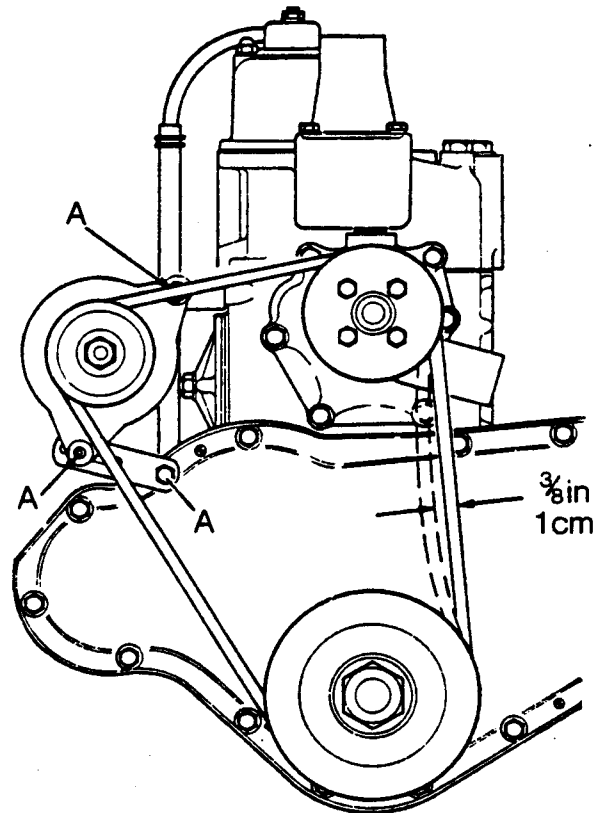


Figure H7
DRIVE BELT ADJUSTMENT
A. Fastening bolts.

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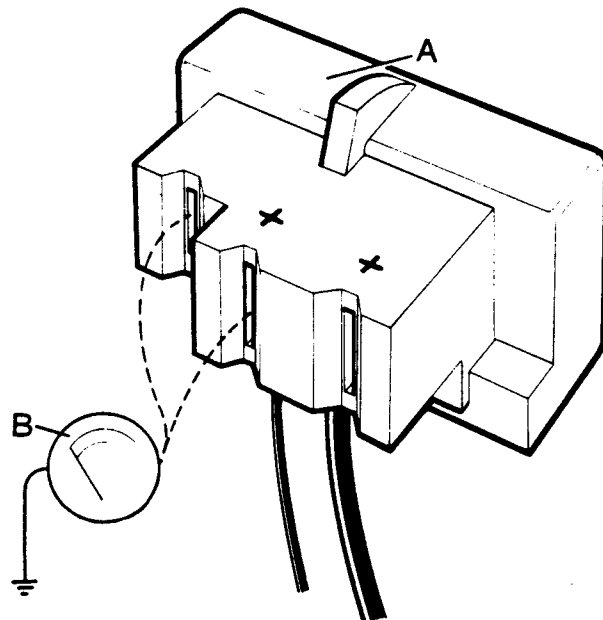


Figure H8
CHECKING FOR SUPPLY AT PLUG
A. Alternator plug. B. Voltmeter.

R78.42

ELECTRICAL EQUIPMENT

5. If a voltage is shown at both connections reconnect the plug to the alternator.
6. If the warning lamp illuminates, do the next test.
7. If the lamp does not illuminate, the alternator must be removed and the field circuit checked.

TEST 4: Output

1. Run the engine until normal running temperature is reached.
2. Stop the engine and disconnect the ground cable from the battery.
3. Disconnect the alternator output wire from the solenoid connection.
4. Disconnect the plug from the alternator and remove the plastic cover.
5. Connect an ammeter to the output wire of the alternator and to the solenoid terminal.
6. On Lucas alternators with the 8TRD regulator, connect a jumper wire from the green wire to ground as shown in Figure H10.
7. On Lucas alternators with the 14TR regulator, connect a jumper wire between the case and ground as shown in Figure H11.
8. Reconnect the alternator plug and the battery cable.
9. Turn the starter key to the 'ACC' position. Check that the warning lamp illuminates. Start the engine and increase speed slowly. The ammeter will show 28 amperes at 1500 engine r/min if the alternator is working correctly.
10. If the output is less than 28 amperes stop the engine and disconnect the surge protection diode. See Figure H12.

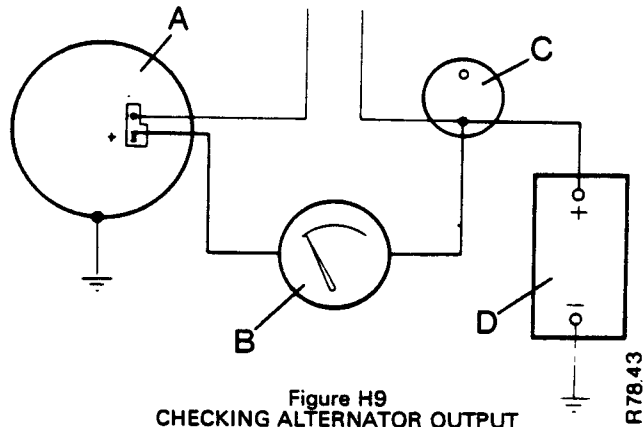


Figure H9
CHECKING ALTERNATOR OUTPUT

- A. Alternator. B. Ammeter.
C. Starter solenoid. D. Battery.

R78.43

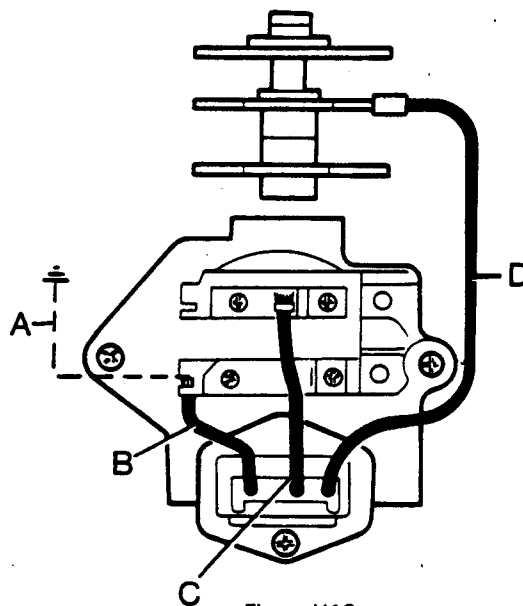


Figure H10
8TRD REGULATOR

- A. Jumper wire. B. Green wire.
C. Yellow wire. D. Red wire.

R78.44

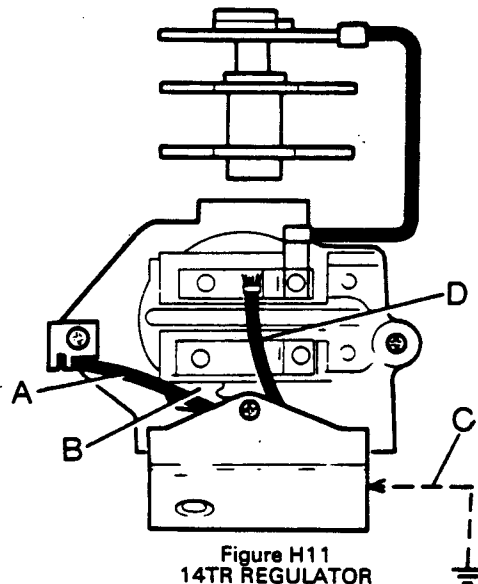


Figure H11
14TR REGULATOR

- A. Black wire. B. Field link.
C. Jumper wire. D. Yellow wire.

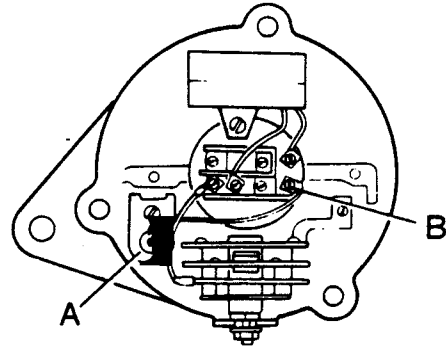
R78.45

11. Start the engine again and increase speed to 1500 r/min. If the ammeter now shows 28 amperes, install a new surge protection diode.
12. If the output is still less than 28 amperes after installing the surge diode, remove the alternator. See the MAINTENANCE AND REPAIR section for disassembly and checking procedures.
13. If the output is correct, **stop the engine**. Remove the jumper wire from the regulator. Remove the ammeter and reconnect all connections.

IMPORTANT: Never disconnect or connect wires or test meters to an alternator while it is running. Damage can occur to internal parts.

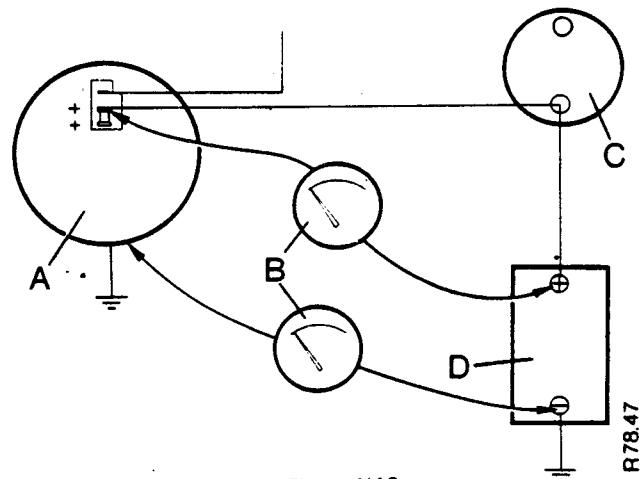
TEST 5: Circuit Resistance

1. Connect a voltmeter between the alternator output terminal and the battery positive post; **not** to the battery terminal.
2. Put the tractor lighting switch to the main beam position.
3. Start the engine and increase speed to 1500 r/min. The voltmeter must show less than 0.5 volts.
4. Stop the engine and connect the voltmeter between the alternator body and the battery negative post.
5. Start the engine and increase the speed to 1500 r/min. The voltmeter must show less than 0.25 volts.
6. If the voltages are more than these limits; disconnect all connections and clean, especially the battery terminals.
Make sure all connections are tight when reconnected.
7. Repeat steps 1 to 5.



R78.46

Figure H12
DISCONNECTING SURGE PROTECTION DIODE
A. Surge protection diode. B. Diode connection.



R78.47

Figure H13
CHECKING RESISTANCE IN THE CIRCUIT
A. Alternator. B. Voltmeter.
C. Solenoid. D. Battery.

ELECTRICAL EQUIPMENT

TEST 6: Regulator Setting

Make sure the battery is in good condition with a full charge before doing this test.

1. Disconnect the ground cable from the battery.
2. Disconnect the alternator output wire from the alternator and starter solenoid.
3. Connect an ammeter between the alternator and the starter solenoid to those connections.
4. Connect a voltmeter between the battery terminals and reconnect the ground cable to the battery.
5. Start the engine and increase the speed to 1500 r/min. When the ammeter shows less than 10 amps read the voltmeter. The voltmeter must show between 13.6 to 14.4 volts. If the voltage is not between these voltages install a new regulator.
6. Stop the engine and reconnect all connections if voltages are correct.

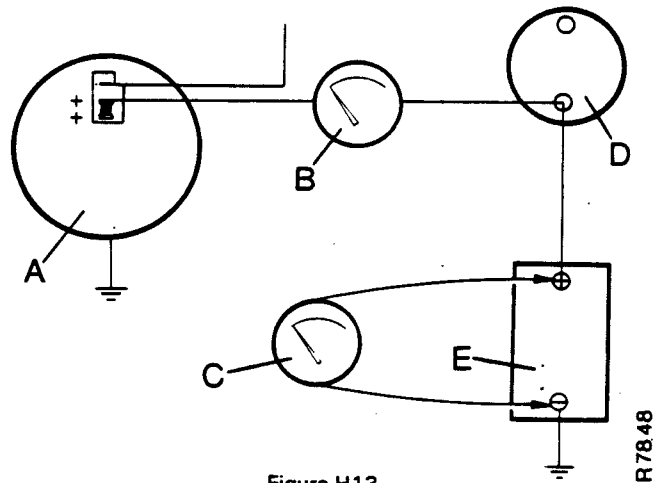


Figure H13
CHECKING VOLTAGE REGULATOR

A. Alternator. B. Ammeter.
C. Voltmeter. D. Solenoid.
E. Battery.

R7848

FAULT FINDING

(See page H9 for Lucas)

AC-DELCO ALTERNATOR**TEST 1: Engine Stopped: Switch 'OFF'
Lamp Illuminated**

1. Disconnect the wire from the starter switch A to the warning lamp B.
 - (a) If the lamp stops illuminating, check the switch and replace with a new switch if necessary.
 - (b) If the lamp still illuminates with the switch wire disconnected, disconnect the 'IND' wire from the alternator C.
 - (c) If the lamp still illuminates, check for a connection between the 'IND' and '+' wires.
 - (d) If the lamp stops illuminating when the 'IND' wire is disconnected install a new rectifier bridge.
2. Check that the lamp now operates correctly and check the condition of the battery after tests.

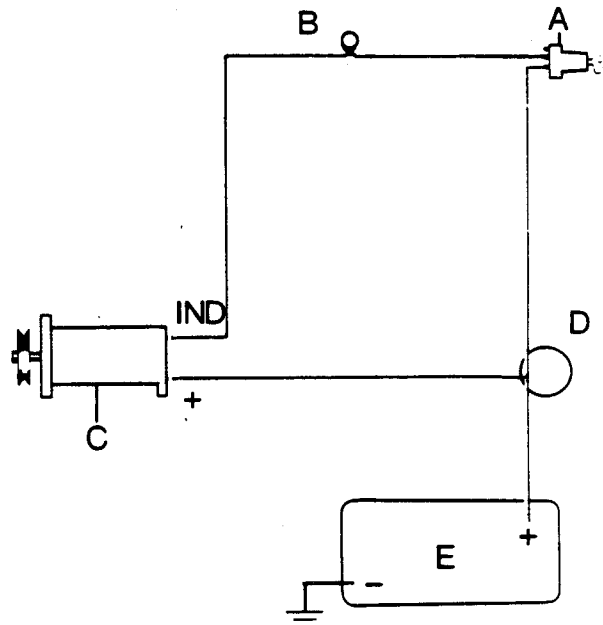


Figure H15
ALTERNATOR CIRCUIT

- | | |
|--------------------|--------------|
| A. Starter switch. | D. Solenoid. |
| B. Warning lamp. | E. Battery. |
| C. Alternator. | |

R78.49

**TEST 2: Engine Stopped: Switch 'ON'
Lamp Not Illuminated**

1. Disconnect the wire from the 'IND' terminal of the alternator and connect it to a good ground.
 - (a) If the lamp does not illuminate; check lamp, bulb socket, wires and fuses.
 - (b) If the lamp illuminates; install a new wire between the 'IND' terminal and the warning lamp.
2. Put the special rod shown in Figure H16 in through the test hole C shown in Figure H17.
 - (a) If the lamp illuminates, install a new regulator and check the rotor windings. See REPAIR section.
 - (b) If the lamp does not illuminate, check the 'IND' terminal connections. Check the brushes, slip rings, and field windings for an open circuit if the connections are correct. See REPAIR section.
3. If all these parts are found in good condition, install a new rectifier bridge.

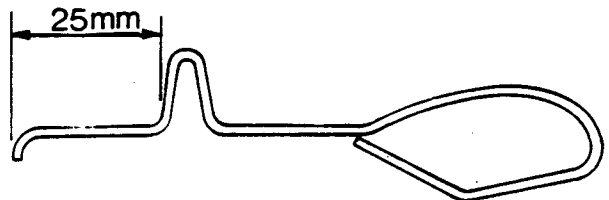


Figure H16
TOOL FOR CONNECTING BRUSH HOUSING TO GROUND
Make from welding rod

R78.50

**TEST 3: Engine Running, Switch 'ON'
Lamp Illuminated**

1. Check the tension of the drive belt. Adjust if necessary.
2. Make sure all connections are clean and tight.
3. Check for broken wires.
4. Turn the starter key to 'ACC' and connect a voltmeter from the alternator '+' terminal A to a good ground.
- (a) If the voltmeter shows zero, check for a broken circuit between the battery and the alternator '+' terminal.
5. Connect a voltmeter from the alternator 'IND' terminal B to a good ground.
- (a) If the voltmeter shows zero, check for a broken circuit between the battery and the 'IND' terminal.

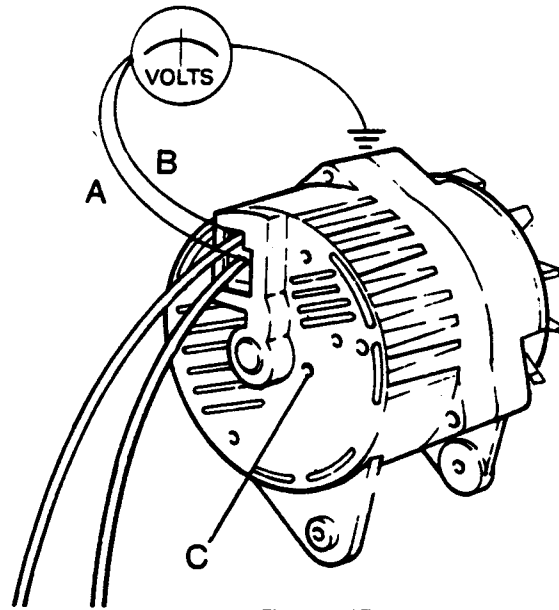


Figure H17
CHECKING FOR SUPPLY
A. Positive terminal.
B. 'IND' terminal.
C. Test hole.

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MAINTENANCE AND REPAIR

LUCAS ALTERNATOR

(see page H21 for AC-Delco)

The alternator is of the machine sensed type, complete with an internal regulator. All the inside connections are soldered.

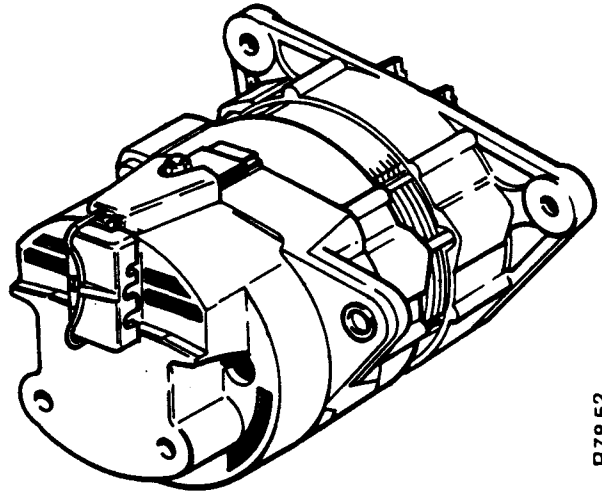
IMPORTANT:

Never connect or disconnect wires in the alternator circuit when the alternator is running. Make sure the starter switch is in the 'OFF' position when the engine is not running.

Always check the polarity before connecting wires in the alternator circuit, especially the battery terminals.

Never run the alternator with the wires disconnected.

Disconnect the alternator if electrical welding is to be done on the tractor.



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Figure H18
LUCAS ALTERNATOR

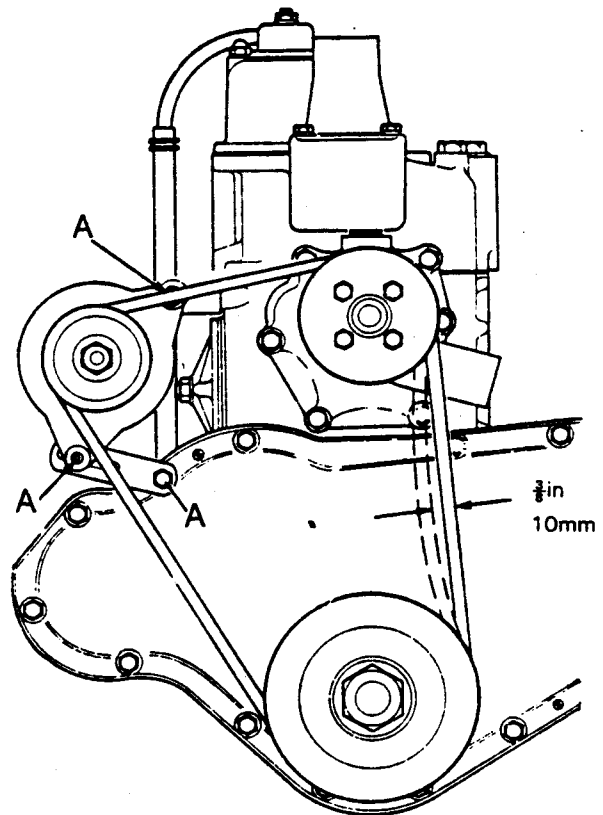
Equipment Needed

Soldering iron.
Hammer.
Voltmeter.
Pliers (long nose).
Piece of steel tube.
Glass paper.
Ammeter.

MAINTENANCE

1. Check the tension of the drive belt every 125 and 500 hours. Make sure the adjustment is correct or damage will occur, see page H9, FAULT FINDING.
2. Make sure all connections are clean and tight and connected correctly.
3. Check the tightness of the bolts A which fasten the alternator to the engine.

NOTE: The bearings are filled with lubricant by the manufacturer and need no maintenance.



R78.64

Figure H19
DRIVE BELT ADJUSTMENT
A. Fastening bolts.

DISASSEMBLY

(Figure H20)

1. After the alternator has been removed from the tractor, remove the two screws A from the end cover J. Remove the cover.
2. Use a soldering iron to disconnect the three connections B which connect the stator N to the rectifier R. Use a pair of long nose pliers on the diodes as shown in Figure H25. This will prevent heat causing damage to the diodes. Make a note of the wire positions for correct assembly.
3. Remove the two screws which fasten the brush holder to the regulator P.
4. Loosen the nut C of the rectifier ground bolt.
5. Remove the screw D which fastens the regulator to the end frame K.
6. Remove the brush holder S and rectifier R together complete with wire.
7. Remove the three bolts E which hold the

- two halves of the alternator together.
8. Make a mark across the junction of the two halves before separating to make sure of correct assembly.
9. Use a piece of steel tube which will just go over the slip-ring moulding F. Put the end of the tube on the outer ring of the bearing G. Carefully remove any solder which causes a restriction to the tube, with a file.
10. Hold the alternator with the drive pulley H down. Carefully hit the tube to push the bearing out of the slip-ring end frame. Make sure the drive end has some support when doing this operation.
11. Remove the drive pulley nut T, washer U, pulley H, fan V and key.
12. Push the rotor M out of the drive end frame L.

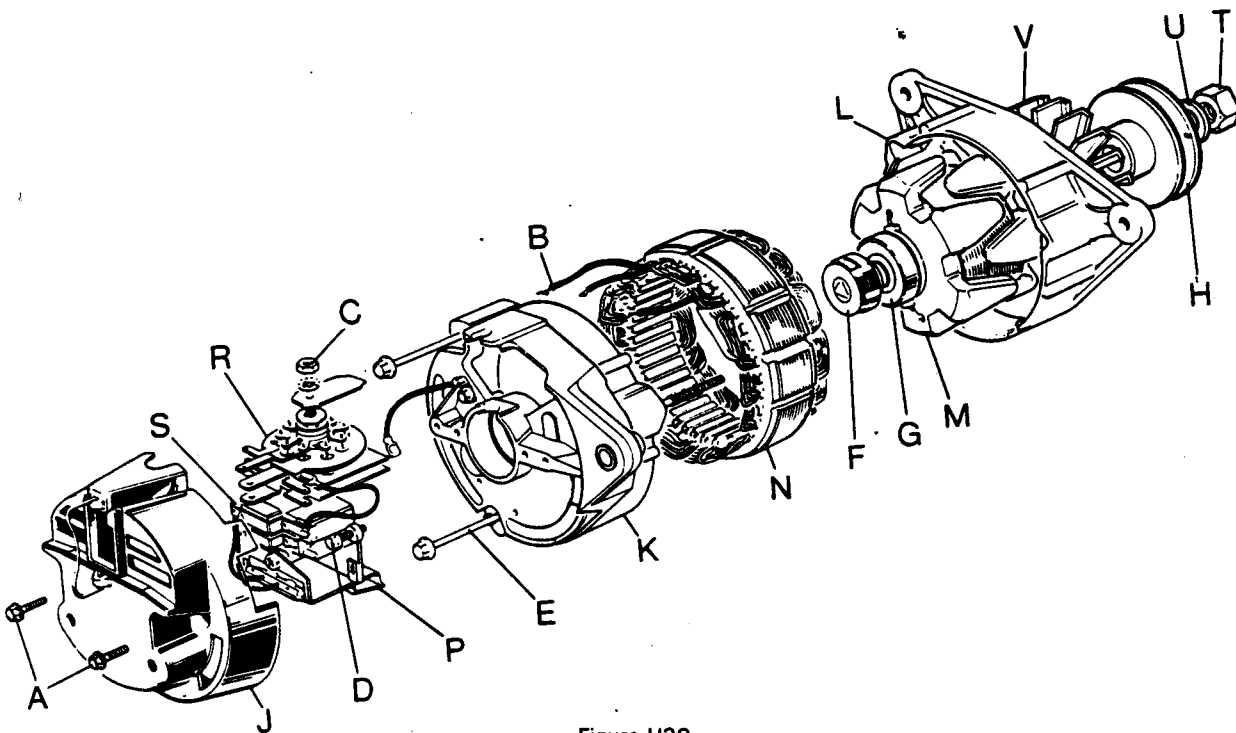


Figure H20
LUCAS ALTERNATOR ASSEMBLY

- | | |
|---------------------------|---------------------|
| A. Screws, end cover. | L. Drive end frame. |
| B. Stator connections. | M. Rotor. |
| C. Nut, rectifier ground. | N. Stator. |
| D. Screw, regulator. | P. Regulator. |
| E. Through bolt. | R. Rectifier. |
| F. Slip-ring moulding. | S. Brush holder. |
| G. Rear bearing. | T. Pulley nut. |
| H. Pulley. | U. Washer. |
| J. Plastic cover. | V. Fan. |
| K. Slip-ring end frame. | |

R7862

TEST AND REPAIR

Brushes

1. Measure the amount that the brushes show out of the holder.
2. If this measurement is less than 8mm ($\frac{3}{10}$ in), install new brushes.
3. When installing new brushes, make sure the small leaf spring at the side of the inner brush does not get lost.
4. Use a push type gauge to check the brush spring pressures as follows: Push the brush into the holder until the end of the brush is level with the holder. The gauge will show between 255–368g (9–13oz) if the springs are in good condition.
5. If the pressure is less than 255g (9oz), install new springs.
6. If the pressure is more than 368g (13oz), check for a restriction of the brushes in the holder. Clean the brushes with a small amount of petrol on a cloth or carefully with a smooth file. DO NOT use emery or similar abrasives.

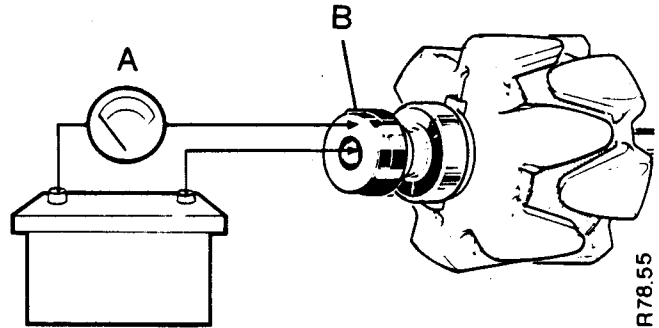


Figure H21
CHECKING ROTOR WINDING RESISTANCE

A. Ammeter. B. Slip-rings.

Rotor

1. Connect an ohmmeter or a 12volt battery and an ammeter between the slip-rings. The resistance of the windings must be as follows:
 - pink windings: 4.3 ohms or 2.8 amperes.
 - purple windings: 3.3 ohms or 3.6 amperes.
2. Use a 110volt AC supply to check the insulation. Connect a 15 watt test lamp between the slip-rings and the poles as shown. If the lamp illuminates, install a new rotor.

NOTE: The poles must not be machined. DO NOT try to correct any distortion of the shaft; install a new rotor.

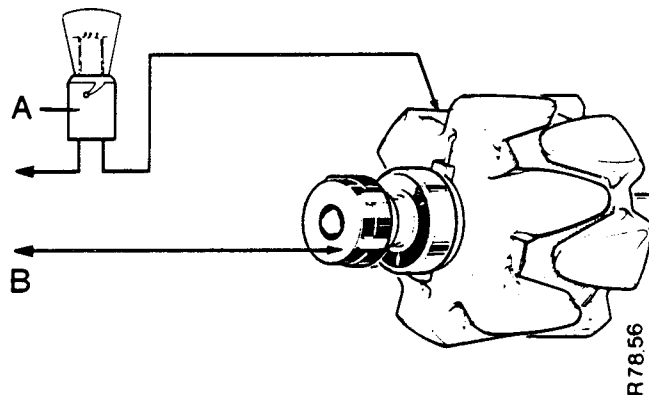


Figure H22
TESTING INSULATION OF ROTOR WINDINGS

A. 15W test lamp. B. 110 volt supply.

Slip-rings

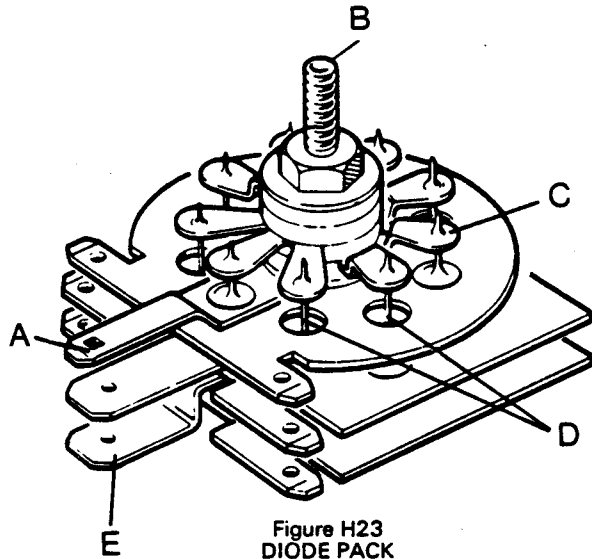
1. Clean any dirt, oil or grease from the slip-ring surfaces with a small amount of petrol on a cloth.
2. Remove scratches or other surface damage with smooth glass paper. DO NOT use emery cloth, similar abrasive or a machine for this purpose.

Diodes

Disconnect all the diodes with a soldering iron and proceed as follows:

NOTE: Use a pair of pliers to remove the heat away from the diodes, see Figure H25.

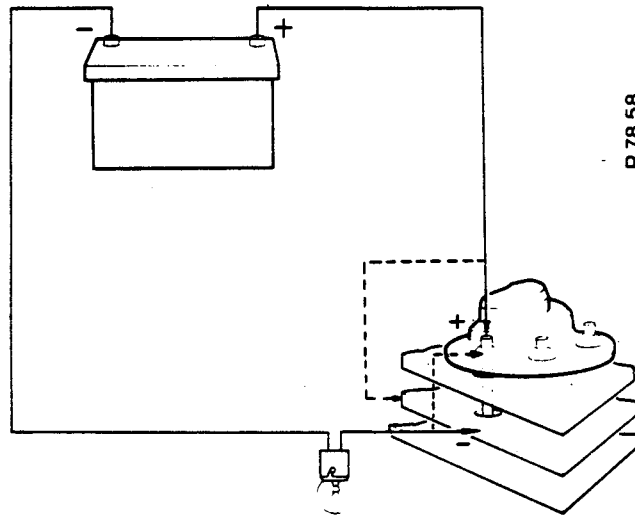
1. Connect one of the nine diodes in series with a 1.5 watt test lamp and 12volt battery. See Figure H24.
2. Connect the other battery terminal to the heat sink to which the diode being tested is fastened. Make a note of the results.
3. Now change the connections with each other. If the lamp shows the same result install a new rectifier assembly. The lamp must only illuminate in one direction.
4. Repeat 1 to 3 on all nine diodes.
5. Check the surge protection diode in the same way. The lamp must only illuminate when connected in one way.



R78.57

Figure H23
DIODE PACK

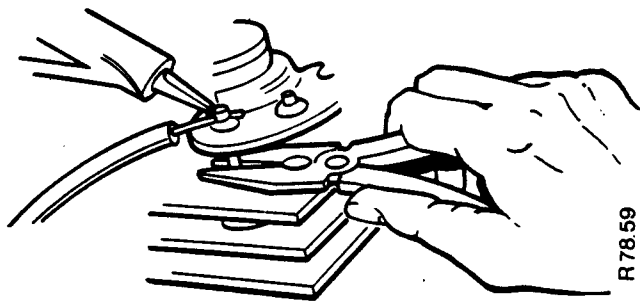
- | | |
|----------------------|------------------------------|
| A. Ind connection. | D. Output diode. |
| B. Earth connection. | E. Positive (+) connections. |
| C. Field diode. | |



R78.58

Figure H24
CHECKING DIODE

IMPORTANT: When using the soldering iron to connect or disconnect the diodes use pliers as shown to remove the heat. Use only 'M' grade solder (45-55 tin-lead) with resin core and do the job as fast as possible.



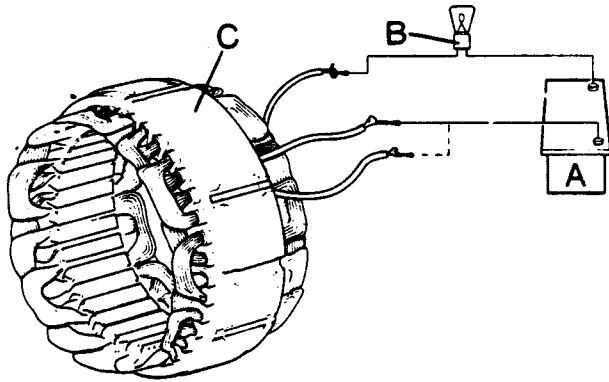
R78.59

Figure H25
APPLYING SOLDER TO DIODE CONNECTION

Stator

Use a 12volt battery and a test lamp of not less than 36 watts to check the windings.

1. Connect the test lamp between any two of the windings, as shown.
2. Repeat the test on all connections. Failure of the lamp to illuminate is an indication of a broken circuit. Install a new stator.



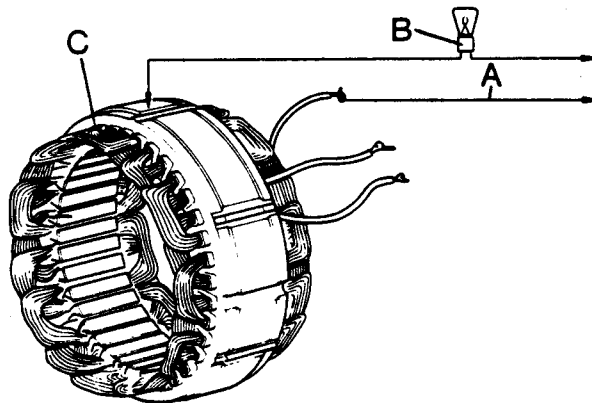
R78.60

Figure H26
CHECKING CONTINUITY OF STATOR WINDINGS

- A. 12 volt battery.
- B. Test lamp, 36 watt.
- C. Stator.

Use a 110volt AC supply and a 15 watt test lamp to check the stator insulation as follows:

1. Connect the lamp between any one of the wires and the laminations as shown.
2. Repeat on the other two wires. If the lamp illuminates there is a failure in the stator windings. Install a new stator.



R78.61

Figure H27
TESTING INSULATION OF STATOR WINDINGS

- A. Supply of 110 volts AC.
- B. Test lamp, 15 watt.
- C. Stator laminations.

BEARING REPLACEMENT

Slip-ring End
Figure H28.

1. Use a soldering iron to disconnect the slip-ring wires. Remove the slip-ring moulding F from the rotor shaft.
2. Pull the bearing G from the shaft with an acceptable puller.
3. Clean the shaft and position the new bearing with the shield nearest the slip-ring moulding.
4. Push the bearing on to the shaft as far as it can go.
5. Install the slip-ring moulding and use 'M' grade solder to reconnect the rotor winding wires.

Drive End

1. Remove the circlip and push the bearing out of the drive end frame.
2. Press the new bearing into the end frame.

Fit the circlip and make sure it has fully entered the groove all the way round.

ASSEMBLY
Figure H28

Assemble the alternator in the opposite sequence to disassembly. Make sure the following instructions are followed when assembling.

1. Push the bearing G at the slip-ring end on to the shaft as far as it can go.
2. Put the brushes into the holder before installing the holder in the alternator.
3. Use a steel tube as a support on the inner ring of the drive end bearing. Install the rotor. DO NOT use the drive-end frame as a support when installing the rotor.
4. Tighten the three bolts E which hold the two halves of the alternator together, to 75Nm (8kgm) (55lbin).

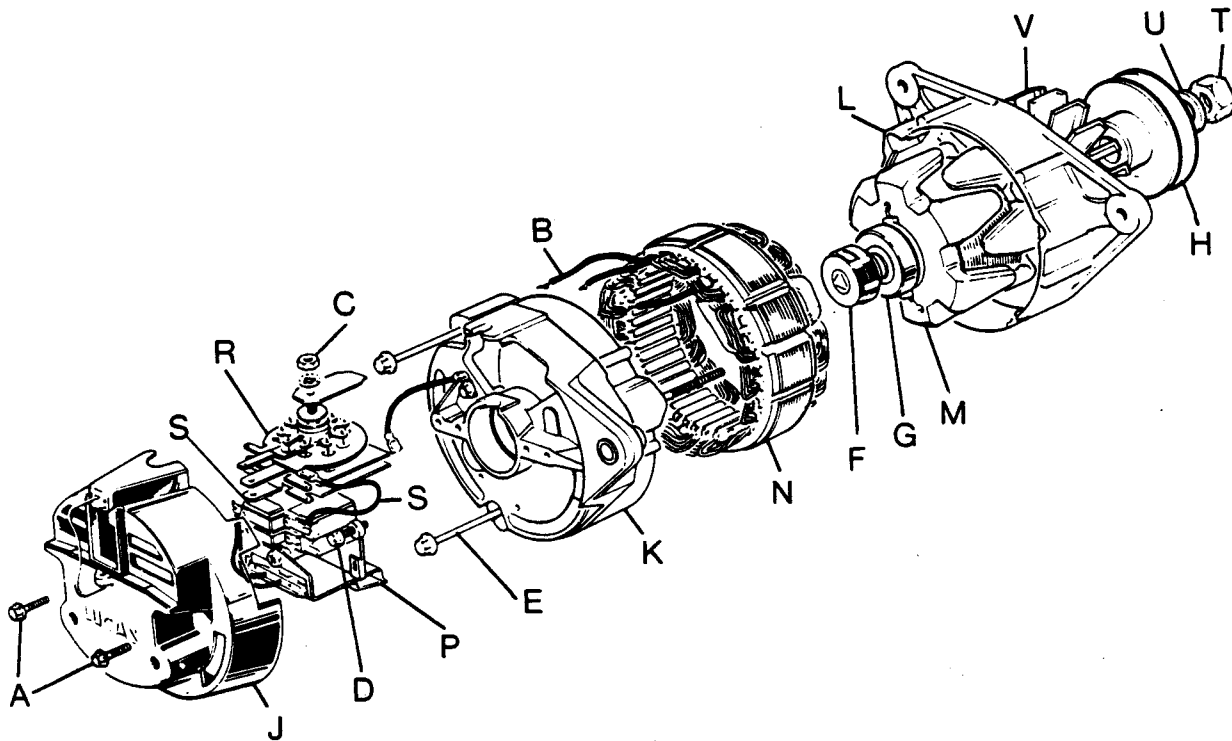


Figure H28
LUCAS ALTERNATOR ASSEMBLY

- | | |
|---------------------------|---------------------|
| A. Screws, end cover. | L. Drive end frame. |
| B. Stator connections. | M. Rotor. |
| C. Nut, rectifier ground. | N. Stator. |
| D. Screw, regulator. | P. Regulator. |
| E. Through bolt. | R. Rectifier. |
| F. Slip-ring moulding. | S. Brush holder. |
| G. Rear bearing. | T. Pulley nut. |
| H. Pulley. | U. Washer. |
| J. Plastic cover. | V. Fan. |
| K. Slip-ring end frame. | |

R78.54

MAINTENANCE AND REPAIR

AC-DELCO ALTERNATOR

(see page H15 for Lucas)

The alternator is of the machine sensed type complete with regulator. All internal connections are fastened by screws or nuts and easily removed.

IMPORTANT

Never connect or disconnect wires in the alternator circuit when the alternator is running. Always make sure the starter switch is in the 'OFF' position if the engine is not running.

Always check the polarity before connecting wires in the alternator circuit, especially battery terminals.

Never run the alternator with the wires disconnected.

Disconnect the alternator if electrical welding is to be done on the tractor.

EQUIPMENT NEEDED

$\frac{15}{16}$ AF and 8mm open end spanners.

$\frac{5}{16}$ in Allen key.

$\frac{9}{16}$ AF, 8mm and 10mm sockets.

Pozidriv screwdriver.

Long nose pliers.

Ohmmeter and test lamp.

Hammer and punch.

MAINTENANCE

1. Check the drive belt tension every 125 and 500 hours.
2. Keep the alternator clean, especially around the connections.
3. Check the tightness of the bolts A which fasten the alternator to the engine.
4. Make sure all electrical connections are clean, tight and connected correctly.

NOTE: The bearings are filled with lubricant by the manufacturer and do not need maintenance.

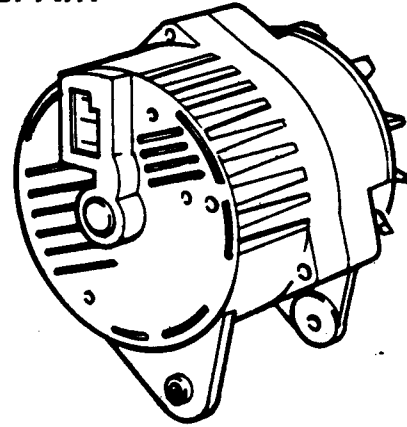


Figure H29
AC-DELCO ALTERNATOR

R78.63

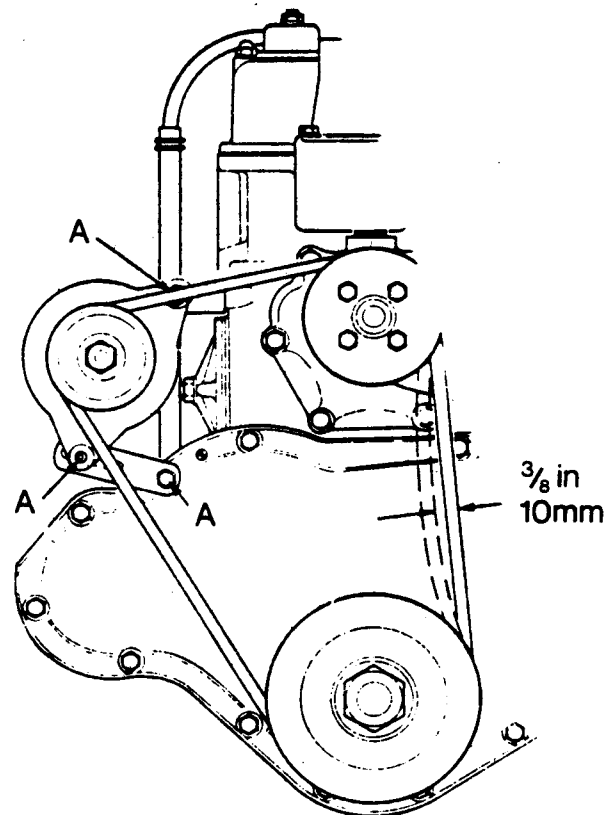


Figure H30
DRIVE BELT ADJUSTMENT
A. Fastening bolts.

R78.53

DISASSEMBLY

Slip-Ring end

1. Make a mark across the junction of the two halves of the alternator. This will make sure the halves are assembled in the same position.
2. Remove the three bolts which hold the two halves together.
3. Carefully separate the two halves and look for the brush springs which can fall out.
4. Put a piece of tape over the bearing A in the slip-ring end frame B. This will prevent dirt from entering.
5. Put a piece of tape on the bearing surface of the rotor shaft to give it protection from damage.
6. Remove the three nuts C which hold the stator wires to the rectifier bridge D.
7. Carefully remove the stator from the end frame. Put the stator on the bench with the terminal lugs up.
8. Use an ohmmeter to check the insulation of the diode trio E before removing it. Connect the ohmmeter between the link F and the frame B. If the ohmmeter shows a low resistance then a new fastening screw G must be installed when assembling.
9. Remove the Pozidrive screw G holding the diode trio E and remove the diode trio.
10. Use an ohmmeter to check the insulation of the screw H holding the brush assembly. Connect the ohmmeter between the brush assembly clip and the frame B. If a low resistance is shown, install a new screw H when assembling.
11. Remove the Pozidrive screw H holding the brush assembly and remove the brush assembly J.
12. Remove the two screws K and L holding the rectifier bridge and remove the rectifier bridge D.
13. Remove the Pozidrive screw M holding the regulator N and remove the regulator.

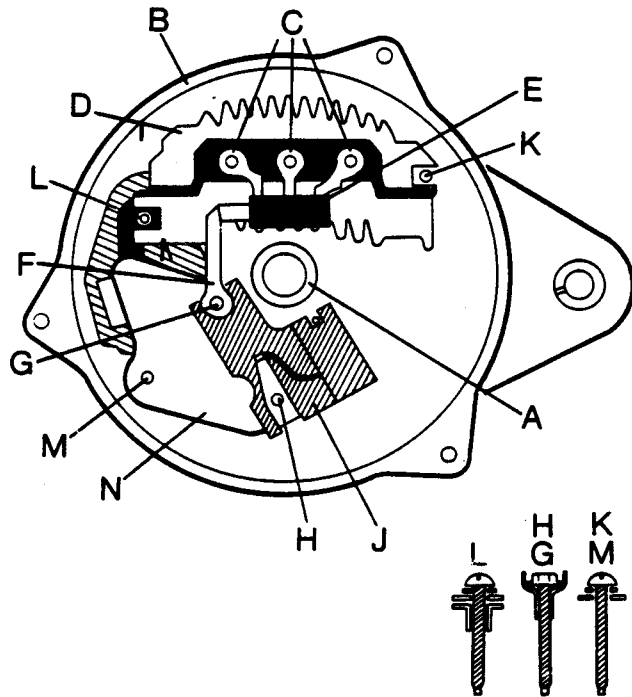


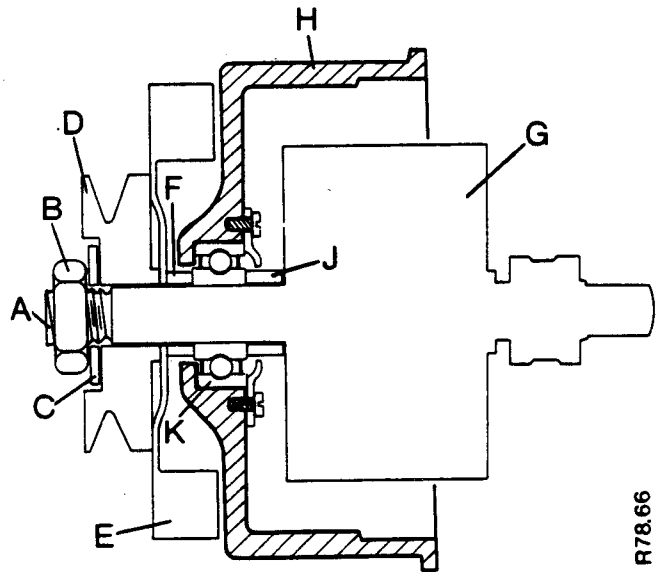
Figure H31
SLIP-RING END FRAME

- A. Bearing, roller type.
- B. Frame, slip-ring end.
- C. Rectifier terminals.
- D. Rectifier bridge.
- E. Diode trio.
- F. Link, diode trio.
- G. Diode trio screw, with insulation.
- H. Brush holder screw, with insulation.
- J. Brush holder.
- K. Rectifier screw.
- L. Rectifier screw, with insulation.
- M. Regulator screw.
- N. Regulator.

R78.65

Drive End

1. Put a $\frac{5}{16}$ in Allen Key in the drive end of the rotor shaft A to prevent it from turning. Use a $\frac{1}{8}$ AF spanner to loosen the pulley nut B.
2. Remove the nut B, washer C, pulley D, fan E and outer spacer F from the rotor shaft.
3. Carefully remove the rotor G from the end frame H. Remove the inner spacer J from the rotor shaft.



R78.66

Figure H32
DRIVE END FRAME

- | | |
|------------|------------------|
| A. Shaft. | F. Outer spacer. |
| B. Nut. | G. Rotor. |
| C. Washer. | H. End Frame. |
| D. Pulley. | J. Inner spacer. |
| E. Fan. | |

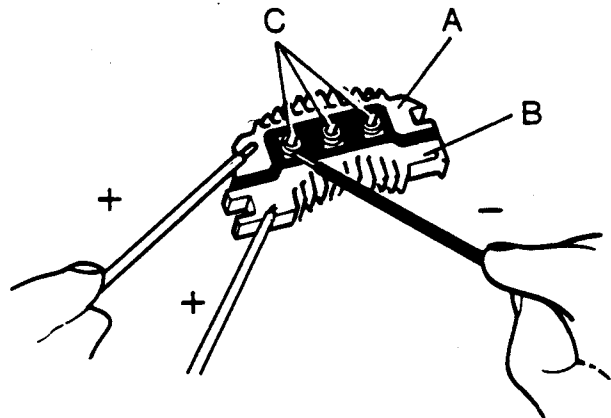
TEST AND REPAIR

NOTE: Test procedures for the stator, rotor and slip-rings are the same as for the Lucas alternator.

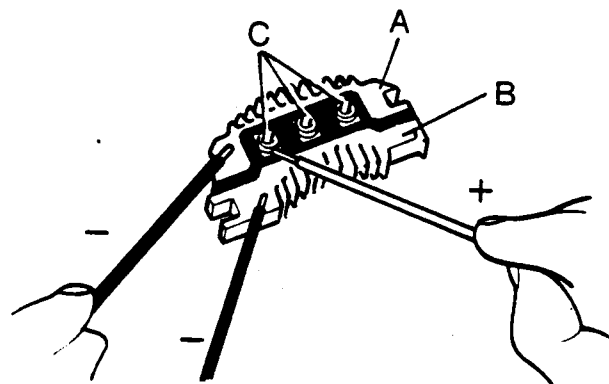
Rectifier Bridge

Use a ohmmeter or test lamp to check the rectifier bridge in the following way.

1. Connect the positive wire of the test equipment to the insulated heat sink A.
2. Connect the negative wire of the test equipment to each terminal C of the rectifier, one at a time. Make a note of each result.
3. Now connect the negative wire to the heat sink A and the positive wire to the terminals C. Make a note of each result.
4. Install a new rectifier bridge if the same result is shown when the wires are connected in both ways.
5. Repeat steps 1 to 4 on the heat sink B which has no insulation.



R78.67.1



R78.67.2

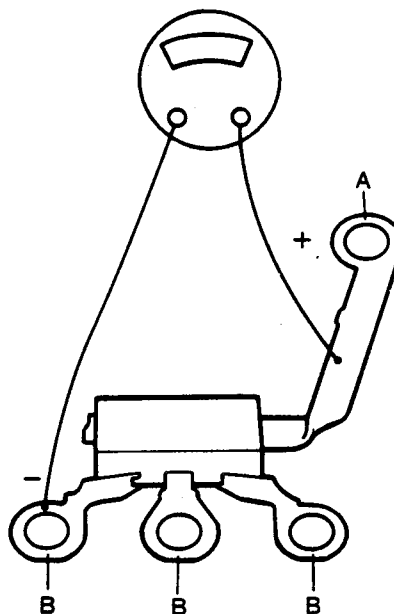
Figure H33
TESTING THE RECTIFIER BRIDGE

- | |
|----------------------------------|
| A. Heat sink with insulation. |
| B. Heat sink with no insulation. |
| C. Terminals. |

Diode Trio

Use the following method to test the diode trio.

1. Connect the positive wire of the test equipment to the brush holder connection A. Now connect the negative wire to each of the three rectifier connections B. Make a note of each result.
2. Now connect the negative to the brush holder connection A and the positive to each of the other wires B. Make a note of each result.
3. Install a new diode trio, if any connection shows the same result when connected in both ways.

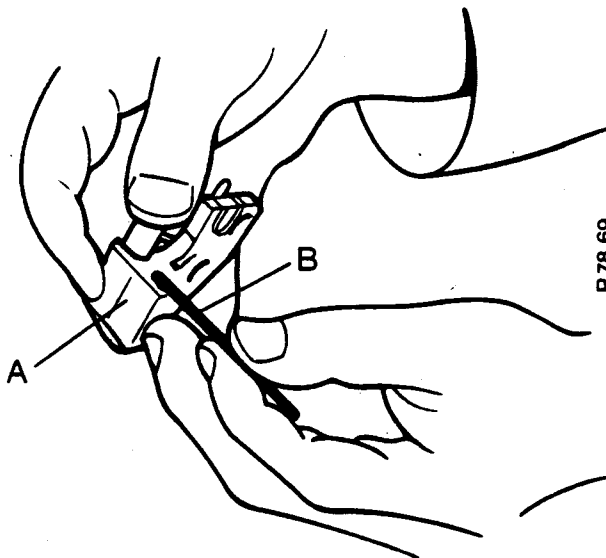


R 78.683

Figure H34
TESTING THE DIODE TRIO
 A. Brush holder connection.
 B. Rectifier connections.

Brushes

1. Remove the brushes from the holder.
2. Measure the length of the brushes. Install new brushes if less than 10mm.
3. Clean the brushes with a small amount of petrol on a cloth before installing into the holder.
4. Get a pin, approximately 2.38mm x 50mm ($\frac{3}{32}$ in x 2 in) and made of a material which is not a conductor. Push the brushes down into the holder. Put the pin through the hole in the holder to hold the brushes down. The pin is removed after the alternator has been completely assembled.



R 78.69

Figure H35
INSTALLING THE BRUSHES
 A. Brush holder.
 B. Pin, made of a material which is not a conductor.

Regulator

To check the regulator it must be connected into a circuit with a variable DC voltage. Use a supply with a maximum of 18 volts.

1. Make a test circuit as shown in Figure H36.
2. Set the supply voltage D to 10 volts. Check the voltmeter E; if showing 1.5 volts continue with test. If showing 10 volts, install a new regulator.
3. Set the supply voltage D to between 14 and 15.5 volts. Check the voltmeter E; if showing supply voltage continue with test. If showing a different reading, install a new regulator.
4. Decrease the supply voltage D until the voltmeter E shows 1.5 volts. Check the supply voltage; it will be between 14.2 and 15.1 volts if the regulator is working correctly.

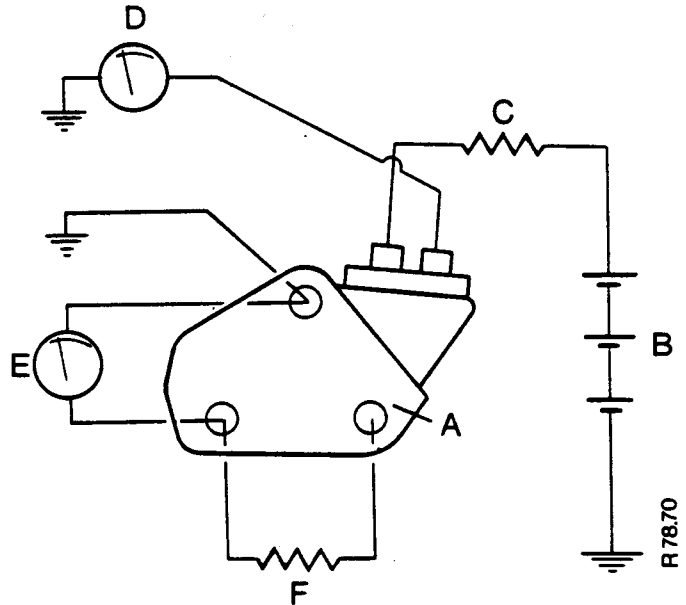


Figure H36
REGULATOR TEST CIRCUIT
A. Regulator.
B. 18 volt supply DC.
C. Variable resistor.
D. Supply voltmeter.
E. Output voltmeter.
F. Resistor, 3 ohms 5 amp capacity.

BEARING REPLACEMENT
Slip-ring End

1. Use a piece of steel tube A 50mm (2in) in diameter as a support for the inside of the frame.
2. Use a piece of steel tube D with an outside diameter of 16.6mm ($\frac{5}{8}$ in). Push the bearing out of the frame from the outside.
3. Heat the frame B to about 50° Celcius. Push the new bearing C into the frame from the outside until it is level with the frame.
4. Put tape on the bearing to stop dirt entering. Remove when ready for assembling.

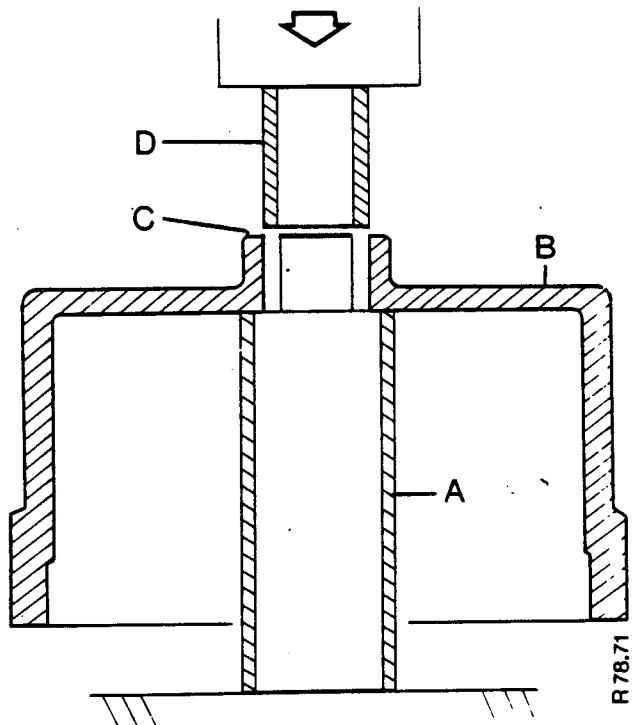
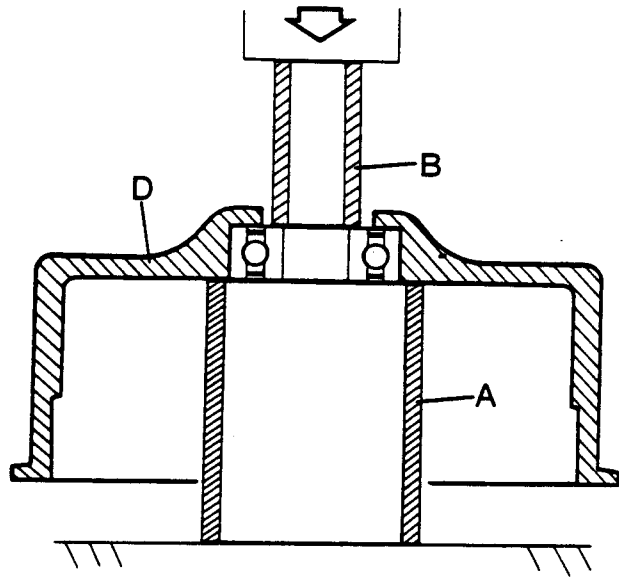


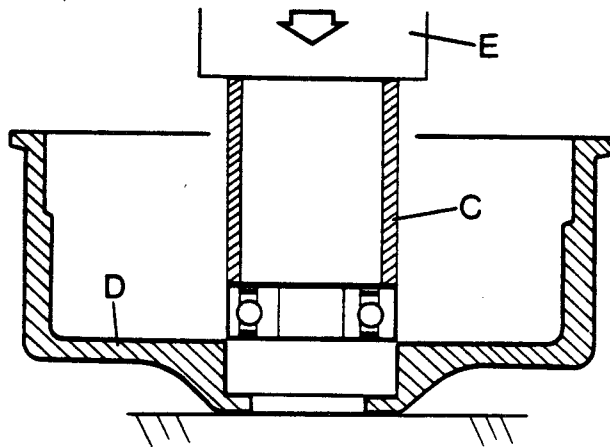
Figure H37
REMOVING AND INSTALLING SLIP-RING END BEARING
A. 50mm (2in) steel tube.
B. End frame.
C. Roller bearing.
D. 16.6mm ($\frac{5}{8}$ in) steel tube.

Drive End

1. Remove the three screws from the retainer plate which keeps the bearing in place. Remove the plate.
2. Use a piece of steel tube A 50mm (2in) diameter as a support on the inside of the frame.
3. Using a piece of steel tube B the same size as the inner ring of the bearing. Push the bearing out of the frame, from the outside of the frame.
4. Heat the frame to about 50° Celcius. Using a piece of tube C the same size as the outer ring of the bearing. Push the new bearing into the frame, with the tube, from the inside of the frame.



R78.72



R78.73

Figure H38
REMOVING AND INSTALLING DRIVE END BEARING
A. 50mm (2in) steel tube.
B. Steel tube, same size as bearing inner ring.
C. Steel tube, same size as bearing outer ring.
D. Drive end frame.
E. A press.

ASSEMBLY
Slip-ring End

1. Fasten the regulator N loosely into position with the screw M which has no insulation.
2. Install the insulation sleeve P to the rectifier bridge D.
3. Install the rectifier bridge into the frame. Align the terminals in the centre of the terminal opening. Install and tighten the screws L and K.
4. Put the brush holder J on to the regulator. Make sure the pin R which holds the brushes in place, goes through the hole in the end frame.
5. Install the insulated screw H but do not tighten.
6. Install the diode trio E and the other insulated screw G but do not tighten.
7. Move the brush holder towards the outside of the frame and tighten the screws. Now tighten the regulator screw M.
8. Put the stator into the frame. Connect the three wires to the rectifier and tighten the nuts. Make sure the three terminals C are not making contact with the heat sink. Bend clear if necessary.
9. Remove the tape from the bearing in the end frame and from the rotor shaft. Clean off any deposit remaining.

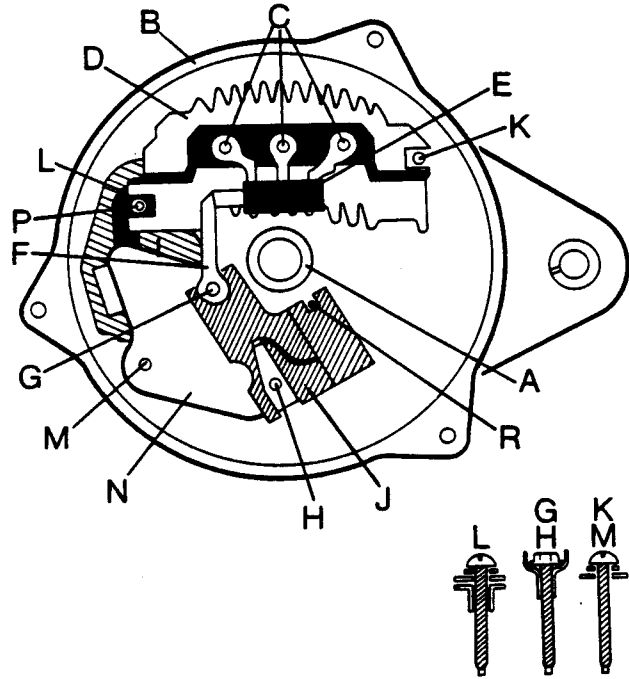


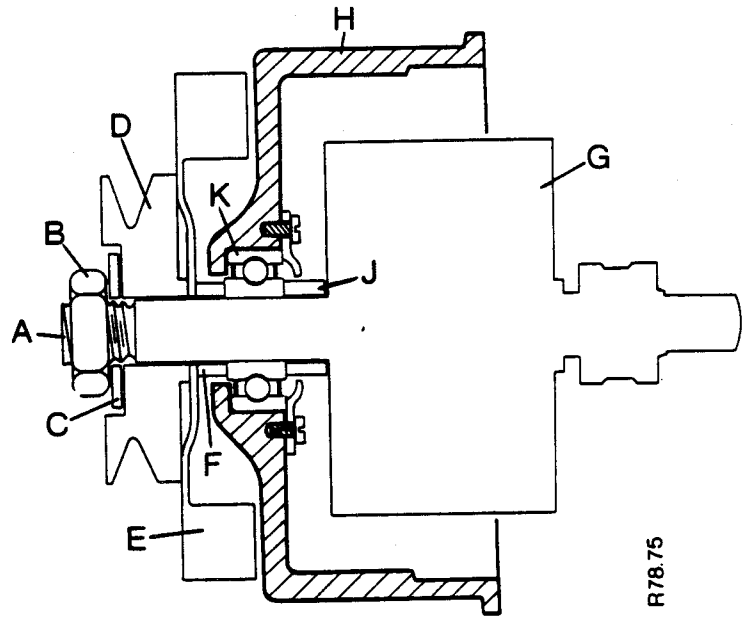
Figure H39
SLIP-RING END FRAME

- | | |
|----------------------------|---|
| A. Bearing. | K. Rectifier screw, without insulation. |
| B. Frame. | L. Rectifier screw, with insulation. |
| C. Terminals of rectifier. | M. Regulator screw, without insulation. |
| D. Rectifier. | N. Regulator. |
| E. Diode trio. | P. Insulation sleeve. |
| F. Diode trio link. | R. Pin, brushes. |
| G. Screw with insulation. | |
| H. Screw with insulation. | |
| J. Brush holder. | |

R78.74

Drive End

1. Clean all the parts.
2. Put the larger of the two spacers J on the drive end of the rotor shaft A. Make sure the chamfer is towards the end of the shaft.
3. Install the rotor G into the end frame bearing K.
4. Put the outer spacer F on the armature shaft.
5. Put the fan E, pulley D, washer C and nut B on to the shaft in that sequence.
6. Tighten the pulley nut B to a torque of 54–80Nm (5.5–8.3kgm) (40–60lbft).
7. Make sure the slip-rings are clean, then enter the rotor shaft into the slip-ring frame bearing.
8. Align the marks made on the two halves of the frame and push the halves together.
9. Install the three bolts which hold the two halves together and tighten to a torque of 40–68Nm (4–7kgm) (30–50lb in).
10. Remove the pin R, Figure H39, which is holding the brushes into the holder.



R78.75

Figure H40
DRIVE END FRAME

- | | |
|------------|------------------|
| A. Shaft. | F. Outer spacer. |
| B. Nut. | G. Rotor. |
| C. Washer. | H. End Frame. |
| D. Pulley. | J. Inner spacer. |
| E. Fan. | K. Bearing. |

DYNAMO

HOW IT WORKS

When the starter key A is turned to the ACC position the 'no charge' warning lamp J is illuminated. Battery current goes through the brushes and armature windings B to ground.

When the engine is started a current is generated in the armature windings. This is caused by the armature turning in a magnetic field made by the field magnets C. The current goes from the armature to the field windings. This current in the field winding increases the strength of the magnetic field. The effect is to increase the armature current. Both currents increase with armature speed. When the armature output reaches 13 volts the cut-out contacts D of the regulator close. This connects the dynamo to the battery and charging starts. When the output decreases to 12 volts the contacts open to prevent the current returning through the dynamo.

When the dynamo output voltage increases the voltage difference at the warning lamp terminals decreases. This causes the lamp to stop illuminating.

The maximum output of the armature is regulated by another set of contacts E. These open, at a set maximum and interrupts the current to the field windings. Field current decreases causing armature current to decrease and the contacts close again. All this occurs at a fast rate, keeping output limited to a set amount. Charging current is controlled by the battery charge condition. A discharged battery will take a high rate of charge. A charged battery will take a low rate of charge.

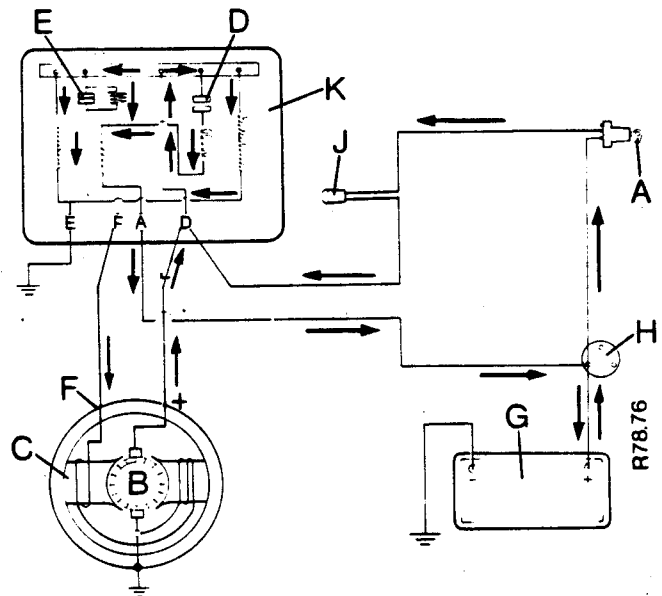


Figure H41

DYNAMO CIRCUIT

- A. Starter key.
- B. Commutator.
- C. Field magnets.
- D. Cut-out contacts.
- E. Regulator contacts.
- F. Field connection.
- G. Battery.
- H. Starter solenoid.
- J. Warning lamp.
- K. RB 108 type regulator.

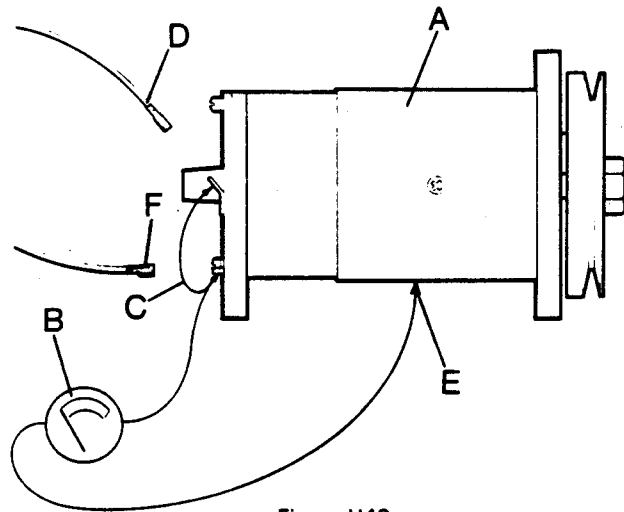
FAULT FINDING

Equipment Needed

- Voltmeter
- Jumper wires

TEST 1: Output

1. Check that the drive belt is adjusted correctly. Check for wear and damage.
2. Disconnect both the wires from the dynamo terminals and connect a jumper wire from one terminal to the other as shown Figure H42.
3. Connect a voltmeter from the jumper lead to ground. Start the engine and let it run at idle speed. The voltmeter must show between 10 and 13 volts and increase with engine speed at a rapid rate. Do not let the voltage increase more than 20 volts or damage can occur to the dynamo.
If the voltage is less than 10 volts or does not increase at a rapid rate remove the dynamo.
4. Disassemble the dynamo and check all parts. See MAINTENANCE AND REPAIR section for procedures.
5. If the voltage is correct reconnect the dynamo wires.



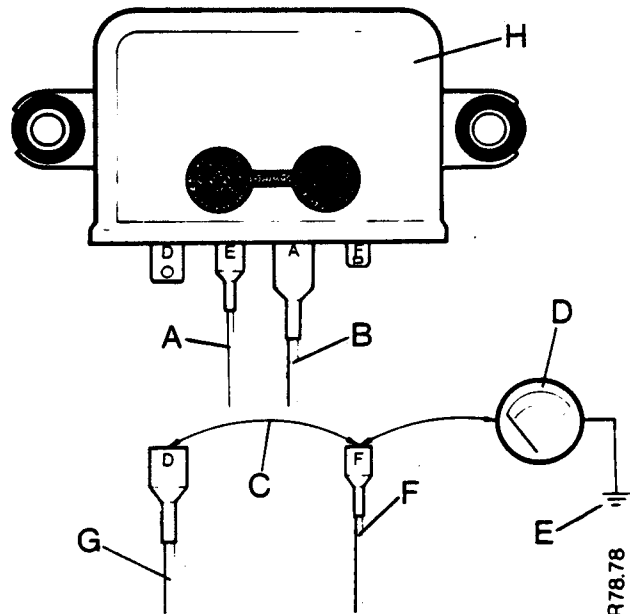
R78.77

Figure H42
CHECKING DYNAMO OUTPUT

- | | |
|-----------------|-----------------------|
| A. Dynamo | D. Positive wire. |
| B. Voltmeter. | E. Ground connection. |
| C. Jumper wire. | F. Field wire. |

TEST 2: Wiring

1. Disconnect the wires from the D and F terminals of the voltage regulator and connect the wires together. Make sure the wires do not make contact to ground.
2. Connect a voltmeter between the ends of the wires and earth.
3. Start the engine and let it run at idle speed. The voltmeter must show a voltage of 10 to 13 volts. If the voltmeter does not show any voltage, check for a break in the wires. Check for loose or dirty connections.



R78.78

Figure H43
CHECKING DYNAMO WIRING

- | | |
|-----------------|-----------------------|
| A. Black wire. | E. Ground. |
| B. Brown wire. | F. Brown/Green wire. |
| C. Jumper wire. | G. Brown/Yellow wire. |
| D. Voltmeter. | H. Regulator. |

4. Disconnect the D & F wires from the dynamo. Use a jumper wire to connect one end of the D wire to the battery positive terminal. Connect a voltmeter between the other end of the D wire and ground. The voltmeter must show battery voltage or there is a break in the wire. Do the same with the F wire.
5. Connect one end of the D wire to the battery positive terminal. Connect the voltmeter from the F wire to ground. If a voltage is shown on the voltmeter there is a leakage from D to F. Reconnect all wires if correct.

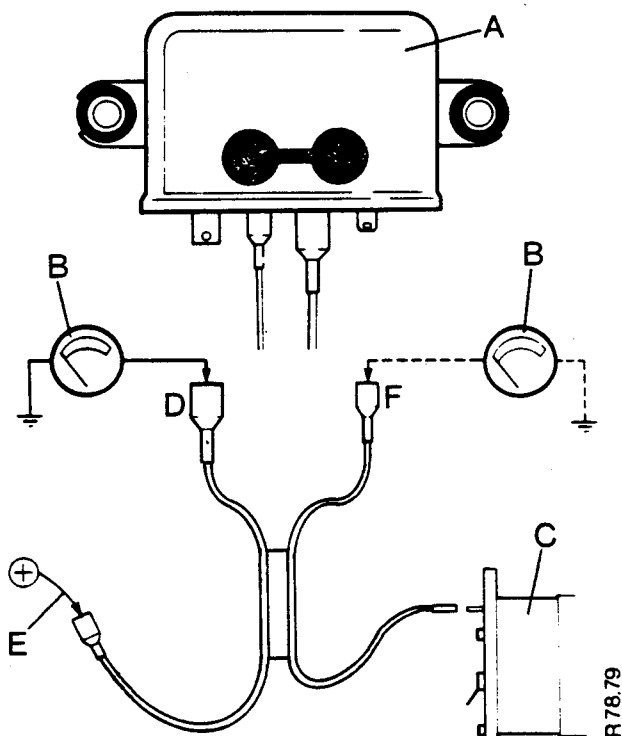


Figure H44
CHECKING DYNAMO WIRING

- | | |
|-----------------------|-------------------------------------|
| A. Regulator. | E. Jumper wire to battery positive. |
| B. Voltmeter. | F. Brown/Green wire. |
| C. Dynamo. | |
| D. Brown/Yellow wire. | |

TEST 3: Regulator

1. Make sure the black wire from the E terminal of the regulator is making a good connection to ground.
2. Disconnect the wire from the A terminal of the regulator. Make sure the wire does not make contact to ground.
3. Connect a voltmeter to the D terminal of the regulator and to ground. Do not disconnect the D wire from the regulator.
4. Start the engine and increase the speed to 2000 r/min. The voltmeter must show 16 to 16.6 volts at 20° Celcius (68° Fahrenheit).
5. If the voltage is more, connect a jumper wire from the E terminal to a good ground. Do the check again. If the voltage then decreases, the E wire is not making a good connection to ground.
6. If the voltage is not correct the regulator can be adjusted.

To increase the voltage turn the screw nearest the F terminal clockwise. See Figure H46.

To decrease the voltage turn the screw counterclockwise.

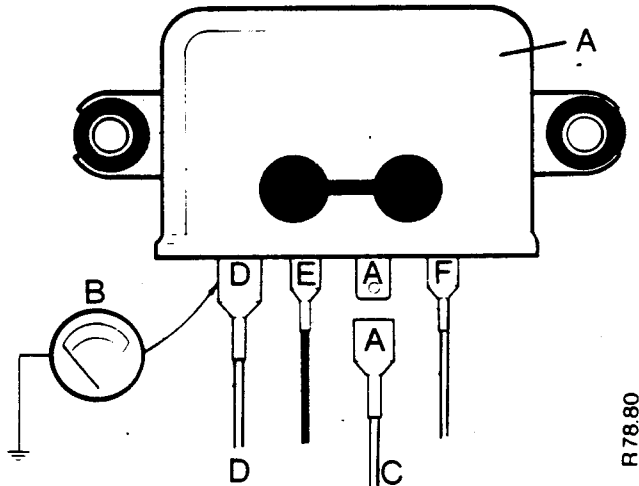


Figure H45
CHECKING DYNAMO OUTPUT

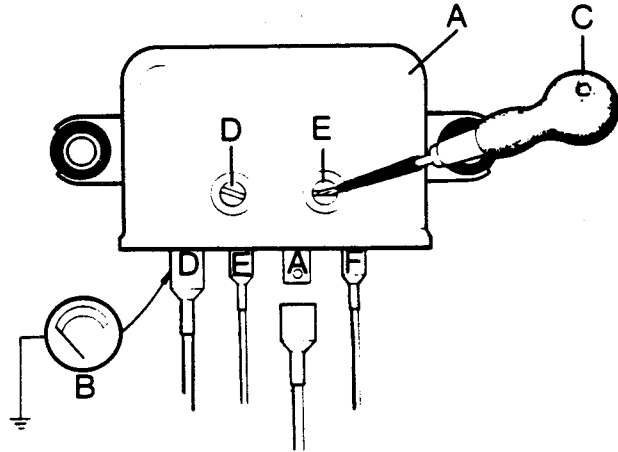
- | | |
|----------------|----------------------------------|
| A. Regulator. | D. Brown/Yellow wire connection. |
| B. Voltmeter. | E. Black wire, to ground. |
| C. Brown wire. | F. Field wire. |

ELECTRICAL EQUIPMENT

IMPORTANT: Use a screwdriver which has insulation on the blade. Output voltage flows through the adjusting screws and the case is connected to ground.

Make sure the test is done without delay or heat will cause the voltages to change.

7. Reconnect the wire to the A terminal and connect the voltmeter from D to ground.
8. Put the tractor lighting switch to the main beam position and start the engine. The voltage must increase to between 12.7 to 13.3 volts then decrease a small amount.
9. If the voltage is not correct adjust the screw nearest the D terminal. Turn the screw clockwise to increase the voltage or counter-clockwise to decrease the voltage.



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Figure H46
VOLTAGE REGULATOR ADJUSTMENT

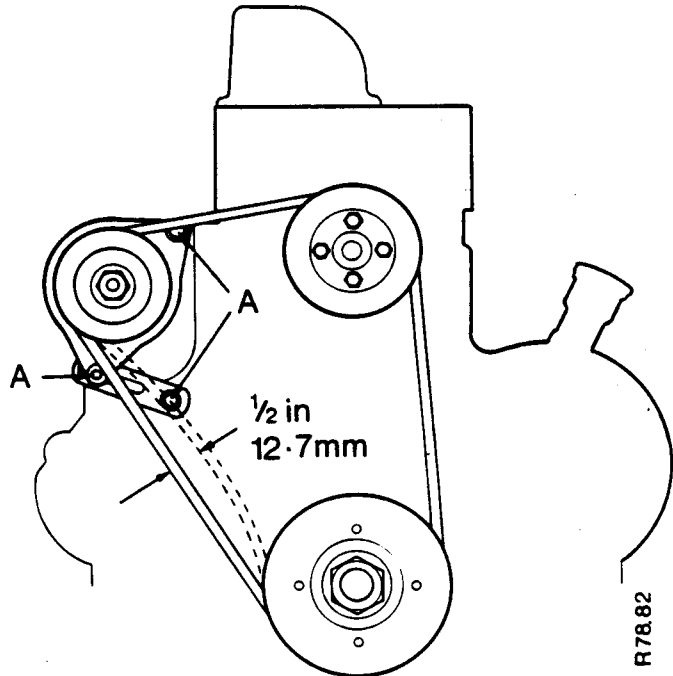
A. Regulator. C. Screwdriver.
B. Voltmeter. D. & E. Adjusting screws.

MAINTENANCE AND REPAIR

Two models of dynamo are installed on David Brown tractors. These are the Lucas C40A and C40T models.

MAINTENANCE

1. Every 125 hours check the tension of the drive belt. Adjust if necessary.
2. Every 500 hours apply a small amount of engine oil to the felt pad in the commutator end plate. Remove the rubber plug, apply oil through the hole and install plug again.
3. Check the tightness of the bolts A which fasten the dynamo to the engine.
4. Make sure the electrical connections are clean, tight and correctly connected.
5. Clean the dynamo, especially around the electrical connections.



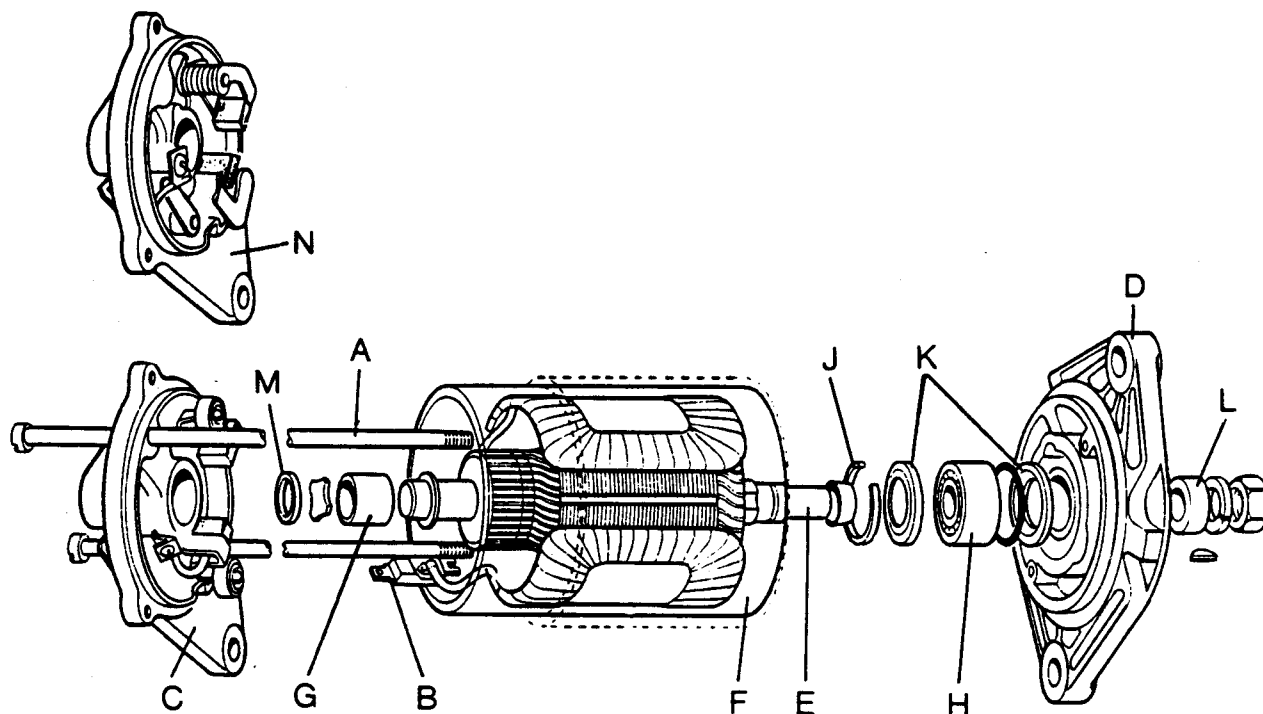
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Figure H47
FAN BELT ADJUSTMENT
A. Dynamo fastening bolts

DISASSEMBLY

After the dynamo has been removed from the tractor use the following procedure to disassemble.

1. Remove the two bolts A which hold the assembly together.
2. If an early type dynamo, remove the nut and washers from the field connection B.
3. Remove the end bracket C at the commutator end of the dynamo.
4. Remove the drive end bracket D complete with pulley and armature E from the yoke F.



R7883

Figure H48
DYNAMO ASSEMBLY

- | | |
|----------------------------|----------------------|
| A. Through bolt. | H. Ball bearing. |
| B. Field terminal. | J. Circlip. |
| C. Commutator end bracket. | K. Seals. |
| D. Drive end bracket. | L. Pulley spacer. |
| E. Armature. | M. Felt oil pad. |
| F. Yoke. | N. C40T end bracket. |
| G. Bush. | |

TEST AND REPAIR

Brushes

1. Remove the brushes from the holders and measure the length. If less than 8mm ($\frac{5}{16}$ in), install new brushes.

On the C40T model, measure to the shoulder of the brush.

2. Clean the brushes with a small amount of petrol on a cloth. Make sure the brushes can move easily in the holders after installing.
3. Apply a small amount of engine oil to the brush pivot arms of the C40T model.
4. Install the end plate complete with brushes on to the commutator.
5. Use a spring-balance to check the brush spring tension with the brushes in the working position.

6. Install new springs if the tensions are not inside the following limits:

C40A model: 368–850g (13–30oz)

C40T model: 567–680g (20–24oz)

NOTE: When installing new springs in the C40A model, make sure the spring is as shown in Figure H49.

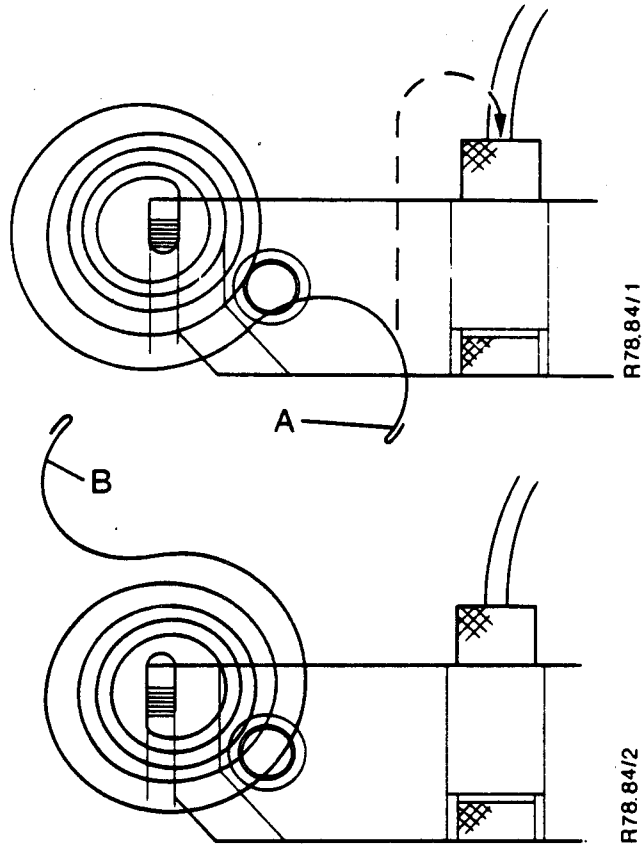


Figure H49
INSTALLING BRUSH SPRINGS

- A. Correct.
- B. Wrong.

Armature

1. Check for damage or movement of solder connections, caused by heat.
2. Check for movement of commutator segments.
3. Install a new armature if any of the above damage is found. Look for possible cause before running the dynamo again.
4. Check for any indication of armature to field winding contact. If any is found, check bearings for wear. Check the tightness of the screws which fasten the pole shoes to the yoke.
5. Clean the commutator with a small amount of petrol on a cloth. Remove small surface damage with smooth glass paper. Do NOT use emery or similar abrasive.
6. If the damage is deep, a lathe can be used to remove the damage. First check what type of commutator is used, fabricated or moulded, see Figure H50.

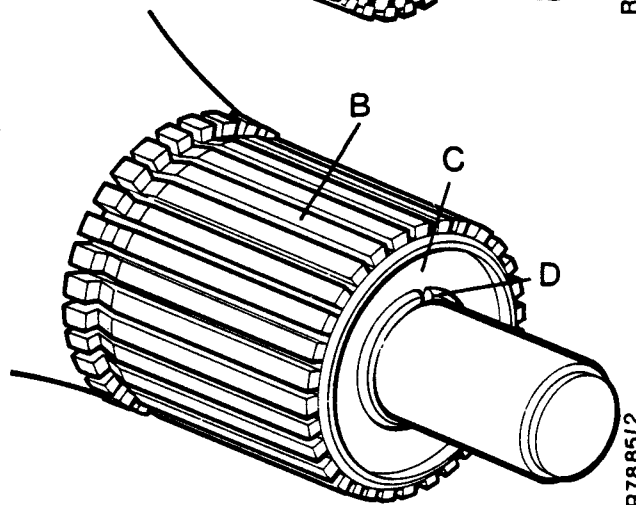
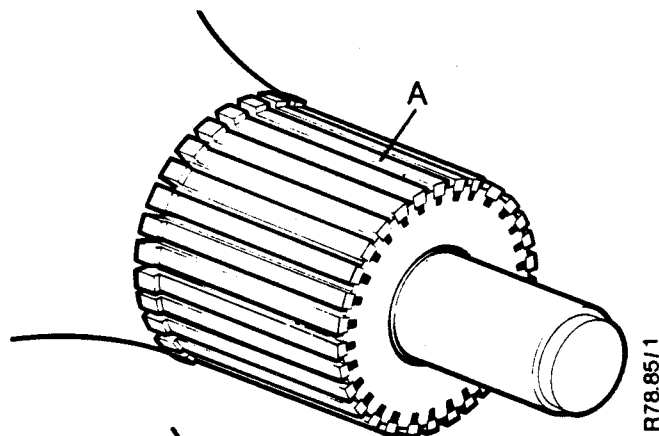


Figure H50
IDENTIFICATION OF COMMUTATORS
A. Moulded commutator.
B. Fabricated commutator.
C. Insulation cone.
D. Metal roll over.

Before doing any repair make sure the armature windings are in good condition.

1. Use a 110 volt AC supply and a 15 watt test lamp to check the insulation as follows:
Connect the supply to the armature shaft and the test lamp to one of the segments. Repeat the test on all segments. If the lamp illuminates, install a new armature.
2. Connect an ohmmeter between two segments next to each other. Continue this check all round the commutator until all segments have been checked. The reading must be the same for all segments. If a zero or low reading is shown, install a new armature.

If the armature is in good condition the following procedures must be followed for a repair.

1. For fabricated commutators the segments must not be decreased to less than a thickness of 1.5mm ($\frac{1}{16}$ in). Cut the insulation to 0.8mm ($\frac{1}{32}$ in) below the segments.
2. For moulded commutators the diameter of the commutator must not be decreased to less than 37mm (1.45in). DO NOT cut the insulation away between the segments. It is made to a set depth by the manufacturer.
3. Use a very fine glass paper to get a smooth finish. Clean away particles with an air jet.

NOTE: Make sure all particles of copper are removed from between the segments after a repair.

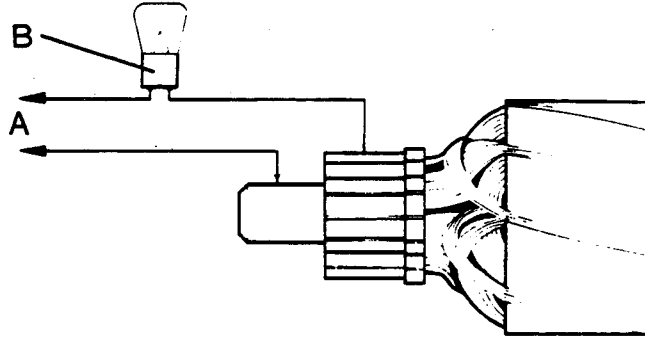


Figure H51
CHECKING INSULATION OF ARMATURE WINDINGS
A. 110 volt AC supply.
B. 15 watt test lamp.

R7886

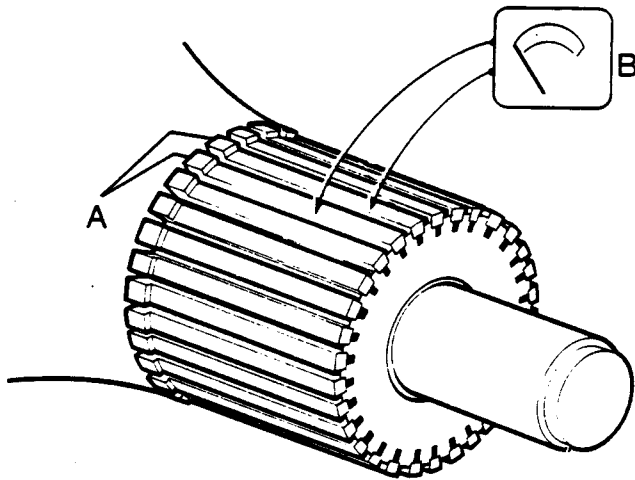
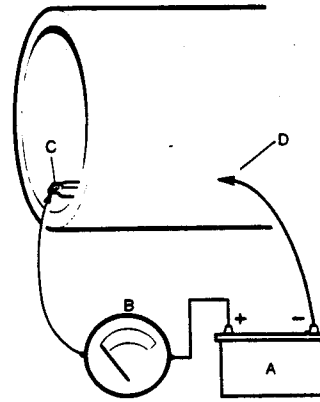


Figure H52
CHECKING CONTINUITY OF ARMATURE WINDINGS
A. Commutator segments.
B. Ohmmeter.

R7887

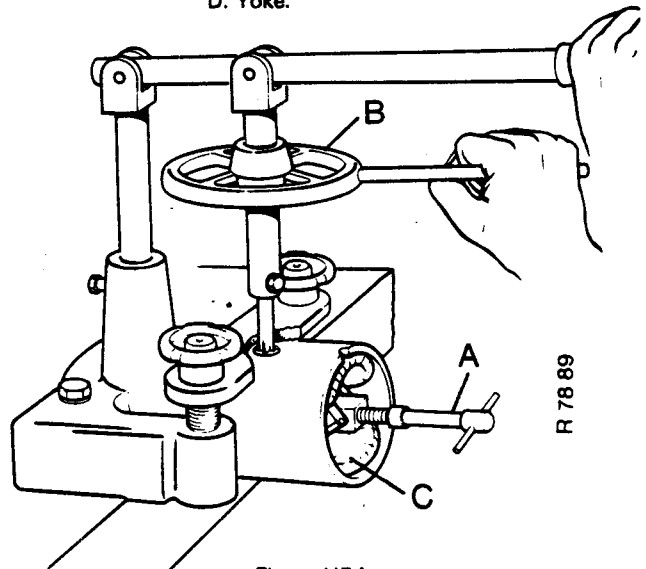
Field Windings

1. Check the tightness of the pole shoe screws.
2. Make an inspection of the windings for any indication of contact with the armature.
3. Check for damage to insulation material.
4. Check for damage to the wire which connects the two windings together.
5. Check the windings for damage caused by heat. Install new windings if damage is found. Look for the possible cause before running the dynamo after assembly.
6. Connect an ohmmeter between the field winding connection and a good ground connection on the yoke. The resistance shown must be 6 ohms, if less look for a short circuit. If the reading is more, check for bad ground connection between the windings and the yoke.
NOTE: This test can also be done by using an ammeter as shown in Figure H53. The reading will be 2 amperes if the windings are in good condition.
7. To remove the windings, use a drill to remove the rivet which connects the windings to the yoke. Then remove the screws which fasten the pole shoes to the yoke. Remove the windings and shoes.
8. When new windings are to be installed, clean and install old pole shoes to new windings. If a threaded terminal is used, this must be fastened to the new windings. Make a note of the arrangement and colour of the wires before disconnecting.
9. Use a shoe expander to install the shoes to the yoke as shown in Figure H54.
10. Install and tighten the screws which fasten the shoes to the yoke to 41Nm (4kgm) (30lbft).
11. Fasten the windings to the yoke with a new rivet.
12. The wire which connects the windings together must be set in the following positions. See Figure H55.
 - (a) If the wire has an insulation sleeve, put it in the position shown in Figure H55C.
 - (b) If the wire is without an insulation sleeve and is connected in the middle, set as in Figure H55C.
 - (c) If the wire is without an insulation sleeve and connected next to a winding, set as in Figure H55B.



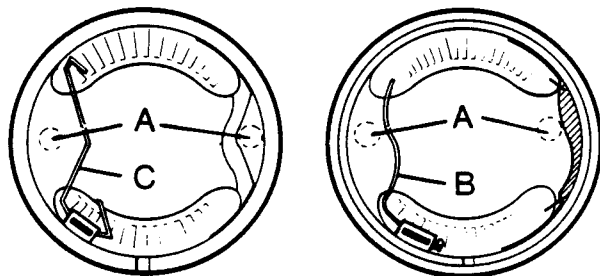
R 78 88

Figure H53
CHECKING RESISTANCE OF FIELD WINDING
A. 12 volt battery.
B. Ammeter.
C. Field terminal.
D. Yoke.



R 78 89

Figure H54
INSTALLING FIELD WINDINGS
A. Field shoe expander.
B. Wheel type screwdriver.
C. Field windings.



R 78 90

Figure H55
FIELD LINK POSITIONS
A. Through bolts.
B. Link wire early type.
C. Link wire later type.

BEARING REPLACEMENT

Drive End

1. To check the condition of the drive end bearing do the following: Hold the drive end bracket complete with armature vertical and turn the armature by hand. Repeat this with the armature held horizontal.
2. To remove the bearing from the end bracket first remove the pulley nut. Remove the pulley and key from the shaft.
3. Press the shaft out of the end bracket.
4. Use a drill to remove the rivets which fasten the bearing retainer plate to the end bracket.
5. Use a hammer and punch to remove the rivets from the end plate.
6. Press the bearing out of the end plate.
7. Clean around the area and press the new bearing into the end bracket.
8. Use new rivets to install the bearing retainer plate.
9. Press the armature through the bearing of the end bracket as far as it can go.

10. Install the key, pulley, washer and nut to the shaft. Tighten the nut to a torque of 34Nm (3.5 kgm) (25 lbft).

Commutator End

1. Put the new bush in engine oil for 24 hours.
2. Turn a $\frac{5}{8}$ in thread tap into the old bush and pull the bush out of the end bracket.
3. Remove the disc and felt oil pad from the bush hole; clean the hole.
4. Apply engine oil to the felt pad and install with the disc into the end bracket.
5. Use a mandrel with a shoulder to press the new bush into the end bracket. The mandrel must be 0.002in larger than the armature shaft.

DO NOT put a reamer through the bush after it has been installed. This will decrease the lubrication quality of the bush.

ASSEMBLY

1. Install the armature complete with drive end bracket and pulley into the yoke.

2. Install the end bracket to the commutator end.

On the C40A type, hold the brushes up in the holders with the springs as shown at A, Figure H56. Push the bracket on to the armature, pull the springs up on to the top of the brushes.

Use the special tool shown in Figure H57 for this purpose.

On the C40T type, hold the brush pivot arms outwards with your fingers, while you push the bracket on. Release the arms slowly when the brushes are over the commutator.

3. Make sure both end brackets are correctly installed. Install the two through bolts and tighten to 8Nm (0.8kgm) (6 lbft).

4. Check the output, see **FAULT FINDING**, page H30.

5. If test equipment is not available check the dynamo as follows:

Make a connection between the field and output terminals. Then connect these to the positive terminal of a 12 volt battery. Connect the negative of the battery to a good ground connection on the yoke.

If assembled correctly the dynamo will run as a motor.

IMPORTANT: Make sure the polarity is correct before making the connections.

6. To correct the polarity of a dynamo fitted to a tractor use the following procedure:

Connect a jumper wire to the battery positive terminal. Put the other end of the wire against the field terminal several times. Hold it in contact with the terminal for part of a second only, each time.

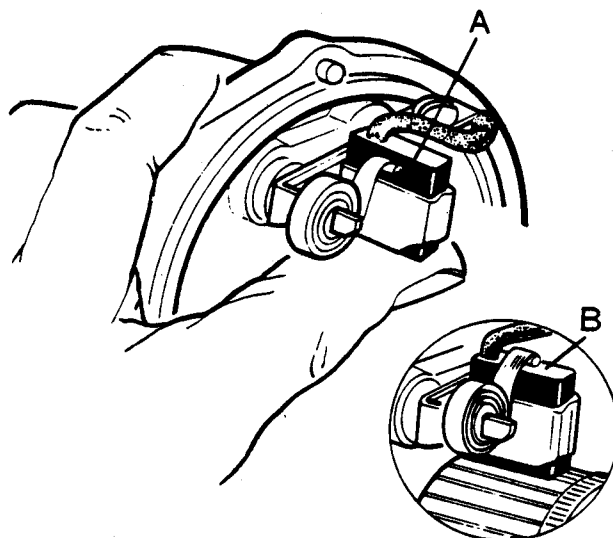


Figure H56
INSTALLING BRUSHES BEFORE FITTING END PLATE
C40A DYNAMO

A. Brush held with spring.
B. Brush in working position.

R 7891

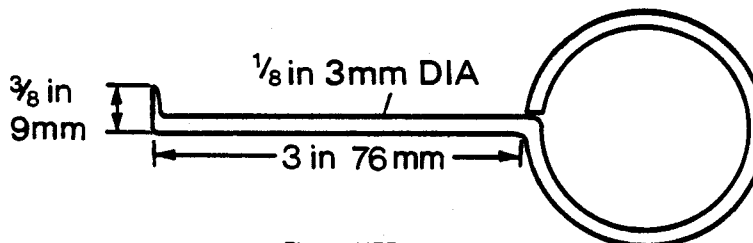


Figure H57
BRUSH SPRING HOOKING TOOL

R 7892

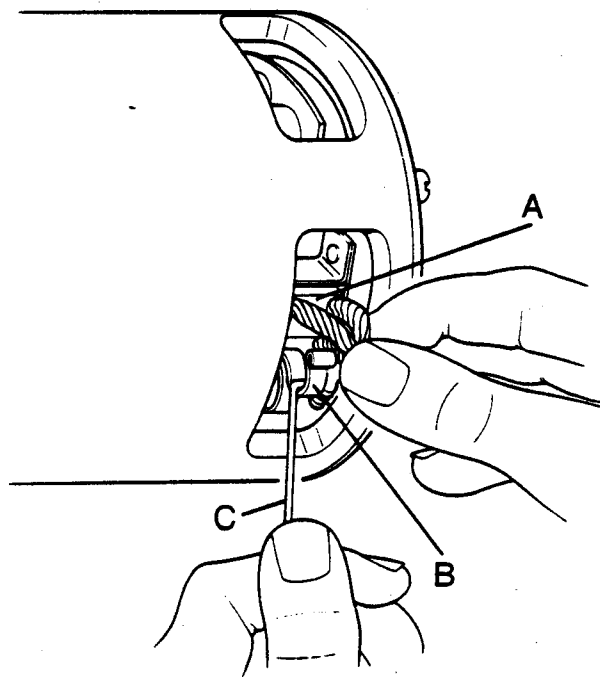


Figure H58
USING BRUSH SPRING TOOL
A. Brush. B. Spring. C. Tool.

R 7893