Service Manual

8013
8015
8017
8018
801 *Gravemaster*

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All construction and agricultural equipment can be hazardous. When a JCB Mini Excavator is correctly operated and properly maintained it is a safe machine to work with. But when it is carelessly operated or poorly maintained it can become a danger to you (the operator) and others.

Do not work with the machine until you are sure that you can control it.

Do not start any job until you are sure that you and those around you will be safe.

If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.

Remember

BE CAREFUL
BE ALERT
BE SAFE

GEN-1-6

As well as the warnings in the following pages, specific warnings are given throughout the book. This section is designed to give a safety code for use of the machine generally and for operation and maintenance practices.

Note: *This section includes a certain amount of operating safety information. But remember that whenever you drive the machine or operate its controls you are, in effect, a machine operator. Therefore, you should read and understand the information given in the Operator Handbook before driving the machine or operating its controls.*

General Safety

WARNING

Lifting Equipment

You can be injured if you use faulty lifting equipment. Make sure that lifting equipment is in good condition. Make sure that lifting tackle complies with all local regulations and is suitable for the job. Make sure that lifting equipment is strong enough for the job.

INT-1-3-7

WARNING

Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the machinery. Wear protective clothing to suit the job. Examples of protective clothing are: a hard hat, safety shoes, safety glasses, a well fitting overall, ear-protectors and industrial gloves. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained.

INT-1-3-6

WARNING

Care and Alertness

All the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.

INT-1-3-5

WARNING

Raised Equipment

Raised equipment can fall and injure you. Do not walk or work under raised equipment unless safely supported.

13-1-1-6

DANGER

Before removing the boom from the machine, ensure that the counterweight is adequately supported as in certain ground conditions the machine could tip backwards. Never travel or transport the machine with the boom removed.

BF 6-3

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Machine Masses (to ISO 6016)

The following machine masses are provided for reference only. Always check the identification plate before transporting a machine (See ***Section 1, Identification plate***).

8014	Machines from M791000 upto M795999	Operating Weight **C**:	1560 kg (3510 lb)
		Transport Weight **E**:	1485 kg (3441 lb)
8015	Machines from M730800 upto M731999	Operating Weight:	1585 kg (3495 lb)
		Transport Weight **E**:	1510 kg (3340 lb)
	Machines from M820000 upto M821999	Operating Weight **C**:	1620 kg (3572 lb)
		Transport Weight **E**:	1545 kg (3476 lb)
	Machines from M894000	Operating Weight **A**:	1625 kg (3583 lb)
		Transport Weight **E**:	1550 kg (3490 lb)
8016	Machines from M728750 upto M729999	Operating Weight **B**:	1665 kg (3671 lb)
		Transport Weight **E**:	1590 kg (3577 lb)
8017	Machines from M800000 upto m800999	Operating Weight **D**:	1742 kg (3841 lb)
		Transport Weight **E**:	1667 kg (3676 lb)
	Machines from M896000	Operating Weight **A**:	1747 kg (3851 lb)
		Transport Weight **E**:	1672 kg (3686 lb)
8018	Machines from M801000 upto M801999	Operating Weight **D**:	1751 kg (3861 lb)
		Transport Weight **E**:	1676 kg (3696 lb)
	Machines from M897000	Operating Weight **A**:	1756 kg (3871 lb)
		Transport Weight **E**:	1681 kg (3706 lb)

Additional

Machine with canopy:	- 89 kg (196 lb)
Machine with steel tracks:	+42 kg (193 lb)

Notes:

A *Operating weight includes cab, rubber tracks, 1138mm dipper, standard dozer, 460mm bucket, full tanks and a 75kg operator.*

B *Operating weight includes cab, rubber tracks, 1238mm dipper, standard dozer, 400mm bucket, full tanks and a 75kg operator.*

C *Operating weight includes cab, rubber tracks, 1138mm dipper, standard dozer, 400mm bucket, full tanks and a 75kg operator.*

D *Operating weight includes cab, rubber tracks, 1238mm dipper, standard dozer, 460mm bucket, full tanks and a 75kg operator.*

E *For transport weight deduct 75 kg (Operator) from the operating weight.*

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Introduction

This chapter is arranged to guide you step-by-step through the task of learning how to use the machine. Read it through from beginning to end. By the end of the chapter you should have a good understanding of the machine and how to operate it.

Pay particular attention to all safety messages. They are there to warn you of possible hazards. Do not just read them-think about what they mean. Understand the hazards and how to avoid them.

If there is anything you do not understand, ask your JCB dealer, he will be pleased to advise you.

When you have learned where the driving controls are and what they do, practise using them. Practise driving the machine in a safe, open space clear of other people.

Get to know the "feel" of the machine and its driving controls.

Move on to the attachment controls only when you can drive the machine confidently and safely.

Take great care when practising with the attachment controls. Practise in an open space, keep people clear. Do not jerk the controls: operate them slowly until you understand the effect they have on the machine.

Finally, do not rush the job of learning. Take you time and take it safely.

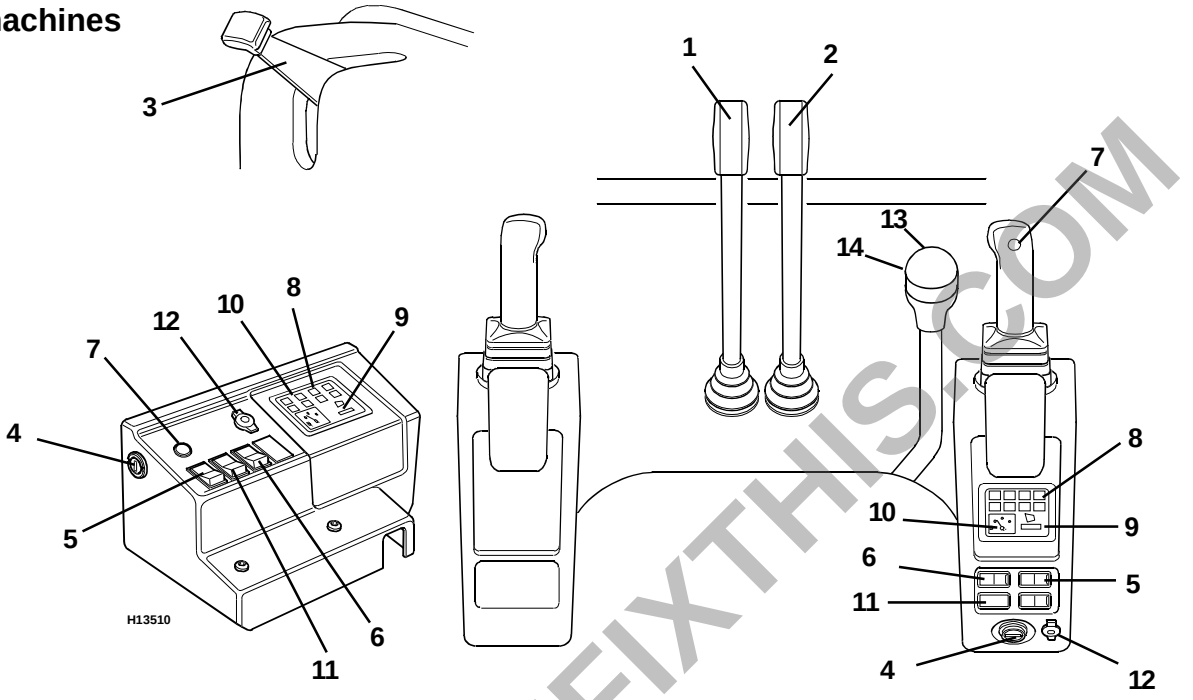
Remember **BE CAREFUL**
BE ALERT
SAFE

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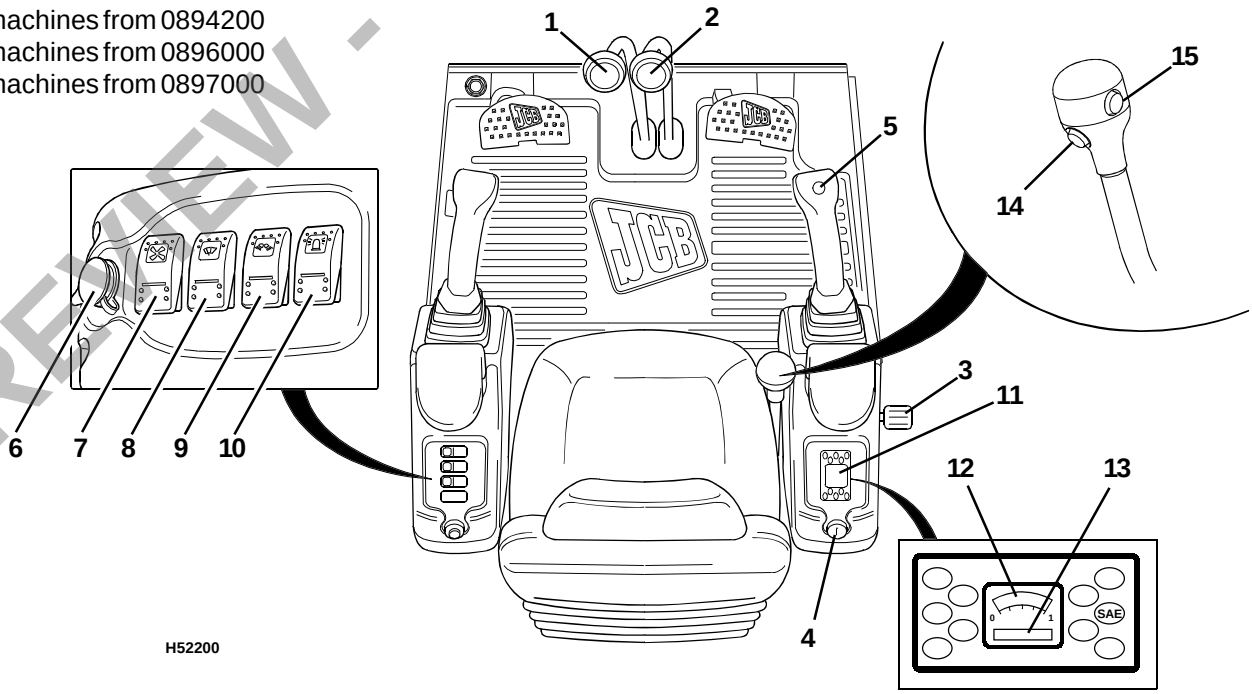
Engine and Track Controls, Switches and Instruments

Earlier machines



1	Left Track Control Lever	**6**	Windscreen Wiper Switch	**11**	Heater Fan
2	Right Track Control Lever	**7**	Horn Button	**12**	Beacon Socket
3	Hand Throttle Lever	**8**	Warning Lights	**13**	Two-Speed Tracking Switch
4	Starter Switch	**9**	Hourmeter	**14**	Extending/Retracting Undercarriage Switch
5	Working Lights Switch	**10**	Fuel Gauge		

*__8015__ machines from 0894200
__8017__ machines from 0896000
__8018__ machines from 0897000



1	Left Track Control Lever	**6**	Beacon socket	**11**	Warning Lights
2	Right Track Control Lever	**7**	Heater Fan	**12**	Fuel Gauge
3	Hand Throttle Lever	**8**	Windscreen Wiper Switch	**13**	Hourmeter
4	Starter Switch	**9**	Working Light Switch	**14**	Two Speed Tracking Switch
5	Horn	**10**	Beacon Switch	**15**	Extending/Retracting Undercaggiage Switch

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Available Attachments

The following attachments are recommended for use with the 801 Range of Mini Excavators.

	8015	8017	8018
General Buckets			
Bucket 160mm (6in) wide	Yes	Yes	Yes
Bucket 230mm (9in) wide	Yes	Yes	Yes
Bucket 300mm (12in) wide	Yes	Yes	Yes
Bucket 360mm (14in) wide	Yes	Yes	Yes
Bucket 400mm (16in) wide	Yes	Yes	Yes
Bucket 460mm (18in) wide	Yes	Yes	Yes
Bucket 610mm (24in) wide	Yes	Yes	Yes
Bucket 760mm (30in) wide	Yes	Yes	Yes
Ditching Buckets			
Bucket 900mm (35in) wide	Yes	Yes	Yes
Bucket 1000mm (39in) wide	Yes	Yes	Yes
Breakers			
Hammermaster HM70	Yes	Yes	Yes
Hammermaster HM160	Yes	Yes	Yes
Hammermaster HM160Q	Yes	Yes	Yes
Augers			
Earth drill	Yes	Yes	Yes
Hand held tool kit	Yes	Yes	Yes

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Transporting the machine

Preparing for road travel

Before loading the machine on to its trailer (see transporting the machine), remove all loose dirt that may otherwise come off and obstruct the highway and damage other vehicles.

Note: *Before transporting the machine make sure you will be obeying the local rules and laws regarding machine transportation of all the areas that the machine will be carried through.*

Make sure that the transporting vehicle is suitable. See Maintenance section of the Operator Handbook for the dimensions and weight of your machine. There is a travel height label fitted to the cab.

Try to make sure that the truck driver knows the clearance height before he drives away.

Note: *The transport position height does not include the truck/trailer height, add the two figures together for the clearance height.*

CAUTION

Make sure that the two speed tracking selector is set to low speed before loading or unloading the machine.

Before using the trailer

WARNING

Before moving the machine onto the trailer, make sure that the trailer and ramp are free from oil, grease and ice. Remove oil, grease and ice from the machine tracks. Make sure the machine will not foul on the ramp angle. HOP69

1 Remove any dirt or debris from the trailer.

2 Check the operation of the parking brake.

3 Check the trailer bodywork for signs of damage.

4 Check the tyre pressures are correct (consult the Manufacturer's handbook).

5 Check the lights are working and are the correct voltage for the towing vehicle (consult the Manufacturer's handbook).

6 Check the breakaway cable is serviceable.

WARNING

The safe transit of the load is the responsibility of the transport contractor and driver. Any machine, attachment or parts that may move during transit must be adequately secured. 5-2-5-3

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Every 10 Operating Hours (Or Daily) whichever occurs first

Clean

1 Machine generally

Check and Adjust where necessary (engine stopped)

2 Generally for damage
3 Hydraulic fluid level
4 Engine oil level
5 Engine coolant
6 Fuel system for leaks
7 Operation of horn
8 Operation of all other electrical equipment
9 Track adjustment

Check and Adjust where necessary (engine running)

10 Exhaust (excessive smoke)
11 Dozer operation
12 Excavator operation
13 Track and Running Gear operation
14 Hourmeter operation

Grease

15 All pivot pins

First 100 Hours Only

Do the jobs listed in 50 hours plus:

Change

1 Engine oil and filter canister
2 Check and adjust fan belt.

Every 100 Operating Hours (Or 2 Weeks) whichever occurs first

Do the daily jobs through to 50 hours plus:

Clean

1 Battery terminals

Check and Adjust where necessary (engine stopped)

2 Hose and pipework for security and damage
3 Condition of ram piston rods
4 All grease seals
5 Track plate condition/rubber condition
6 Engine mounting bolts
7 Air cleaner hose security
8 Wiring for damage
9 Track tension

First 250 Operating Hours

Do the jobs listed in 250 hours (below) plus:

1 Change track gearbox oil
2 Check kingpost pivot pins retaining bolt torque.

Every 250 Operating Hours (Or Two Monthly) whichever occurs first

Do the daily jobs through to 100 hours plus:

Change

1 Engine oil and filter canister

Check

2 Operation of excavator lever and swing pedal lock(s)

Grease

3 Slew ring grease nipples

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New engines DO NOT require a running-in period. The engine/machine should be used in a normal work cycle immediately; glazing of the piston cylinder bores, resulting in excessive oil consumption, could occur if the engine is gently run-in. Under no circumstances should the engine be allowed to idle for extended periods; (e.g. warming up without load). Engines of new machines are filled at the factory with JCB 10W/30 Multigrade oil. This oil should be drained after the first 100 hours operation and the engine filled with the appropriate recommended grade as shown in the lubrication chart. JCB 10W/30 Multigrade should also be used for the first 100 hours operation whenever a new or reconditioned engine is fitted to the machine. After the first 100 hours operation, it is essential that the 10W/30 oil is replaced by the lubricant recommended below.

ITEM	CAPACITY Litres (Gal)(US Gal)	FLUID / LUBRICANT	INTERNATIONAL SPECIFICATION
Fuel Tank	19 (4.17)(5.0)	Diesel Oil (See Types of Fuel)	ASTM D975-66T Nos. 1D, 2D
Engine (Oil)			
First 100 hours only	3.5 (0.77)(0.924)	**JCB 10W/30 Multigrade** above -15°C (above 5°F) **5W/20** -15°C to -25°C (5°F to -13°F)	MIL-L-46152, API CC/SF API CC/SE (recommended)
After first 100 hours		**JCB 15W/40 Multigrade** above -10°C (above 14°F) **5W/20** -10°C to -25°C (14°F to -13°F)	SAE15W/40, MIL-L-46152B, AP1 CD/SE MIL-L-2104D API CC/SE or API CD/SE
Engine (Coolant)			
Canopy Cab	4.5 (1.0)(1.2) 5.0 (1.1)(1.32)	**JCB Universal Antifreeze/water** (See **Coolant Mixtures**)	ASTM D3306-74
Track Gearbox. Single/Two Speed (each)	0.3 (0.07)(0.084)	**JCB SAE 30 Engine Oil** (NOT Multigrade)	API CD/SF, MIL-L-46152 MIL-L-2104D
Slew Gearbox (Lubrication) 8014/8015/8016 8017/8016		**From Hydraulic System**	
Track Idler Wheels	0.025 (0.006)(.007)	**JCB HD90 Gear Oil**	API-GL-5, MIL-L-2105D
Track Rollers	0.025 (0.006)(0.007)	**JCB HD90 Gear Oil**	API-GL-5, MIL-L-2105D
Hydraulic System		**JCB Special Hydraulic fluid**	
8014/8015 8016/8017/8018	29 (7.39)(7.7) 31 (6.8)(8.2)	Below -10°C (14°F) **JCB Hydraulic Fluid 46** -10°C to 40°C (14°F to 104°F) **JCB Hydraulic Fluid 68** Over 40°C (104°F)	
Hydraulic Tank 8014/5/6/7/8	24 (5.2)(6.3)		
Slew Ring			
Bearings Gear Teeth		**JCB MPL Grease** **JCB Slew Pinion Grease ##**	Lithium based, No. 2 consistency.
All Other Grease Points		**JCB MPL Grease**	Lithium based, No. 2 consistency.

WARNING

JCB Slew Pinion Grease is harmful. It contains bitumen compounds 2811 with possible risks of irreversible effects. Excessive contact may lead to dermatitis or skin cancer. Always use a barrier cream or wear gloves.
Wash contaminated skin thoroughly with soap and water. In the event of contact with the eye, immediately wash with plenty of water and seek medical advice.

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Track Motors and Slew Motor

Slew Motors

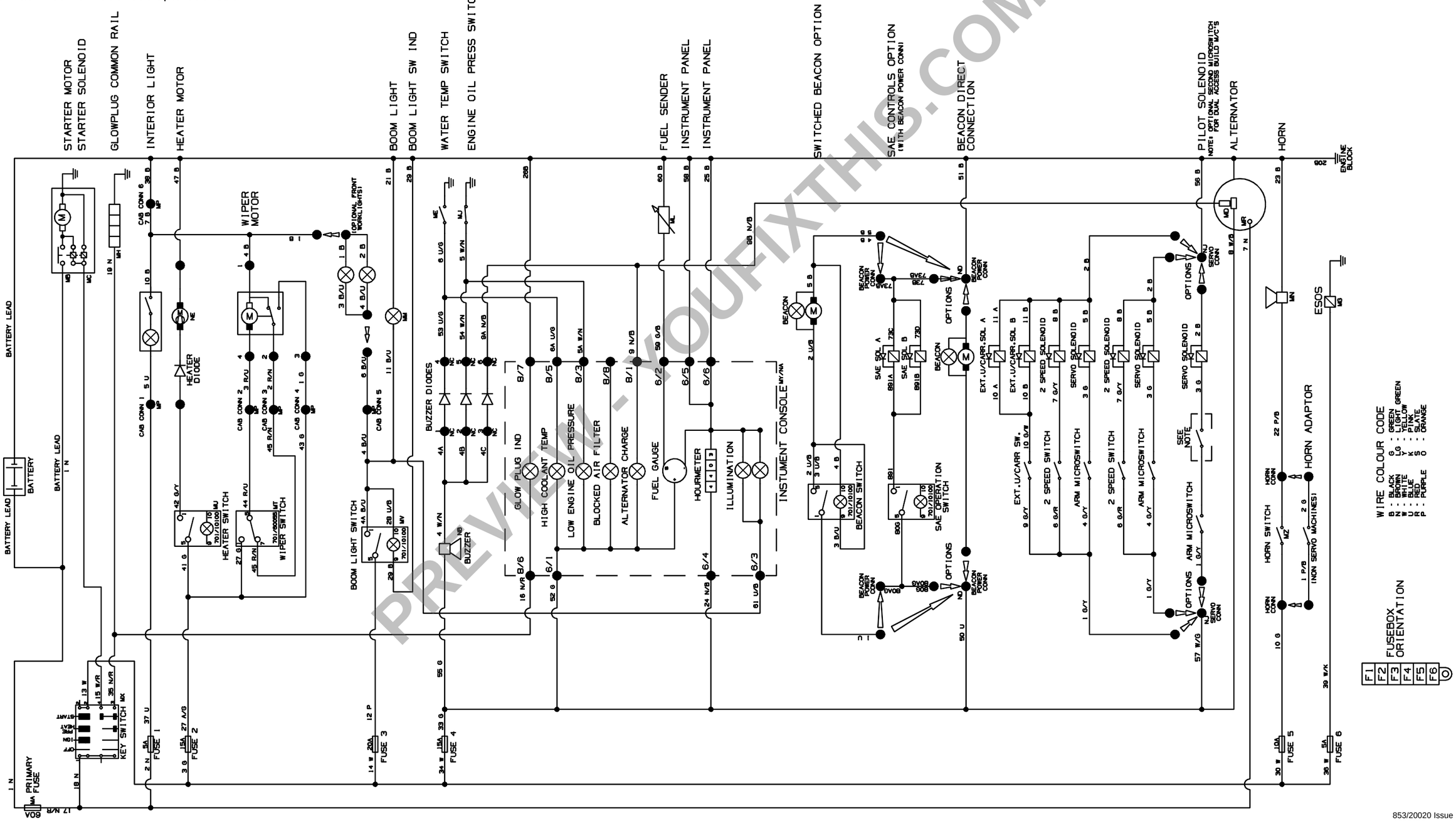
Fault		Probable Cause		Action
1	Motor fails to rotate	**1**	Abnormal wear or seizure of sliding parts.	Replace worn parts. Repair sliding surfaces or replace rotating parts sub-assembly.
		2	Damage to internal parts.	Replace rotating parts sub-assembly or motor assembly.
		3	Plunger of counterbalance valve sticking.	
			3.1 Overtightening.	Apply correct torque.
			3.2 Dirt in clearances.	Clean, repair scratching as necessary.
		4	Relief valve pressure too low.	
			4.1 Dirt in poppet seat or orifice.	Clean and/or replace relief valve sub-assembly
		5	Check valve sticking.	
			5.1 Dirt in valve seat, clearances or orifice.	Clean and/or replace plunger sub-assembly.
2	Low or uneven speed of rotation	**1**	Wear of sliding parts.	Repair sliding surfaces or replace rotating parts as necessary.
		2	Wear of bearings and/or splined parts.	Replace bearings and/or shaft. Replace rotating parts sub-assembly.
3	Creep speed high.	**1**	Increase of clearance between piston and bores.	Strip, check clearances, replace rotating parts sub-assembly as necessary.
		2	Damage to sliding surfaces.	Repair sliding surfaces or replace valve plate and/or rotating parts sub-assembly.
		3	Increase of clearance between:	Replace parts as necessary.
			3.1 Valve body and plunger.	
			3.2 Valve body and shockless piston.	

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*Electrical Schematic

8014 machines from 0791000
8015 machines from 0730800 upto 0894199
8016 machines from 0728750
8017 machines from 0800000 upto 0800999
8018 machines from 0801000 upto 0801999



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*The illustrations and text are representative of a Single Acting Circuit (980/88804). They have been included in order to give an overall view and understanding of the circuit.

Special fitting instructions for every kit are supplied with the kit. These instructions are definative and must be followed.

⚠ WARNING

Hydraulic Fluid

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help immediately.

INT-3-1-10/1

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

⚠ WARNING

Electrical Circuits

When working on the machine electrical system always disconnect the battery. Understand the electrical circuit before connecting or disconnecting an electrical component. A wrong connection can cause injury and/or damage.

⚠ WARNING

Welding

When welding on the machine always disconnect the battery and the alternator. Always connect the earth clamp to the component being welded to avoid damage to pivot pins and bushes.

⚠ CAUTION

Cleanliness - Hydraulic Systems

Hydraulic components are susceptible to damage if the hydraulic system is not kept free from debris. Ensure that open hoses and ports are protected from the ingress of dirt, grit and other debris such as swarf.

Making the Machine Ready

Ensure that the machine is as safe as possible to work on. Carry out the the steps below. Refer to the machine Operator Handbook for full details about procedures for the applicable machine.

1 Park the machine on firm level ground.

2 Remove any attachment.

3 Apply the parking brake (if fitted) and, or chock the wheels. If the machine is raised from the ground make sure it is securely chocked. **NEVER WORK UNDER A MACHINE RAISED ON STABILISERS OR JACKS**.

4 Make the loader arms, boom and dipper safe as applicable. Lower to the ground or, raise and fit the applicable safety strut.

5 Stop the engine and remove the starter key.

6 Operate the controls several times to release any trapped hydraulic pressure. Slowly release the hydraulic tank filler cap.

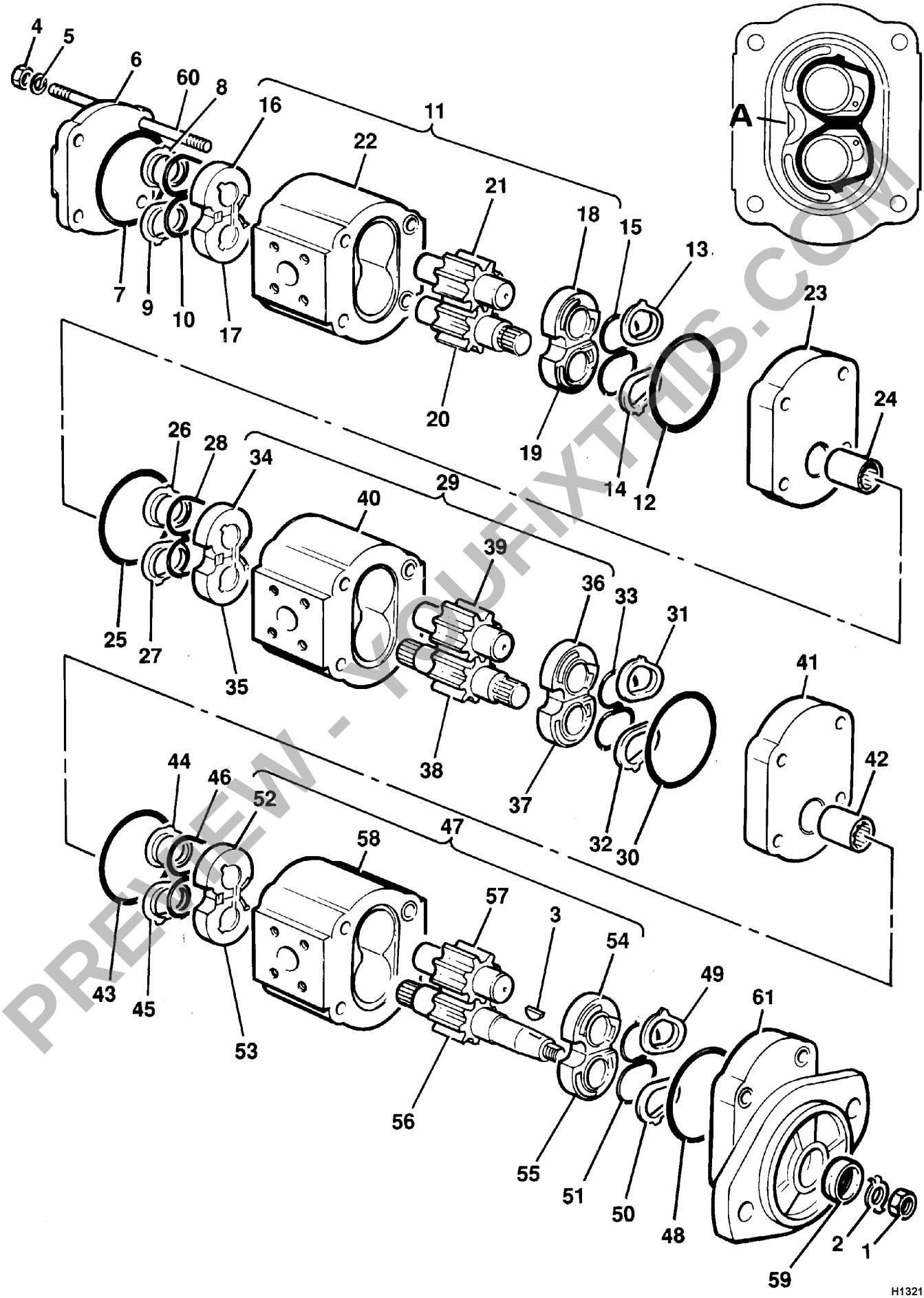
7 Disconnect the battery.

8 Allow the machine hydraulics and engine cooling system to cool before commencing work.

9 Disconnect the alternator and electronic control units (if fitted) if arc welding is to be carried out on the machine.

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* Introduction - Zinc Plated Fasteners and Dacromet Fasteners

JCB Mini Excavators are assembled using an improved type of corrosion resistant finish. This type of finish is called Dacromet and replaces the original Zinc and Yellow plating used on earlier machines.

The two types of fasteners can be readily identified by colour and part number suffix as follows:

Fastener Type	Colour	Part Number
Zinc and Yellow	Golden finish	'Z' (e.g. 1315/3712Z)
Dacromet	Mottled silver finish	'D' (e.g. 1315/3712D)

Note: As the Dacromet fasteners have a lower torque setting than the Zinc and Yellow fasteners, the torque figures used must be relevant to the type of fasteners.

Note: A Dacromet bolt should not be used in conjunction with a Zinc and Yellow plated nut, as this could change the torque characteristics of the torque settings further. For the same reason, a Dacromet nut should not be used in conjunction with a Zinc and Yellow plated bolt.

Note: All bolts used on JCB machines are high tensile and must not be replaced by bolts of a lesser tensile specification.

Only use the following when no setting is specified in the text of the manual.

Metric Grade 8.8 Bolts

Bolt size		Zinc Plated Fasteners Torque Settings			Dacromet Fasteners Torque Settings		
Diameter mm	Hexagon (A/F) mm	Nm	kgf m	lbf ft	Nm	kgf m	lbf ft
M6 x 1.0	10	12	1.2	9	9	0.9	7
M8 x 1.25	13	28	3.0	21	22.5	2.3	17
M10 x 1.5	17	56	5.7	42	47.5	4.8	35
M12 x 1.75	19	98	10	72	80	8.2	59
M14 x 2	22				133	13.6	98
M16 x 2	24	244	25	180	200	20.4	148
M18 x 2.5	27	350	36	258	278	28.4	205
M20 x 2.5	30	476	48	352	392	40	289
M24 x 3	36	822	84	607	675	69	498
M30 x 3.5	46	1633	166	1205	1348	138	994
M36 x 4	55	2854	291	2105			

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Battery

Negative Earth Electrical System

1 Always connect the negative terminal of the battery to **EARTH.**
2 When connecting the battery, connect the earth lead **LAST.**
3 When disconnecting the battery, disconnect the earth lead **FIRST.**

Inspection

Check the level of the electrolyte (low maintenance). Make sure that the terminals are tight and clean. Coat them with petroleum jelly to prevent corrosion. Ensure the battery vent tube is correctly fitted.

Testing the Specific Gravity

The specific gravity of the electrolyte gives an indication of the state of charge of the battery. Readings should be taken using a hydrometer, when the electrolyte temperature is 15°C (60°F). If the battery has recently been charged, wait approximately one hour to dissipate the 'surface charge' before testing.

Readings should be as the table and should not vary between cells by more than 0.04. A greater variation indicates an internal fault on that particular cell.

If the electrolyte temperature is other than 15°C (60°F) a 'correction factor' must be applied to the reading obtained. Add 0.0007 per 1°C higher than 15°C, and subtract the same if the temperature is lower.

Specific Gravity (20°C)	Quantity of Electricity Discharged (%)	Residual Capacity (%)
1.260	0	100 **(**fully charged)
1.210	25	75
1.150	50	50
1.110	75	25
1.060	100	0 (fully discharged)

High Rate Discharge Test

This test is to determine the electrical condition of the battery and to give an indication of the remaining useful 'life'

Before testing, ensure that the battery is at least 75% charged.

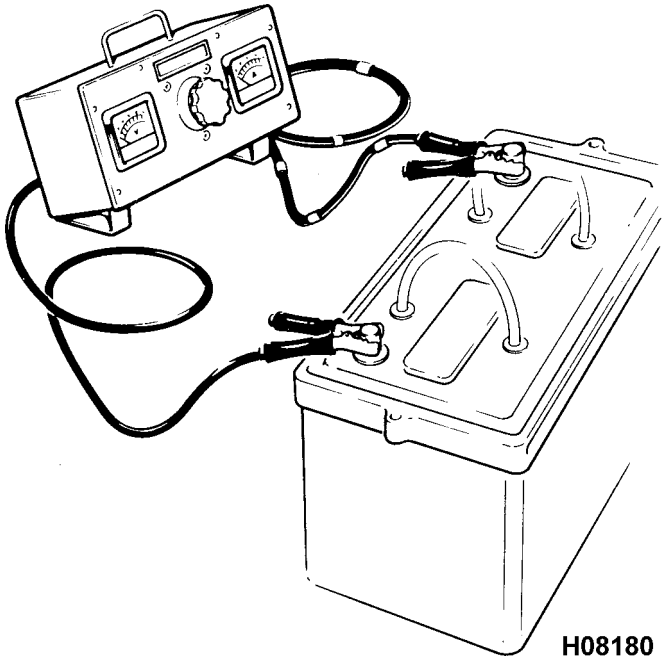
1 Disconnect both terminals of the battery.

2 Adjust the discharge tester to 3 x amp/hour rating of the battery.

3 Connect the tester to the battery terminals, observing the polarity.

4 Note the voltmeter reading. The battery should be capable of maintaining at least 9 volts for 10 seconds. A rapidly falling voltage indicates a fault in one or more of the battery cells.

Note: *Do not leave the discharge tester connected to the battery for longer than is necessary to complete the test.*



H08180

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Track Motors and Slew Motor

Mating Parts	Nominal Clearance	Allowable Clearance
Cylinder block bore and piston.	0.02 mm	0.05 mm
Valve body bore and plunger.	0.015 mm	0.03 mm
Valve body bore and shockless piston	0.015 mm	0.03 mm

		4	Dirt in valve seat of relief valve and/or check valve.	Strip and clean
4	Oil leaks from seals.	**1**	Damage to seals	Replace oil seals and/or 'O' rings.

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VOLTAGE REGULATOR OPERATION

Key on - Engine off (see fig. 1)

Indicator Lamp Circuit

When the starter switch is turned to the ON position, battery current will flow from the switch through the indicator lamp to the L terminal of the regulator. In the regulator, the current flows through the closed points P5 and P6 to the regulator E terminal. From the E terminal the current flows to earth at the alternator. When the current reaches earth, the circuit is complete and the charge indicator lamp will illuminate.

Field Circuit

When the starter switch is turned to the ON position, battery current will flow from the switch to the IG terminal of the regulator. In the regulator, the current flows through the closed points Pl and P2 to the regulator F terminal. From this terminal the current flows to the alternator F terminal which is the battery side of the rotor field coil. It is the current flowing from the F terminal through the rotor coil to earth which provides the initial magnetic field needed by the alternator before it can begin producing its own current.

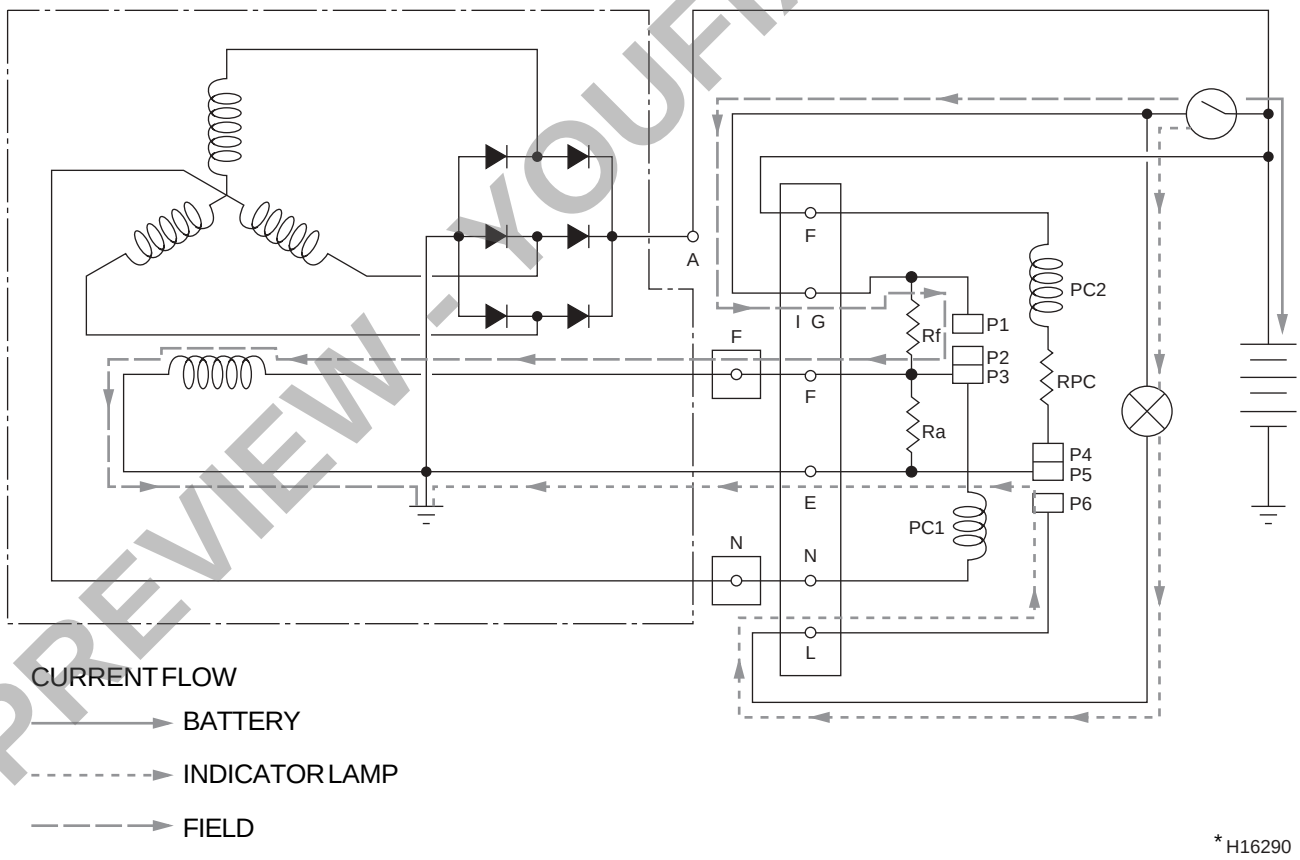


Figure 1
Alternator - Regulator Circuit
Key ON - Engine Off

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