

# INDEX

## 14C Dozer With 8205

### SERVICE MANUAL SET

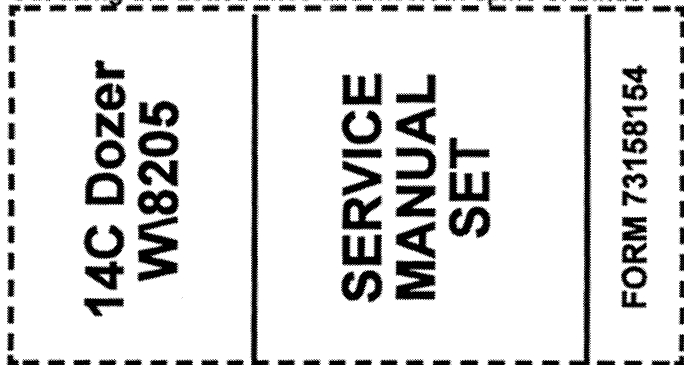
### FORM NO. 73158154

Service manual set is arranged in the following order	Individual manuals are also available in translation in form numbers listed below
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Service Manuals	English Form No.	Español (Spanish)	Français (French)	Italiano (Italian)	Deutsch (German)
Engine.....	60406243				
Engine Related.....	73153736				
Transmission.....	73153737				
Steering Clutches & Brakes.....	73153738				
Fianal Drives.....	73153738				
Undercarriage.....	60406290				
Cab.....					
Hydrualic.....	60406290				
Electrical.....	60406381				
Binder.....	73155403				

The following additional Service Manuals, in English, are not included in the Manual Set, but may be ordered from a Fiatallis representative:

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## 2.2.2 14-C DOZER

For 14-C dozers, the oil pan cannot be removed with the engine on the machine. Remove engine from machine in order to remove oil pan.

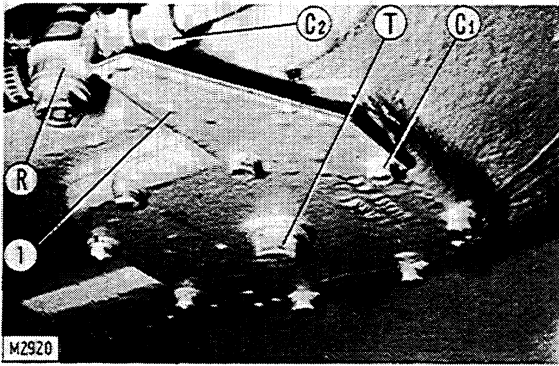


Fig. 6 - Bottom view of oil pan on S15B excavator.

C<sub>1</sub>, Capscrews. - C<sub>2</sub>, Connector nut. - R, Coolant drain tap. - T, Engine oil drain plug. - 1, Drain tap bracket.

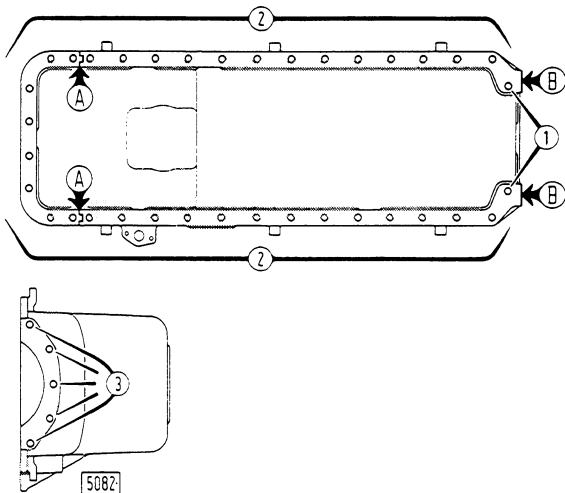


Fig. 7 - Engine oil pan tightening diagram (See instructions in para. 2.2.1).

## 2.2.3 S15B EXCAVATOR

Remove oil pan as follows:

- Rotate superstructure 90° with respect to direction of forward travel.
- Remove screws (C<sub>1</sub>) and detach drain tap bracket (1, fig. 6).
- Loosen nut (C<sub>2</sub>) and hose clip.
- Turn bracket to free oil pan.
- Loosen all screws securing oil pan to engine block and remove pan.

To install oil pan follow the procedure described for FL 14-C crawler loader (paragraph 2.2.1).

## 2.3 CYLINDER HEADS

### 2.3.1 CYLINDER HEAD REMOVAL

Do not remove cylinder heads when the engine is warm, as this could cause warping. To remove, proceed as follows:

- Remove exhaust manifold.
- Disconnect and remove engine temperature gauge tube from rear of water outlet manifold.
- Remove screws securing intake manifold to cylinder heads and remove manifold.
- Disconnect and remove radiator upper hose. Remove capscrews and lockwashers securing water outlet manifold to cylinder heads and remove manifold and thermostat housing.
- Remove capscrews securing valve rocker covers to cylinder heads and remove covers.
- Disconnect and remove fuel leak-off lines. Disconnect lines from injection pump and nozzle holders.
- Cover all fuel openings to prevent entrance of dirt. Remove nozzle holder assemblies from cylinder heads to prevent possible damage to nozzles after head is removed.
- Drain cooling system.
- Remove or disconnect all components and/or assemblies necessary for access to the cylinder heads, such as engine hood, air cleaner, exhaust system, etc.

**WARNING**

Always wear safety glasses with side shield when machining or grinding metal, or performing any task where particles might fly.

**Rocker arm installation**

Assemble rocker arm shaft components as shown in fig. 22, noting the points below:

- Ensure that oil holes and passages (8, 10 and 11) are clean.
- Position rocker arm shafts so that reference mark (9) machined in shaft lines up with the stud hole drilled in center bracket (4) to ensure correct alignment of oil holes (10 and 11).
- Thickness of spring plates (6) should be 1.5 mm or 0.059 in.
- End washers (7) are available in three different thicknesses, namely 1.5 mm, 2 mm and 2.5 mm (0.06 in, 0.081 and 0.1 in). Use the most suitable thickness to reduce end float of the end rocker arms to a minimum.

**3.3.2 VALVE LIFTERS**

Valve lifters may be removed with the engine on the machine and cylinder heads removed.

Check that surface in contact with cam is in good condition. Any score marks may be remedied using a very fine abrasive stone.

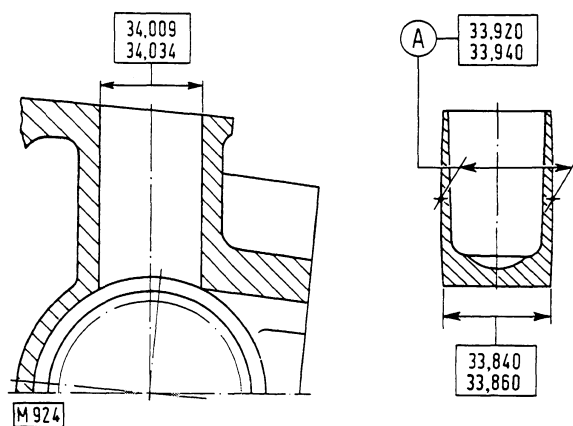


Fig. 25 - Standard valve lifter and seat dimensions.  
A. Maximum O.D., measured at valve lifter centerline.

Check working clearance. If clearance exceeds 0.2 mm or 0.007 in, install new oversize valve lifters and open out associated housing bores in cylinder block (see data table, section 11).

Lubricate valve lifters with clean oil before installing.

**3.4 VALVE LASH ADJUSTMENT**

For valve lash adjustment, use wrench 75290886 (M, fig. 26) and a suitable feeler gauge (R). The correct clearance is 0.30 mm or 0.012 in for intake valves and 0.40 mm or 0.016 in for exhaust valves.

Cylinder matching for valve lash adjustment is 1-6, 2-5 and 3-4.

Bring the valves of the first cylinder of each pair to a condition of balance to adjust the valves of the second cylinder of the same pair and vice versa.

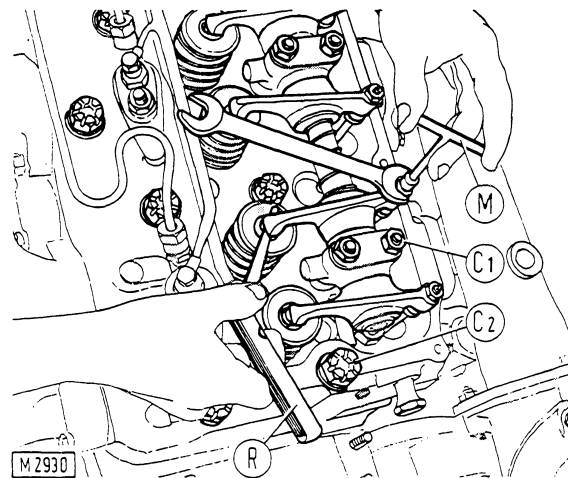
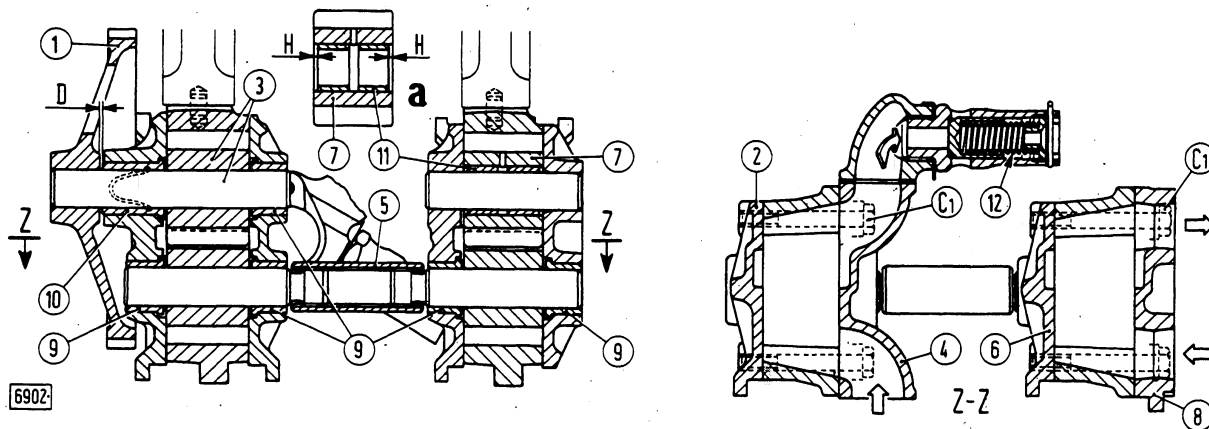


Fig. 26 - Checking and adjusting valve lash.  
C<sub>1</sub>. Rocker shaft bracket nut. - C<sub>2</sub>. Self-locking cylinder head cap-screws. - M. Wrench 75290886. - R. Feeler gauge.





**Fig. 54 - Oil pump and pressure relief valve sections.**

a. Bushing assembly on scavenging pump driven gear. - C<sub>1</sub>. Cap screws. - D. 0.50 to 1.50 mm or 0.02 to 0.058 in - clearance between driving gear and bushing (10). - H. = 0.40 to 0.60 mm or 0.015 to 0.023 in - bushing stand-in. - 1. Pump driving gear. - 2. Pressure pump front cover. - 3. Pressure pump drive gear. - 4. Pressure pump rear cover. - 5. Coupling sleeve. - 6. Scavenging pump front cover. - 7. Scavenging pump driven gear. - 8. Scavenging pump rear cover. - 9 and 10. Cover bushings. - 11. Scavenging pump driven gear bushing. - 12. Pressure relief valve spring.

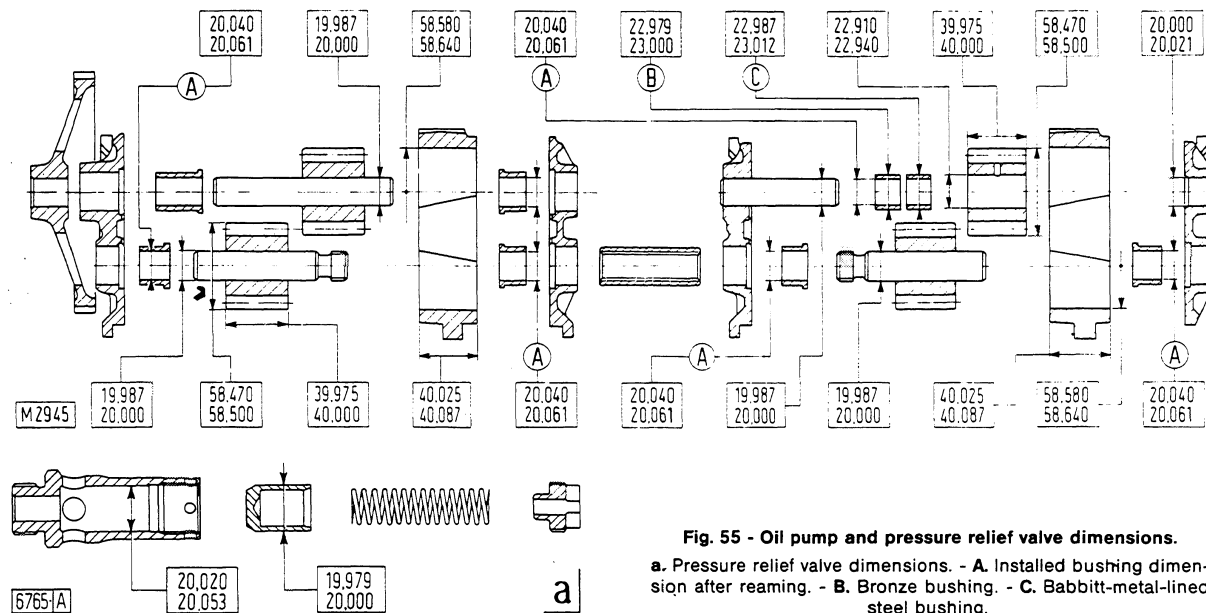
An oil passage through the crankshaft provides for crankshaft bearing lubrication.

The connecting rods are rifle-drilled for piston pin lubrication. Oil holes in the connecting rod small end convey oil spray to the underside of the piston head for cooling purposes.

## 6.2 OIL PUMPS

To remove oil pumps, take off oil pan, detach suction and discharge pipes and remove pump capscrews (C<sub>1</sub>, fig. 53).

To disassemble pumps, remove cap screws (C<sub>1</sub>, fig. 54).



**Fig. 55 - Oil pump and pressure relief valve dimensions.**

a. Pressure relief valve dimensions. - A. Installed bushing dimension after reaming. - B. Bronze bushing. - C. Babbitt-metal-lined steel bushing.

## 7.4 THERMOSTAT

The two thermostats (fig. 71) are positioned side-by-side in a housing at the front of the water outlet manifold. To remove thermostats, detach thermostat housing cover (fig. 70).

The thermostats have a fixed setting and thus need no adjustment.

To test the thermostats, submerge in water at room temperature. Gradually heat the water (above 60°C or 140°F, the rate of temperature increase should be 1°C or 1.8°F per minute).

Under the above conditions, the settings for both thermostats should be as follows:

- Opening temperature (equivalent to 0.10 mm or 0.004 in valve displacement) 77° - 81°C or 170° - 176°F.
- Maximum valve displacement at 94°C or 200°F - 7.5 mm or 0.29 in min.

## 7.5 WATER TEMPERATURE GAUGE

The coloured gauge scale is divided into three sections as follows (accuracy  $\pm 4^\circ\text{C}$  or  $7^\circ\text{F}$ ):

- White: 40° - 75°C or 104 - 167°F.
- Green: 75 - 108°C or 167 - 225°F.
- Red: 108 - 118°C or 225 - 240°F.

In normal operating conditions, the pointer should lie over the green sector.

To test the water temperature gauge, submerge the sending unit in hot water and compare the gauge reading with a master thermometer.

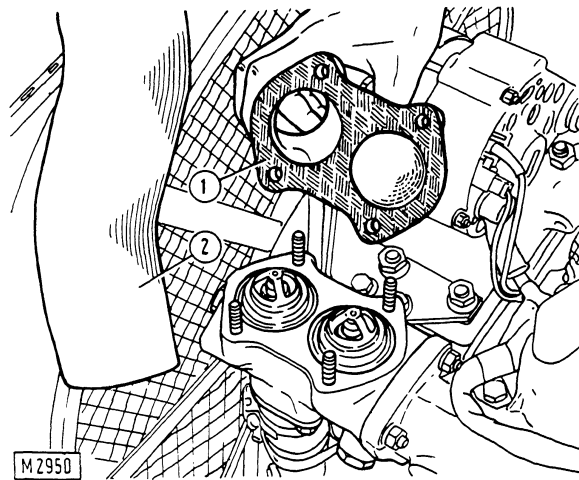


Fig. 70 - Removing or installing thermostats.  
1. Gasket. - 2. Radiator inlet elbow.

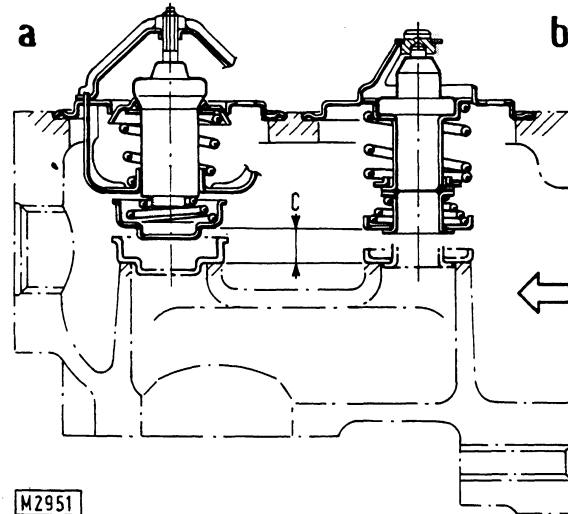


Fig. 71 - Section through bellow-type thermostat.

Note - Arrows show direction of water flow from cylinder heads.  
a.b. Alternative thermostats. - C. = 7.5 mm or 0.29 in. Maximum valve displacement.

## 7.6 FAN

Check that blades are not bent as shown in fig. 72. Bent blades may sometimes be straightened using a fork lever, provided that blade curvature or strength of material is not altered.

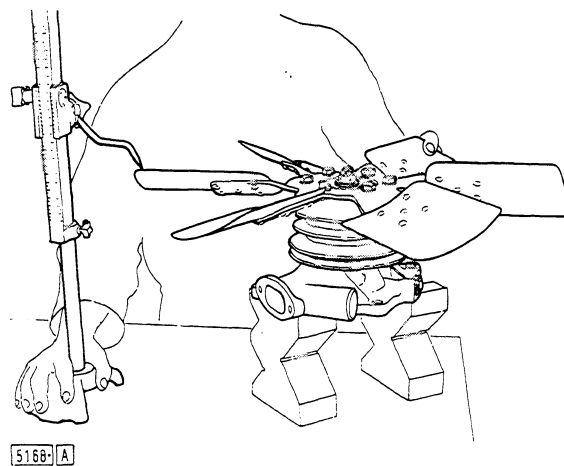


Fig. 72 - Checking for bent fan blades using a surface gauge (maximum bend allowance 2 mm or 0.078 in).

Note - Fig. shows fan installed on class 8205.02.575 engines.

TROUBLE	CAUSE	REMEDY
	<ul style="list-style-type: none"> <li>8. Water pump inoperative.</li> <li>9. Leaky radiator cap.</li> <li>10. Converter or transmission overheating oil and hence water.</li> <li>11. Insufficient engine lubrication.</li> <li>12. Ruptured engine oil heat exchanger (oil in coolant).</li> <li>13. Use of wrong gear.</li> <li>14. Cylinder heads or air compressor cracked.</li> <li>15. Engine block cracked.</li> </ul>	<ul style="list-style-type: none"> <li>8. Repair or replace water pump.</li> <li>9. Replace.</li> <li>10. Check operation of affected parts.</li> <li>11. Check that oil level and pressure are normal.</li> <li>12. Replace heat exchanger.</li> <li>13. Use a lower gear.</li> <li>14. Replace cylinder heads.</li> <li>15. Replace engine block.</li> </ul>
13. Coolant temperature too low.	<ul style="list-style-type: none"> <li>1. Thermostats stuck in open position.</li> <li>2. Operating in extremely cold weather.</li> </ul>	<ul style="list-style-type: none"> <li>1. Replace.</li> <li>2. Provide covers for radiator and engine side openings.</li> </ul>
14. Low lubricating oil pressure.	<ul style="list-style-type: none"> <li>1. Insufficient oil in crankcase.</li> <li>2. Oil pressure gauge inoperative.</li> <li>3. Oil pump inoperative or excessively worn.</li> <li>4. Oil lines loose or broken inside crankcase.</li> <li>5. Oil pressure relief valve stuck in open position.</li> <li>6. Improper lubricant.</li> <li>7. Main and/or big end bearings worn.</li> </ul>	<ul style="list-style-type: none"> <li>1. Top up to proper level.</li> <li>2. Replace.</li> <li>3. Repair or replace pump.</li> <li>4. Repair or replace as necessary.</li> <li>5. Adjust valve. Replace if necessary.</li> <li>6. Replace with specified lubricant.</li> <li>7. Replace bearings.</li> </ul>

Item	Thread	Torque (°)	
		daNm	lb. ft.
<b>Camshaft (continued)</b>			
Camshaft gear self-locking capscrews . . . . .	10 x 1.25	6	43
Camshaft thrust plate capscrews . . . . .	10 x 1.25	8	58
Rocker arm shaft support stud nuts . . . . .	12 x 1.5	9	65
<b>Injection</b>			
Fuel injection pump base to cylinder block self-locking capscrews . . . . .	12 x 1.25	10	72
Injection pump coupling capscrew . . . . .	10 x 1.25	6	43
Injection pump shaft coupling nuts . . . . .	8 x 1.25	3	22
Injector to cylinder head stud nuts . . . . .	10 x 1.25	5	35
<b>Lubrication</b>			
Oil pump covers to body self-locking capscrews . . . . .	8 x 1.25	3	22
Oil pressure regulating valve assembly . . . . .	22 x 1.5	8	58
Oil cooler pressure relief valve assembly . . . . .	24 x 1.5	12	87
Filters to oil cooler capscrews . . . . .	10 x 1.25	6	43
<b>Cooling System</b>			
Fan hub capscrew . . . . .	10 x 1.25	10	72
Water pump shaft nut . . . . .	18 x 1.5	5	36
Cylinder block to water pump body stud nuts . . . . .	8 x 1.25	24	17
Pump front bearing lock ring (early type) (C <sub>3</sub> , fig. 64) (*) . . . . .	18 x 1.5	26	188
Nut (new type) (*) . . . . .	18 x 1.5	28	202
Water pump pulley nut (**) . . . . .	10 x 1.5	3	22

(\*) Lubricate with engine oil.

(\*) For class 8205.02.531...engines

(\*\*) For class 8205.02.575 engines

<u>AIR/FUEL SYSTEM</u>	mm	in
<u>Air Filter</u>		
Type .....	DONALDSON EGB 09 - 0010	
<u>Fuel Injection</u>		
Fuel Injection Pump (Bosch) .....	in line piston type	
Type .....	PE 6P 110 A 720 RV 14264 with solenoid-operated, automatic cold starting aid.	
Rotation (seen from drive end) .....	clockwise	
Firing order .....	1 - 5 - 3 - 6 - 2 - 4	
Camshaft end play .....	0,02	0.0008
Piston stroke from BDC to port opening ....	2,05 ± 0,05	0.08 ± 0.002
Fuel injection advance on flywheel: beginning of injection in cylinder No. 1 during compression stroke .....	23°+ or - 1	
<u>Injectors</u> .....	4 hole nozzles	
Nozzle body : FIAT .....	KB 108 S6 F 13	
BOSCH .....	KBL 108S 178/4	
Nozzles : FIAT .....	DLL 160 S 65 F	
BOSCH .....	DLLA 160 S 699	
Nozzle orifice diameter .....	0,38	0.015
Release pressure .....	200 - 208 bar	2845 - 2958 psi
<u>Fuel pump</u> .....	Piston type, camshaft driven	
Type .....	FP/K 22P5	
Fuel charging pressure .....	1.2 - 1.8 bar	17-25.7 psi
<u>Fuel injection automatic timing advance</u>		
Type .....	A 6/5 10 CD2	
Automatic advance begins (cut-in) at .....	500 RPM	
Maximum automatic advance at .....	1000 RPM	
Maximum angle change at high idle .....	6	
<u>Speed Governor</u> .....	mechanical flyweights, operating over the full RPM RANGE	
Type .....	RQV 425 - 1000 PA	

Study SAFETY RULES in the front of this manual thoroughly for the protection of machine and safety of personnel

# SAFETY RULES

## GENERAL

Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling, or servicing machine.

Read and heed all machine-mounted safety signs before starting, operating, maintaining, fueling or servicing machine.

Machine-mounted safety signs have been color coded yellow with black border and lettering for WARNING and red with white border and lettering for DANGER points.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Keep head, body, limbs, hands and feet inside operator's compartment at all times to reduce exposure to hazards outside the operator's compartment.

Do not allow unauthorized personnel to operate, service or maintain this machine.

Always check work area for dangerous features. The following are examples of dangerous work areas: slopes, overhangs, timber, demolitions, fire, high walls, dropoff, backfills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

An operator must know the machine's capabilities. When working on slopes or near dropoffs be alert to avoid loose or soft conditions that could cause sudden tipping or loss of control.

Do not jump on or off machine. Keep two hands and one foot, or two feet and one hand, in contact with steps, grab rails and handles at all times.

Do not use controls or hoses as handholds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimize the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.

Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.

For your personal protection, do not attempt to climb on or off machine while machine is in motion.

Never leave the machine unattended with the engine running.

Always lock up machine when leaving it unattended. Return keys to authorized security. Heed all shutdown procedures of the Operation and Maintenance Instruction Manual. Always set the parking brake when leaving the machine for any reason.

Do not wear rings, wrist watches, jewelry, loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned, or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles, reflector vests, or respirators. Consult your employer for specific safety equipment requirements.

Do not carry loose objects in pockets that might fall unnoticed into open compartments.

Do not use machine to carry loose objects by means other than attachments for carrying such objects.

DO NOT CARRY RIDERS unless the machine is equipped for carrying people to reduce personal exposure to being thrown off.

Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of the shift.

Roll Over Protective Structures are required on wheel loaders, dozer tractors, track type loaders, graders and scrapers by local or national requirements. DO NOT operate this machine without a Roll over Protective Structure.

Do not operate a machine without a falling object protective structure (FOPS).

Do not operate this machine without a rear canopy screen when machine is equipped with rear mounted towing winch.

Seat belts are required to be provided with roll over protective structures or roll protection cabs by local or national regulations. Keep the safety belt fastened around you during operation.

Where noise exposure exceeds 90 dBA for 8 hours, wear authorized ear protective equipment per local or national requirements that apply.

Keep clutches and brakes on machine and attachments such as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the manufacturers at all times. DO NOT adjust machine with engine running except as specified.

Do not operate a machine with brakes out of adjustment. See the Operation and Maintenance Instruction Manual.

Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.

To move a disabled machine, use a trailer or low boy truck if available. If towing is necessary, provide warning signals as required by local rules and regulations and follow Operation and Maintenance Instruction Manual recommendations. Load and unload on a level area that gives full support to the trailer wheels. Use ramps of adequate strength, low angle and proper height. Keep trailer bed clean of clay, oil and all materials that become slippery. Tie machine down securely to truck or trailer bed and block tracks (or wheels) as required by the carrier.

To prevent entrapment in cabs or mounted enclosures, observe and know the mechanics of alternate exit routes.

On machines equipped with suction radiator fans, be sure to periodically check all engine exhaust parts for leaks as exhaust gases are dangerous to the operator. Keep a vent open to outside air at all times when operating within a closed cab.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers. Store containers in cool, well-ventilated place secure from unauthorized personnel. DO NOT PUNCTURE OR BURN CONTAINERS. Follow the recommendations of the manufacturer for storage and disposal.

Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.

Full power shift transmission with three forward and three reverse speeds obtained through five multipleplate hydraulically controlled clutch engagements. Single lever to the left of the operator.

Speed kph (mph)	I	II	III
Forward . . . . .	0-3.6 (0-2.2)	0-6 (0-3.7)	0-9.5 (0-5.9)
Reverse . . . . .	0-4.5 (0-2.8)	0-7.4 (0-4.6)	0-11.4 (0-7.1)

Safety lever device: when the lever is lowered to allow the operator to get in or out, puts the lever in neutral and opens the engine start circuit.  
 Pump with two pairs of gears for circulation and converter-transmission and scavenge pump.  
 Oil cooling by means of oil/water heat exchanger mounted on the engine.

**TRANSMISSION (Clutch)**

Twin-disc main clutch in oil bath, 14" dia. Hydraulic engagement synchronized with the transmission. Transmission: two forward and two reverse speeds by means of four clutch engagements (power-shift) controlled by a lever.  
 Mechanical reduction unit built into the two-range transmission (transfer-work) controlled by a lever.

Speed kph (mph)	I	II	III	IV
Forward . . . . .	2.3 (1.43)	3.5 (2.17)	5.2 (3.23)	8 (4.97)
Reverse . . . . .	2.8 (1.74)	4.2 (2.6)	6.4 (3.97)	9.5 (5.9)

Pump with two pairs of gears for transmission/clutch unit and for scavenging.  
 Cooling as on convert version.

**FINAL DRIVES AND SPROCKETS**

Double-reduction final drives with spur gears. Sprockets with replaceable crown gear in two sectors.

**STEERING CLUTCHES AND BRAKES**

Hydraulically controlled multipleplate clutches in oil bath and servo-assisted oil bath band brakes. Clutches controlled by a lever, brakes by two pedals. Parking brake controlled by a lever.

**UNDERCARRIAGE**

Track frames connected at front by an oscillating beam and at rear by the sprocket axle. Each frame is provided with 6 track rollers (3 double-flange and 3 single-flange) and 2 carrier rollers. Lubrication of rollers and idlers with long-life seals.  
 - No. of shoes (per track) . . . . . 39  
 - Shoe width (standard) . . . . . 500 mm (19.6 in)  
 - Ground contact area . . . . . 24,100 sq cm (3736 sq in)  
 - tension adjustment . . . . . hydraulic

**ELECTRIC SYSTEM**

Voltage . . . . . 24 V  
 Alternator: MARELLI A12M-124/24/26 with max. current 30 A; 9 diodes and built-in electronic voltage regulator.  
 Starter motor: MARELLI M1 30-8/24T VAR2, 8 kW.  
 Two batteries in series: MARELLI 12 V-143Ah-630A.  
 Front and rear lamps with rubber suspension, 115 mm dia.

**Instruments**

Warning lights with standardized symbols:  
 - engine oil filter clogging;  
 - transmission oil filter clogging;  
 - transmission oil low pressure;  
 - hydraulic system oil filter clogging;  
 - steering clutches oil filter clogging;  
 - fuel low pressure;  
 - alternator charge;  
 - lamps.  
 Gauges and indicators:  
 - fuel level;  
 - water temperature;  
 - engine oil pressure;  
 - transmission oil temperature;  
 - transmission oil pressure;  
 - electronic hour meter;  
 - air cleaner clogging indicator.

**EQUIPMENT**

**Angledozer attachment**

Blade dimensions 3890x960 mm (153x38 in)  
 Horizontal ±25°  
 Pitch ±10°  
 Tilt 5°30'

- Disconnect the radiator top hose.
  - Remove the complete exhaust muffler, the air pre-cleaner, the top hood, the fan grill and fan.
  - Free the converter (or main clutch) support housing from the lines.
  - Remove the complete dashboard frame after disconnecting all electric cables and indicator and instrument connections.
  - Remove the universal joint transmitting motion from the converter (or main clutch) to transmission.
  - Remove the engine-to-frame pad mounting nuts and apply hook 75295500 as shown in Fig. 2-1, positioning front and rear hook eyes as illustrated in details A and B.
- Lift the unit.

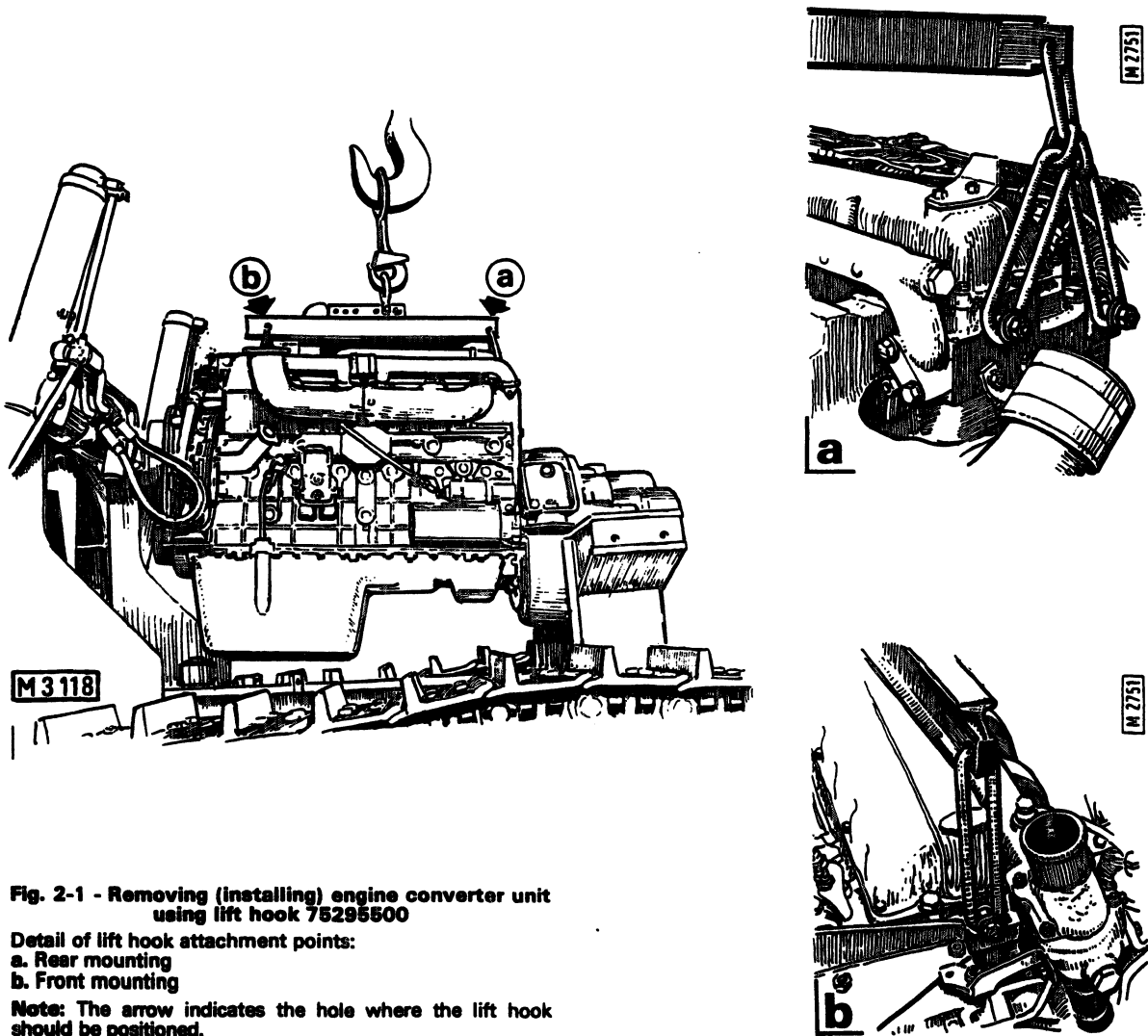
### 2.1.2 OVERHAULING THE ENGINE

Remove the oil pump and mount the engine with converter (or main clutch) on the rotating stand and follow the instructions given in the "ENGINE 8205 Service Manual", print No. 604.06.243.

### 2.1.3 INSTALLING THE ENGINE

Reverse the order of the removal operations:

- prepare lift hook 75295500 as shown in Fig. 2-1;
- remove the engine-converter (or main clutch) from the stand; install the sump; lift and install on the machine;
- tighten the pad-to-suspension support mounting nuts to a torque of 49 daNm (361 lb ft).



**Fig. 2-1 - Removing (Installing) engine converter unit using lift hook 75295500**

Detail of lift hook attachment points:

- a. Rear mounting
- b. Front mounting

**Note:** The arrow indicates the hole where the lift hook should be positioned.

# MACHINE THEFT AND VANDALISM

## ACTIONS TO DISCOURAGE THEFT AND VANDALISM

Immediately upon receipt of a new machine, record the serial numbers of the machine and of all major components and attachments. Keep this list up-to-date as components are replaced or exchanged on the machine. File these numbers in a safe location for fast retrieval.

Report all model, machine and component serial numbers to the insurance company at the time of purchase. If the numbers are noted on the insurance policy, make certain that the numbers are correct.

Remove keys from unattended machines.

Attach, secure, and lock all anti-vandalism and anti-theft devices on the machine.

Lock doors of cabs when not in use.

Immobilize machine by lowering the blade, bucket, or boom to the ground, removing the battery or removing a critical electrical or starting system component.

Discourage the thief! Inspect the gates and fences of the machinery storage yard or construction site. If possible, keep machines in well-lighted areas. Ask the law enforcement agency having local jurisdiction to make frequent checks around the storage or work sites, especially at night, during weekends, or on holidays.

Establish liaison with neighbors and ask them to watch equipment left at job sites and report suspicious activities to the applicable law enforcement agency.

Make frequent inventories of machines to promptly detect losses and vandalism.

## ACTIONS TO AID IN RECOVERY OF STOLEN MACHINES

Take photographs of the machine for identification purposes.

In the event of theft, immediately notify the law enforcement agency having jurisdiction. Provide the investigating officer with brand name, type of equipment, and serial numbers of the machine and of major attachments and components. It is helpful to show the investigating officer an operator's manual, photographs, and advertising to familiarize him with the appearance of the machine.

Report the theft to the insurance company. Provide the model and all serial numbers.

Report the model and serial numbers of the stolen machine to a dealer handling the respective line of equipment. Request that the dealer forward this same information to the equipment manufacturer.

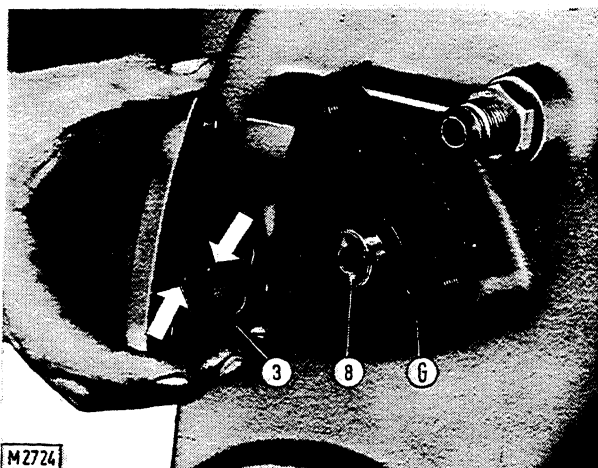
Ask the dealer to post a description of the stolen machine, including serial numbers, and to inform his sales and service personnel.

# 14-C crawler dozer

## Section 2 - TRANSMISSION

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**Fig. 30 - Assembly of high/intermediate/low/forward speed clutch valve spool caps.**

NOTE: The arrows point to control valve spool dowels.  
G. Gasket - 3. Cap - 8. Spool.

Install intermediate speed drum at front, lift driven gear (91) and retain in position with retaining ring (65):

- Insert thrust ring (49, Fig. 31).
- Place transmission case horizontal with the rear end facing upwards, securing high speed clutch unit during case rotation.
- Rebuild shaft (50) with oil catcher (58) installed as shown, bearing (56), thrust ring (94) and split rings (95).
- Insert the complete shaft from above.
- Put back transmission in the vertical position, rebuild intermediate speed clutch pack with the components positioned as in a (see Fig. 20), make sure that split rings (95, Fig. 31) are correctly fitted in the associated groove, tighten nut (C<sub>14</sub>) to the specified torque and peen in position.

To reassemble low/forward speed clutches and shaft:

- Install forward speed clutch drum (45, Fig. 14), reposition driven gear (44, Fig. 16) from inside and retain in position with retaining ring (41).
- Place transmission case horizontal with the rear end facing upwards.
- Install first thrust ring (43, Fig. 15) and idler gears (42 and 47).

- Insert from above shaft (34), second thrust plate (43) and case (30) together with complete drum (31) and case gasket.
- Rebuild forward (A) and low (L, Fig. 31) speed clutch packs, arranging the components as shown in Fig. 20.
- Mate outer end plate (20, Fig. 22) with splined hub, tighten low speed clutch nut to the torque of approximately 19 daNm (138 lb. ft.), retighten forward speed clutch nut (C<sub>14</sub>, Fig. 14) to the specified torque. Check low speed nut for correct tightening and peen in position.
- Support oil bowl (13), connect lines (11, 12 and 40) inserting rear end in the associated ports (S, Fig. 16) and secure the bowl inserting edge into the grooves in the piping.

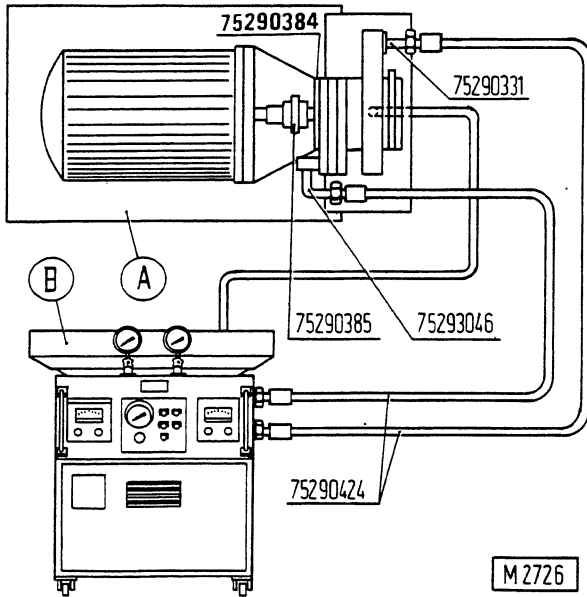
To reassemble transmission outer covers:

- Secure complete rear cover (8, Fig. 13) and speed clutch case cover (7), installing gaskets and reconnecting high speed lubrication and hydraulic lines.
- Reconnect tubes (9 and 10, Fig. 14) and secure lift hook 75291526 (A, Fig. 29) on front cover. Screw in guide pins 75291525 (B) on case and use one pin to install the high/low speed clutch lines into the associated cover ports.
- Reinstall left/right hand side covers (6, Fig. 13), inspection cover (2) and lube oil collector cover (1) after installing gaskets and making sure that cover (1) is complete with O-rings.
- Slide in control valve spools (8, Figs 26 and 30) of low/high/forward speed clutches, bearing in mind the instructions given previously.
- Reinstall gasket (G, Fig. 30) smeared with grease and caps (3, 4, 5 and 7, Figs. 13 and 30).

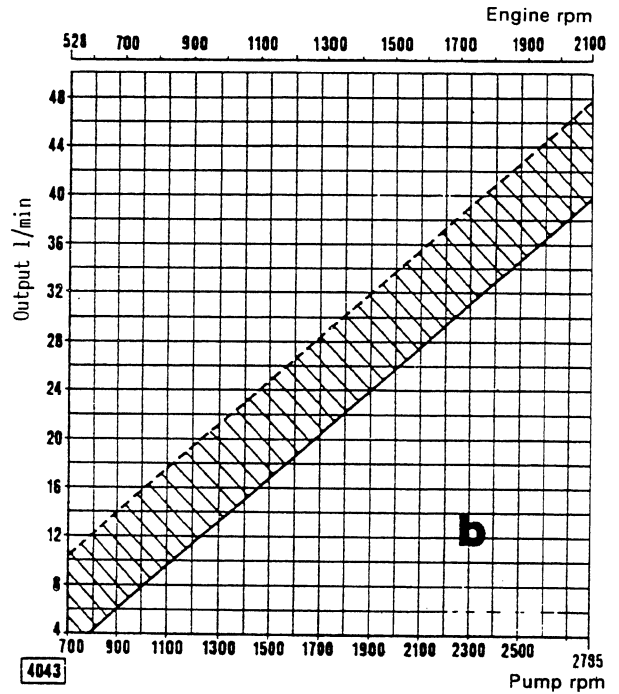
## 2.5 INSTALLATION

### WARNING

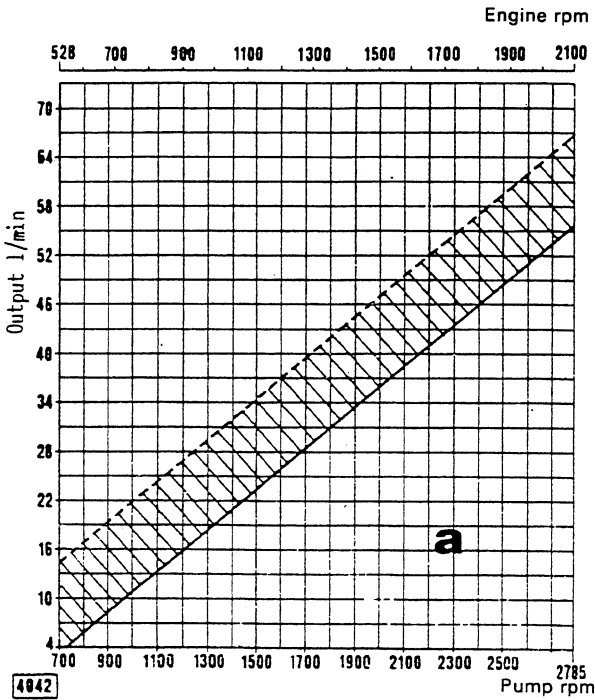
Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.



**Fig. 36 - Transmission/converter dual hydraulic pump output test set-up.**  
 A. Trolley-mounted electric motor 75291235 - B. Output tester 75295501.



**Fig. 38 - Dual pump converter section output chart.**

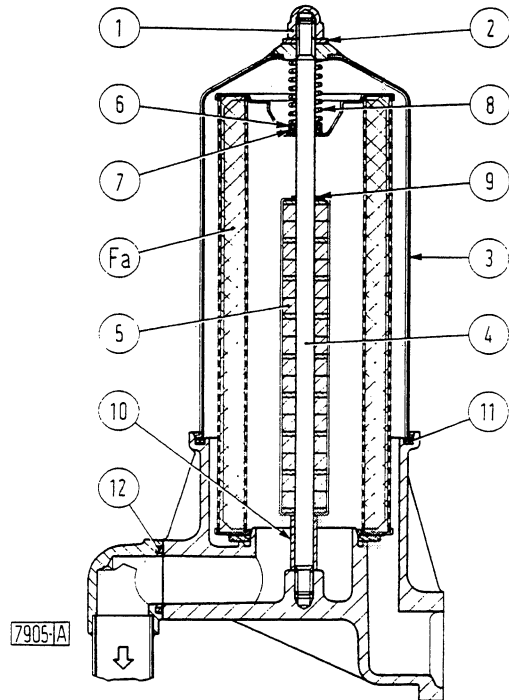


**Fig. 37 - Dual pump transmission/converter section output chart.**

Test pressure: 15 bar (213 psi) - Oil temperature: 55° to 65°C (131° to 149°F) - Pump drive ratio: 1.326 to 1.

NOTE: Output readings applicable to used pumps are acceptable if they fall within the dashed area of the chart; if near to, or lower than, the continuous line, overhaul or renew the pump.

Test conditions described under Fig. 37.



**Fig. 39 - Section through dual charging pump inlet filter.**

Fa. Steel wool filtering element - 1. Cover locknut - 2. Copper washer - 3. Cover - 4. Stud - 5. Magnetic rod - 6. Steel washer - 7. Rubber gasket - 8. Retaining spring - 9. Magnetic rod retaining ring - 10. Spacer - 11. Gasket - 12. O-ring.

Study SAFETY RULES in the front of this manual thoroughly for the protection of machine and safety of personnel

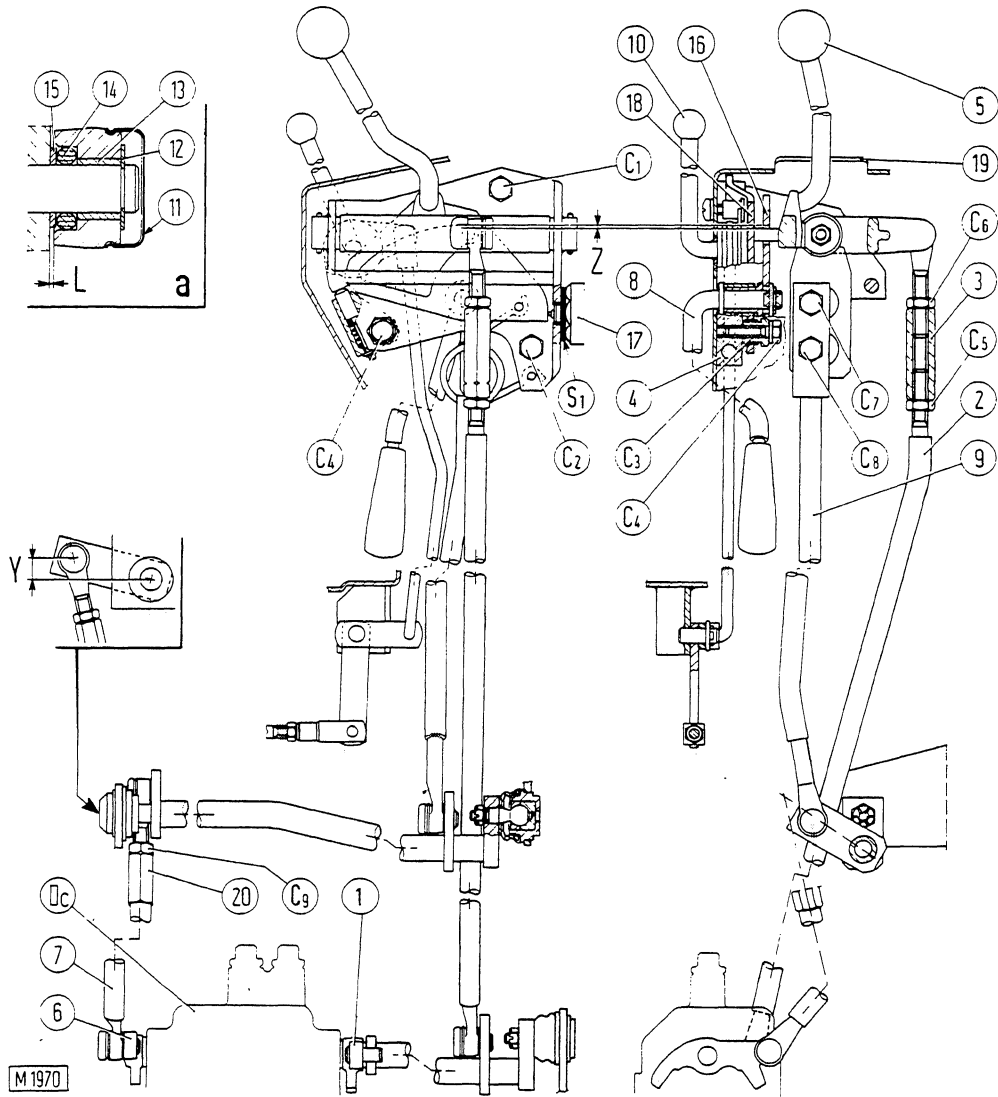


Fig. 50 - Transmission remote control schematics (new type).

a. Rod end articulation detail - C<sub>1</sub>/C<sub>2</sub>. Support capscrews - C<sub>3</sub>. Lever support adjuster screw - C<sub>4</sub>. Adjuster screw stop screw - C<sub>5</sub>/C<sub>6</sub>. Transmission actuating rod adjuster locknuts - C<sub>7</sub>/C<sub>8</sub>. Reverser actuating rod adjuster screws - C<sub>9</sub>. Reverser remote control link adjuster locknut - Dc. Transmission control valve - L = 0.5 mm (0.02 in) articulation assembly clearance - S<sub>1</sub>. Starter inhibitor switch shims - Y = 2.5 to 3.5 mm (0.10 to 0.14 in) reverser remote control link adjustment dimension - Z = 0.5 to 1.5 mm (0.02 to 0.06 in) clearance between pin and reverser lockplates - 1. Transmission remote control lever - 2. Transmission actuating link - 3. Transmission actuating link adjuster - 4. Lever support block - 5. Gear lever - 6. Reverser control valve lever - 7. Reverser remote control link - 8. Transmission safety lever (lockup in neutral) - 9. Reverser actuating rod - 10. Accelerator lever - 11. Snap cover - 12. Retaining ring - 13. Bushing - 14. O-ring - 15. Backing ring - 16. Reverser lockplate - 17. Starter inhibitor switch - 18. Gear lever support plate - 19. Seat left hand upright - 20. Reverser actuating rod adjuster.

Study SAFETY RULES in the front of this manual thoroughly for the protection of machine and safety of personnel



**FL 14-C, 14-C**





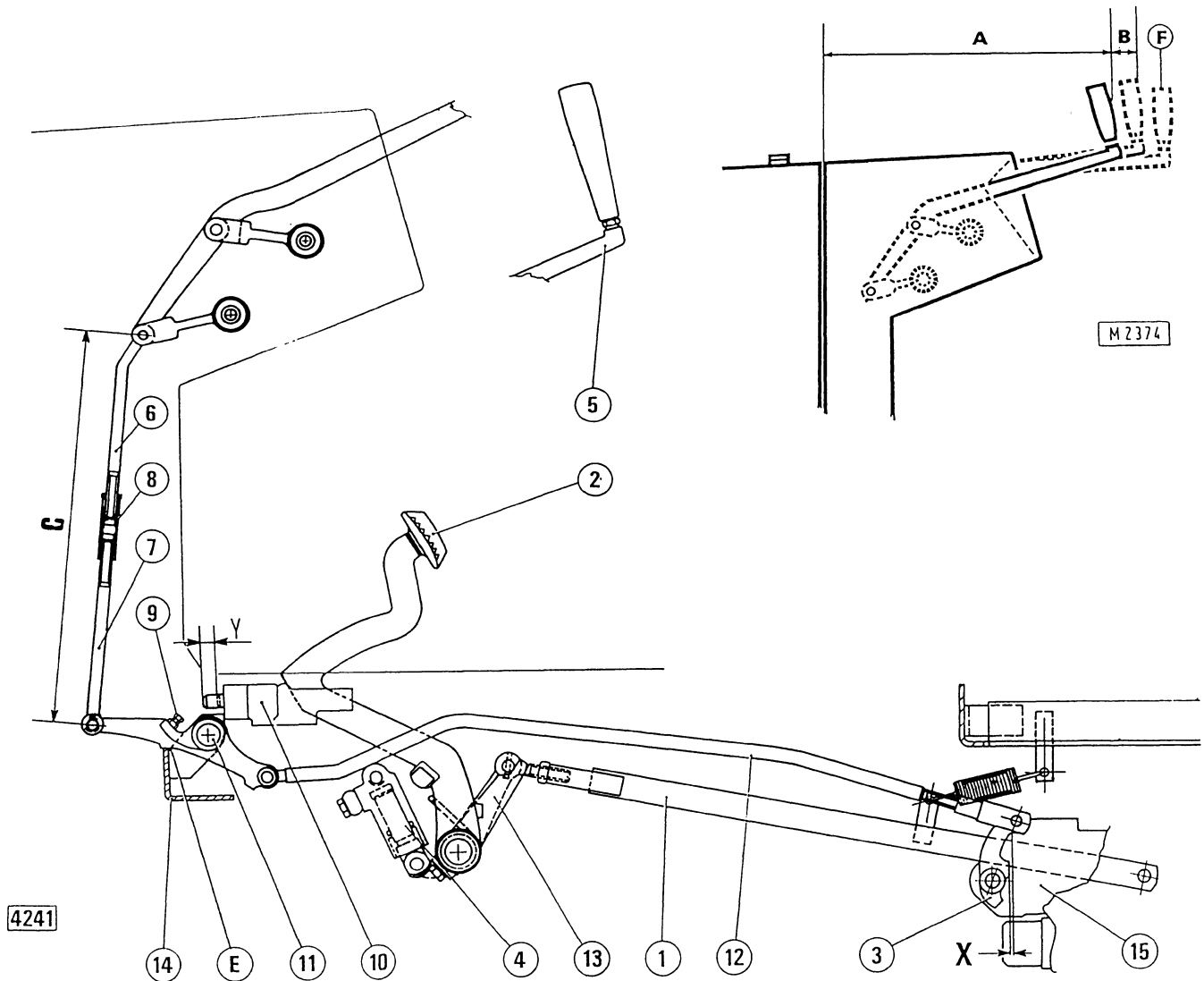


Fig. 4-6 Brake and steering clutch linkage adjustment (with combined steering clutch/brake control).

1. Brake servo cylinder control rod - 2. Brake pedal - 3. Steering clutch control valve actuating lever - 4. Brake rod hydraulic control cylinder - 5. Steering clutch control levers - 6 and 7. Tie rods - 8. Threaded adjuster - 9. Control valve(10) adjustable control screw - 10. Hydraulic cylinder(4) control valve - 11. Idler lever - 12. Steering clutch tie rod - 13. Idler lever - 14. Support - 15. Steering clutch control valve.

### 2.6.1 Adjustment of clearance between brake and steering clutch drum.

Tighten screws (v, fig. 15) to a torque of 8 daNm (59 lbs. ft) and then slacken off two complete turns.

## 2.7 ADJUSTMENT OF FL 14-C BRAKES AND STEERING CLUTCHES

Adjust the tie rods (3, fig. 25) of the power brake as follows:

- with the steering clutch-brake pedals (B) on blocks (1), tighten screw (2) until it is clear that the tie rod (3) is pushing the power brake return lever (4) against the cover (5);
- slacken screw (2) until contact is again made with the pedals (B);
- back off one more half turn, and lock the screw with the nut.

After adjustment, the pedal idle travel should be about 60mm (2.36").

The movement of pistons (9) closes the drive ports if the pedal (or pedals) are not pushed fully down (partial braking).

The overall effect is a hunting movement between the control valve spools (10) of the pedal hubs, and the pistons (9) that is brought about by the oil at a pressure that continues to increase, and is proportional to the force required from the bands to get the braking action desired.

If the pedals (or pedal) are pushed right down (total braking) the outlet holes stay open all the time, and the maximum pressure in the brake circuit is governed by the pressure relief valve (5).

Due to the drops in load and the two different cross-sections of the servovalve (3), its upstream circuit pressure than the calibrated value of valve (5).

When braking is finished, the spring of the control pedals brings back the spools and pistons, and the drive oil returns to the transmission housing via the outlet ports opened by the backward travel of the spools.

#### NOTE

The groove in the centre of the spools (10) serves to take off oil seeping inside the power brake and from the supply circuit.

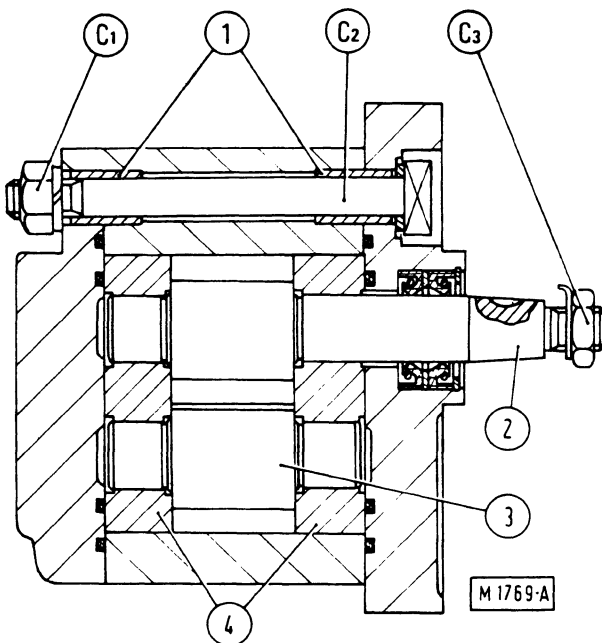


Fig. 28 - Longitudinal section of hydraulic pump for steering clutches and brakes (model FL 14-C and 14-C clutch).

C<sub>1</sub>. Pump retaining nuts. - C<sub>2</sub>. Pump retaining screws. - C<sub>3</sub>. Coupling retaining nut - 1. Centring bushes. - 2. Drive gear. - 3. Driven gear - 4. Bushes.

### 3.1.5 Application of one clutch and power actuation of the corresponding brake (C, fig. 27).

When one steering clutch is disengaged, the operating stage described in 3.1.2 will take place in the respective hydraulic circuit.

If the clutch is kept disengaged by means of the lever and the brake is applied (model 14-C), or the pedal is brought to the end of its travel (FL 14-C), the previous stage is replaced by that described in para. 3.1.4.

The balls of the lock valves (6, 4 & 11) will take up the positions shown in the detailed drawing (C).

The pressure in the brake circuit may be higher than that in the clutch circuit. The areas with different pressure are separated from each other by the effect of the lock valve (6), which takes up the position shown in the drawing, and the clutch disengagement valve, which, as already stated, moves to and fro between the drive and exhaust positions.

When a clutch is applied after brake (mod. 14-C), the check valve (12) moves into the position indicated in the drawing (C), so as to prevent the oil under pressure in the brake circuit from flowing into the clutch circuit to the detriment of the braking action already obtained.

## 3.2 STEERING CLUTCH AND BRAKE (MOD. FL 14-C AND 14-C CLUTCH AND POWER SHIFT) HYDRAULIC PUMP

This pump does not require maintenance of any kind, checking or periodic adjustment. Its spindles are lubricated by oil sucked in through grooves in the seats of the shaft bearings (1, fig. 29). Axial play is taken up by oil under pressure from the drive side (M) acting on the surfaces of the shaft bearings in the areas bounded by the O-rings (2).

### 3.8 TORQUE SPECIFICATIONS

Part	Thread size	Torque value (*)	
		daNm	ft. lbs
STEERING CLUTCH HYDRAULIC SYSTEM			
Nut for hydraulic pump retaining screws	3/8" - 24 UNF	6.5	47
Hydraulic pump drive coupling lock nut	7/16" - 20 UNF	3.5	25.8
Screws holding control valve on bevel gear housing	12 x 1.25	10	73.7

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- reassemble idler (1, fig. 52) with the aid of hook **75293200 (A)**;
- use lifting hook **75291582 (A)** to place the driven gear complete with hub (3, fig. 44) on the suspension bar.

#### NOTE

If either the ring gear or the driven gear hub have been changed, preassemble them on the bench without tightening the self-locking nuts (**C<sub>9</sub>**, fig. 53) for the retaining screws; this is done after assembly of the gear, using clamp **75291731 (A)**.

- fit the two centring dowels **75291584** on the housing, and refit the housing cover with the aid of a metal cable;
- fit a front-seal inner gasket (**29**, fig. 62) on the cover and sprocket;
- reassemble the sprocket on the driven gear hub using the portable ram **75295015 (A)**, and the tools illustrated in fig. 54. Make sure that mating references previously placed on the two hubs during production or removal are aligned;

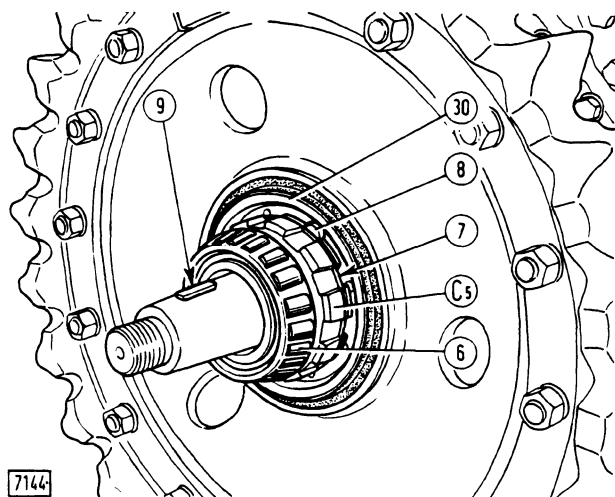


Fig. 56 - Sprocket hub.

**C<sub>5</sub>**. Sprocket lock nut. - **6**. Inner ring of outboard taper roller bearing. - **7**. Snap ring holding tab (8). - **8**. Tab locking ring nut (**C<sub>5</sub>**). - **9**. Key. - **30**. Front-seal outer half-gasket.

- apply a load of 40,000-50,000 daN (89,920-112,402 lbs) and after ramming check that distance (**H**, fig. 62) is 3.5-5.5 mm (0.13-0.21”).
- lock the sprocket (fig. 55) in place by tightening ring nut (**C<sub>5</sub>**, fig. 56) with spanner **75291597** and torque multiplier **75291279**, and insert tab (**8**), this beign held in place with snap ring (**7**).

#### NOTE

If either one or both parts have been changed, mount the sprocket hub on the splined section of the driven gear hub by means of the portable press, and the tools shows in fig. 54, under a load of 40,000-50,000 daN (89,920-112,402 lbs). After ramming, check that distance **H** (fig. 62) is 3.5-5.5 mm (0.13-0.21”).

Mark the two parts so as to ensure their correct mating when disassembling on other occasions.

- reassemble the inner ring of the outboard taper roller bearing (**6**, fig. 56). This is heated in oil at 80-90°C, along with the key (**9**), which must always be facing upwards;
- mount the rings of the front-seal outer gasket (**30**, fig. 62) fit the gear cage (**5**, fig. 58) and inner carrier (**4**) without shims (**S**, fig. 62), and lock nut (**C<sub>3</sub>**);

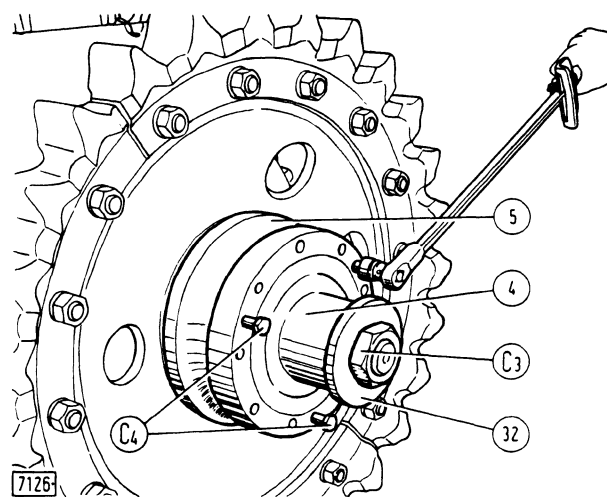


Fig. 57 - Tightening screws (**C<sub>4</sub>**) to determine the preload value of the sprocket taper roller bearings.

**C<sub>3</sub>**. Inboard bearing lock nut. - **4**. Inboard bearing. - **5**. Bearing cage. - **32**. Thrust washer.

# 14-C

## crawler dozer Service manual





### 1-UNDERCARRIAGE

### 2-EQUIPMENT

Form 604.06.290 - English

#### **WARNING**

STUDY THE OPERATION AND MAINTENANCE.  
INSTRUCTION MANUAL THROUGH BEFORE STARTING.  
OPERATING, MAINTAINING. FUELING OR SERVICING THIS  
MACHINE.

-  The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.
-  This symbol is your safety alert sign. It MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED.
-  Read and heed all safety instructions carrying the signal words WARNING and DANGER.
-  Machine mounted safety signs have been color coded yellow with black border and lettering for WARNING and red with white border and lettering for DANGER points.

#### **IMPORTANT**

The information in this manual was current at the time of publication. It is our policy to constantly improve our product and to make available additional optional items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

#### **NOTE**

Additional publications pertaining to this model and to all other Fiat Allis products are available through Fiat Allis dealers. Publications are generally available in several languages. Refer to Service Publications Index for all such publications; this index is available from Fiat Allis.

- Place the release spring on the ground and apply fixture A (Fig. 6) with the aid of a hoist.
- Install threaded adapter 75295568 (E) on the end of the press piston rod.
- Actuate the press to relieve nut (3) from the load springs (1) and (2).
- Unscrew nut (3) and tighten guide pin 75290590 (C) onto end of threaded rod.
- Gradually reduce the action of the press until the springs are fully extended.
- For reassembly, use the same fixtures and tools (a): operate the press until the outer spring reaches the installation length of 730 mm (28.74 in) (L), remove guide pin (C) lock nut (3) in contact with plate (4) and release the press action.

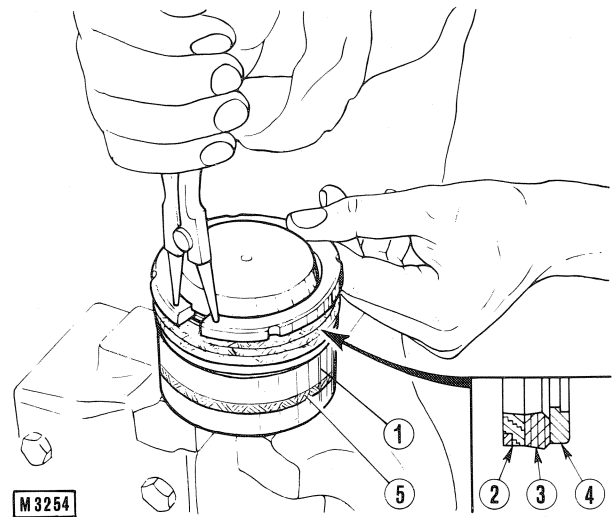


Fig. 7 - Installation (removal) of hydraulic adjuster piston (1) seal.

2. Thrust ring - 3. Seal ring - 4. Retaining ring - 5. Piston guide ring.

Upon reassembly of the track adjuster keep the following in mind:

- Locate and arrange piston (1) seal components shown in Fig. 7.
- Lubricate piston and the adjuster cylinder accurately with grease.
- Lubricate cylinder rear end with a thin film of NEVER SEEZ Compound.
- Install cover (2, fig. 5) after smearing the contact surface with one of the following jointing compounds: VIT type C, OMNI FIT 105H, RHODORSIL CAF1, LOCTITE PLASTIC GASKET.
- Upon re-installing an adjuster unit on a new track carrier frame the following will be necessary; tighten beforehand screws C<sub>4</sub> (Fig. 8) fixing the support, then ream in frames the holes for dowels (10) to a diameter of 24.939 to 24.972 mm (0.982 to 0.983 in); use guide bush 75292763 for the first drilling with bit size 24.5 (1 in) and guide bush 75292764 for reamer 75291570 and finally press-fit dowels (10) Fig. 8.
- Subsequently, fit the protection sleeve (6, Fig. 8) and nut (5) fixing the assembly by washer (14) and screw (C<sub>1</sub>).

**NOTE** - Before screwing nut 5 (Fig. 8) protect the adjuster spring rod threaded ends with a coating of corrosion inhibiting oil PROT 30/M.

### 1.2.1 SETTING OF HYDRAULIC ADJUSTER CYLINDER RELIEF VALVE

Disassemble the valve (Vs, fig. 8) and remove all traces of grease from its components.

Reassemble the valve and proceed as follows:

- Place tool 75291573 (A, Fig. 9) in a vice and fasten the valve (Vs) to the tool using the appropriate O-ring.
- Fill the tool tank (P) with gasoline or alcohol.
- The valve should remain closed and the level of the liquid in the tool tank (P, Fig. 9) should not vary at a torque wrench (B) reading of 6.41 to 6.86 daNm (47.2 to 50.5 lb ft).
- The valve should open and the contents of the tool tank should empty out at a torque reading of 6.86 to 7.35 daNm (50.5 to 54.2 lb ft). This torque equals a valve setting of 784 to 833 bar (11,150 to 11,847 psi).
- Use valve adjustment shims (S<sub>1</sub>) as necessary to obtain specified setting.
- Pack valve with Jota 3 grease or equivalent.

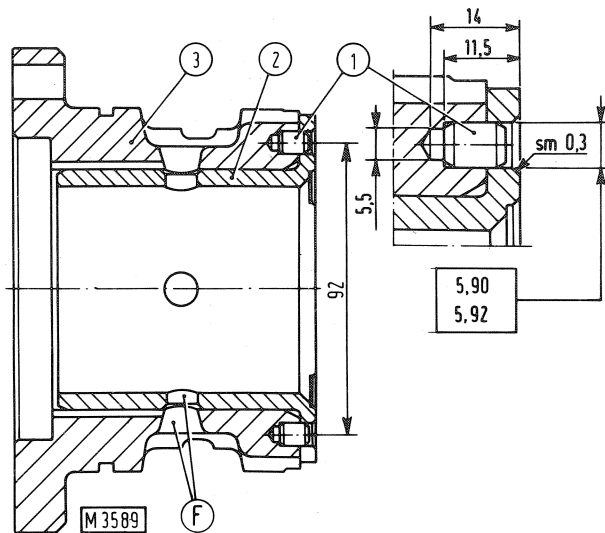


Fig. 22 - Sizes of dowel pin holes in track roller and idler wheel bushing carriers.

F. Lubrication orifices - 1. Bushing retainment dowels - 2. Bushing - 3. Bushing carrier.

### 1.5 TRACK CARRIER ROLLERS

**WARNING**

Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.

Remove bolts (C<sub>4</sub> Fig. 25) securing the roller support (8) to track frame and then take off the roller. Clamp the roller in a vice using fixture 75291417 (A, Fig. 24), remove fitting (7, Fig. 25) and drain out the oil. Next, proceed as follows:

- Remove screws (C<sub>1</sub>, Fig. 24) and cover (1, Fig. 24; 9 Fig. 25) with O-ring (6, Fig. 25); next, remove screws (C<sub>2</sub>) and thrust ring (2).

- Pull out shaft (3) with support (8) and face seal halves (5).

In case of replacement, take out bushings (4) using a puller.

Upon reassembly, bear the following in mind:

- In case of bushing replacement, refit bushings in their respective seats in roller using an arbor press and a proper drift.
- Install face seal (5).

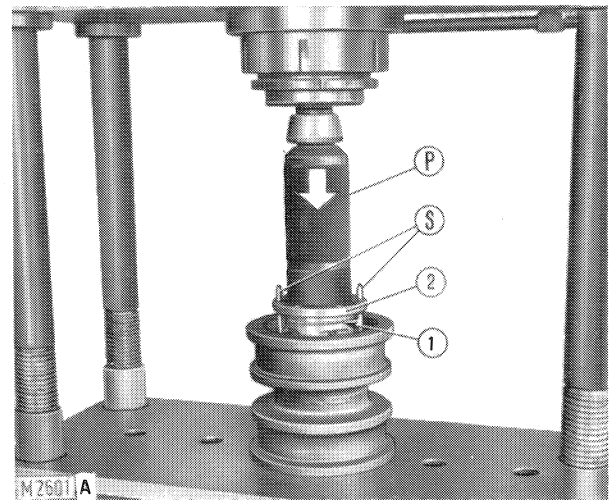


Fig. 23 - Fitting the complete bushing carrier (2).

P. Drift - S. Pilot guide pins 75291525 - 1. O-rings.

**NOTE** - Degrease and clean face seal housings. Wipe off any trace of dust or fingerprints, then coat with a thin film of oil taking care not to oil any other part.

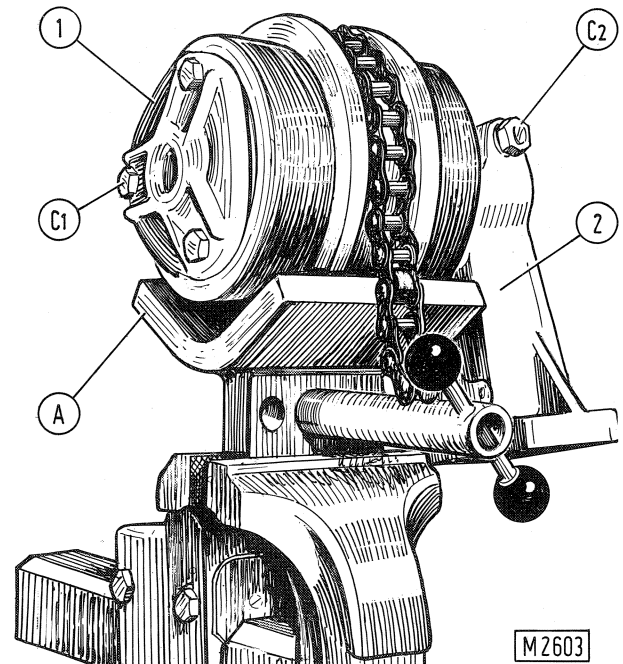
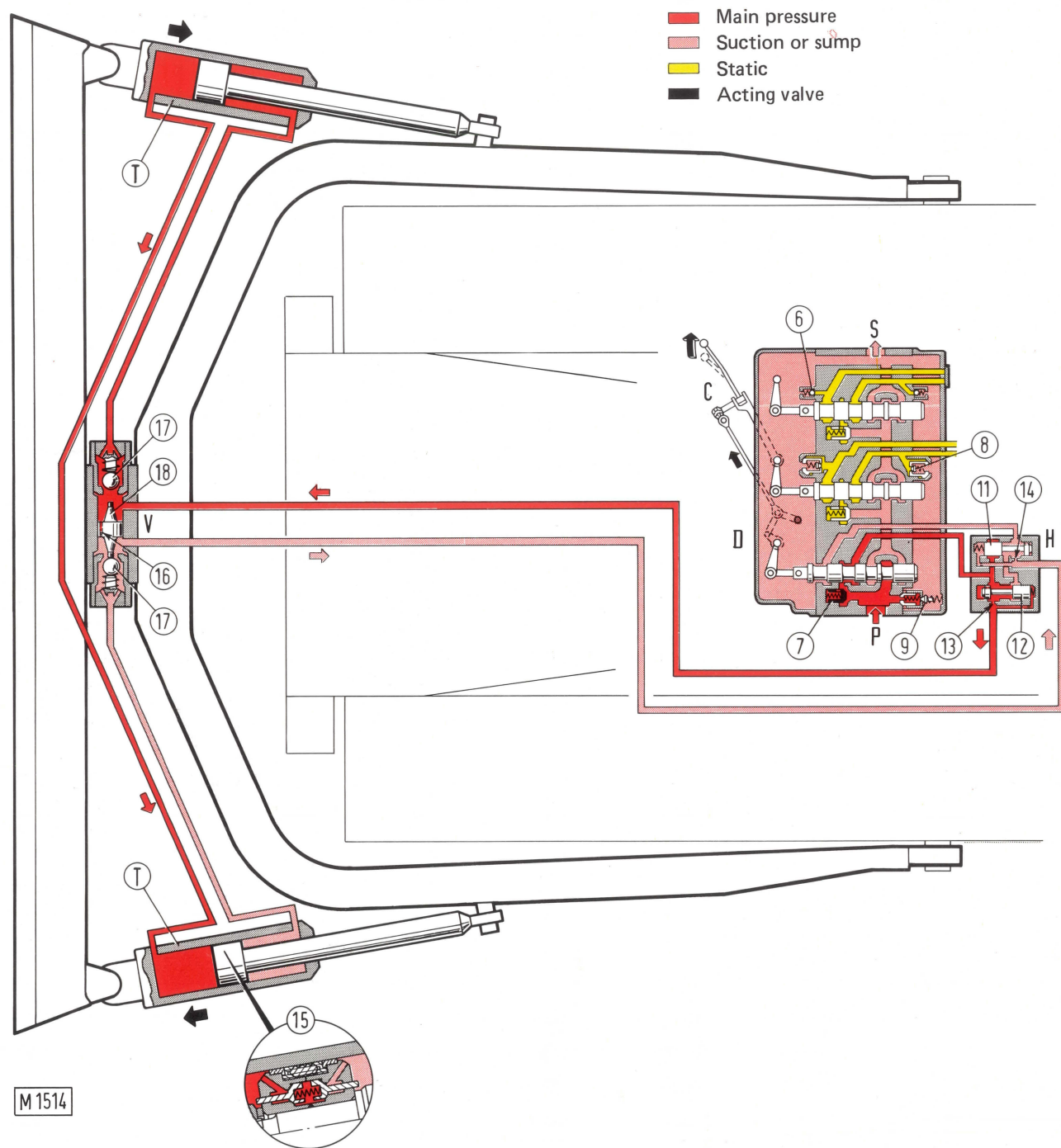


Fig. 24 - Overhauling a track carrier roller.

A. Retainer 75291417 - C<sub>1</sub>. Cover capscrow - C<sub>2</sub>. Roller shaft nut - 1. Cover - 2. Roller support.

SPECIFICATIONS (cont'd)

	mm	in
Bushing O.D.:		
– Early . . . . .	75.075 to 75.105	2.955 to 2.956
– Late . . . . .	74.970 to 75.000	2.951 to 2.952
Bushing seat bore diameter:		
in idler body (Early) . . . . .	75.000 to 75.030	2.952 to 2.953
in bushing carrier (2) (Late) . . . . .	74.911 to 74.957	2.949 to 2.951
Bushing to seat interference		
– Early . . . . .	0.045 to 0.105	0.0017 to 0.0041
– Late . . . . .	0.013 to 0.089	0.0005 to 0.0035
Bushing carrier (2) O.D. (late type only) . . . . .	114.067 to 114.102	4.490 to 4.492
Bushing carrier seat bore in wheel (late type only) . . . . .	114.000 to 114.035	4.488 to 4.489
Bushing carrier to seat bore interference . . . . .	0.032 to 0.102	0.0012 to 0.0040
Shaft (3) centre shoulder thickness (late type only) . . . . .	17.750 to 17.800	0.698 to 0.700
Bushing flange thickness:		
– Early . . . . .	4.950 to 5.000	0.194 to 0.197
– Late . . . . .	4.750 to 4.800	0.187 to 0.189
Idler end float . . . . .	0.30 to 0.75	0.012 to 0.029
Maximum wear tolerance:		
– Early . . . . .	1.3 to 1.5	0.0511 to 0.0590
– Late . . . . .	1.2	0.047
Shim thickness ( $S_1$ ) for adjusting clearance between side plates and upper slide bars . . . . .	0.5	0.019
Shim thickness ( $S_2$ ) for adjusting clearance between idler bracket slide bars and track frame slide bars . . . . .	0.5	0.019
<b>FRONT SUSPENSION</b>	Pivot mounted oscillating beam with track frame rubber pad support	
Oscillating beam pivot pin (1, Fig. 35) O.D. . . . .	69.954 to 70.000	2.754 to 2.755
Oscillating beam bushing (2) I.D., installed . . . . .	70.210 to 70.280	2.764 to 2.766
Bushing to pin clearance . . . . .	0.210 to 0.326	0.008 to 0.012
Tractor frame (3) pin bore . . . . .	70.010 to 70.040	2.756 to 2.757
Frame to pin clearance . . . . .	0.010 to 0.086	0.0004 to 0.0033
Bushing (2) O.D. . . . .	85.090 to 85.125	3.349 to 3.351
Oscillating beam bushing bore . . . . .	85.000 to 85.054	3.3464 to 3.3485
Bushing press fit . . . . .	0.036 to 0.125	0.0014 to 0.0049
Track frame guide adjusting shims ( $S_1$ and $S_2$ , Fig. 31) thickness . . . . .	0.5-1-1.5	0.019-0.039-0.059



**Fig. 38 - Oil flow schematic - Angledozer with hydraulic tilt.**

**C.** Blade lift and angling single control lever (same as for bulldozer) - **D.** Control valve - **H.** Flow reduction valve unit - **P.** From pump - **S.** To hydraulic tank - **T.** Blade tilt cylinder - **V.** Check valve - **6.** Overload valve - **7.** Check valve - **8.** Multi-function (overload and makeup) valve - **9.** Pressure relief valve - **11.** and **12.** Flow control plungers - **13** and **14.** Flow control valve port - **15.** Piston cushion valve - **16.** Pilot compensating oil passage - **17.** Check valve ball - **18.** Pilot plunger.

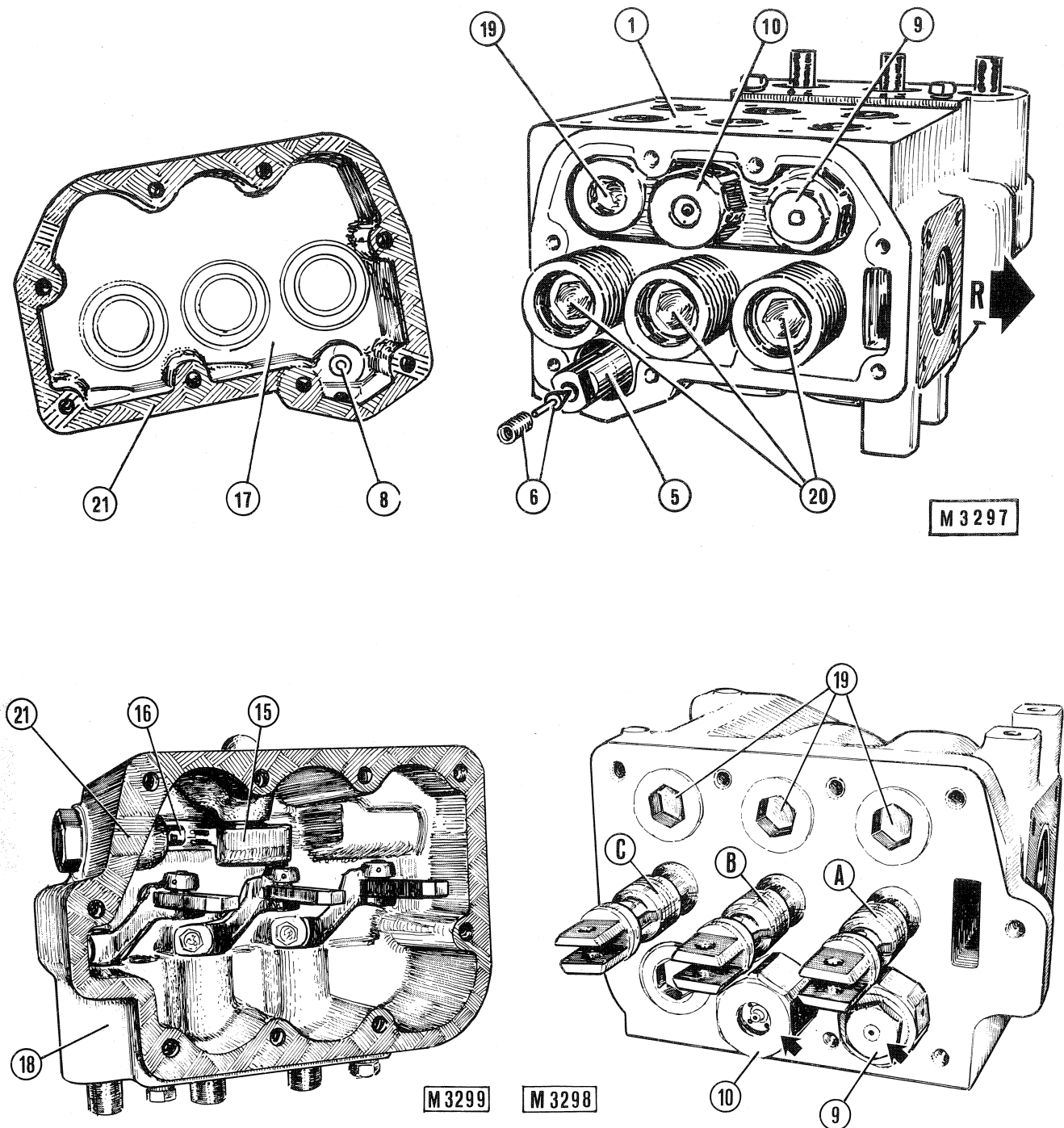


Fig. 47 - Hydraulic control valve - Exploded views and sections.

A. Ripper spool (raise and lower) - B. Blade spool (raise, lower and float) - C. Blade tilt spool - C<sub>1</sub>. Rear control valve cover capscrews - C<sub>2</sub>. Pressure adjustment screw (8) locknut - C<sub>3</sub>. Screws, cover (18) - d. Cam follower (11) for spool (B) - e. Overload valve (9) - f. Overload valve and makeup valve (10) - R. Duct for oil return to tank - T<sub>1</sub>, T<sub>2</sub>, Control valve oil sump plugs - 1. Control valve body - 2. Spool return spring - 3. Check valve - 4. Check valve spring - 5. Pressure relief valve - 6. Pressure relief valve pilot spring - 7. Main pressure valve plunger spring - 8. Main pressure valve adjusting screw - 9. Safety valve - 10. Multi-function valve (overload and make-up) - 11, 12, 15 and 16. Cam follower, spring, spool positioning roller - Blade float - 13. Needle bearings - 14. Oil seals - 17. Rear cover - 18. Lever support cover - 19. Plugs - 20. Spool return spring cup screws - 21. Cover gaskets - 22. Spacer.

**NOTE** - Black arrows indicate nominal values of safety valves pressure setting.

- Make sure the regulating valve (10) and its plunger (11) are correctly located.

### 2.5.3 HYDRAULIC TILT BLADE

NOTE – This differs from the attachment described under 2.5 in that it is provided with two hydraulic cylinders in place of the standard adjustable struts (3, Fig. 55). Besides powering the side tilt of the blade the hydraulic circuit is characterized by two flow reducing valves (same as those provided on the bulldozer, see 2.6.2) and a stop valve. For a description of their functions and operation refer to para. 2.1 herein.



#### WARNING

DO NOT USE HANDS to search for pressure leaks. Fluid escaping under pressure can penetrate the skin.

### 2.5.4 HYDRAULIC TILT CYLINDERS

To disassemble the cylinders:

- Disengage the cylinder upper pivot at blade and lower pivot at strut (see Fig. 55).
- Remove the screws ( $C_1$ , Fig. 59) fixing the front end plate.
- Pull out of cylinder the rod with piston and front end plate.

Upon reassembly, lubricate all parts adequately and remember the following:

- Cushion valve (5) components must be correctly mounted in their respective seats in piston halves (8).
- Piston halves (8) must be paired by interposing dowel (10).
- The elements of seals for piston halves (7) and for the rod (1 and 2) must be correctly arranged and located.
- The nut and screws must be tightened to specifications under TORQUE DATA.

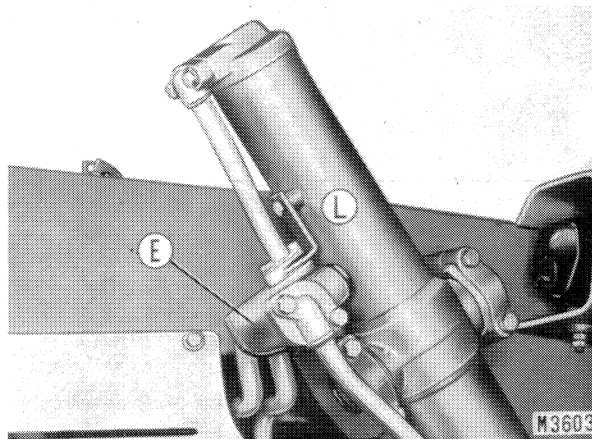
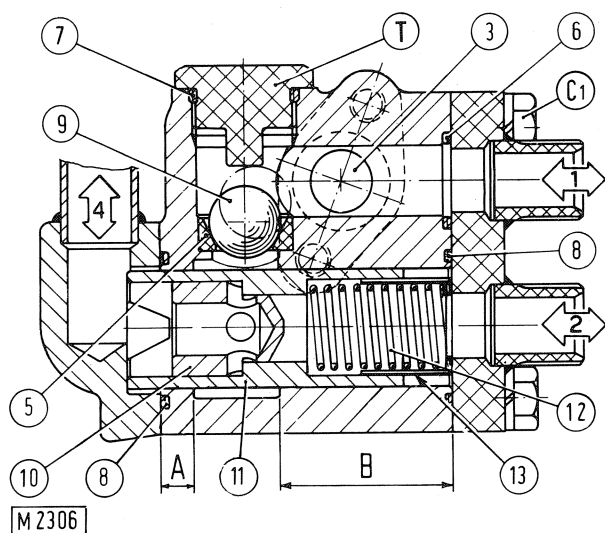


Fig. 58 - Quick drop valve (E) and installation on machine.

A. Short section - B. Long section - L. Blade raise/lower cylinder -  $C_1$ . Piping flange screws - T. Check valve (9) plug - 1. From control valve - 2. To control valve - 3. To cylinder piston side - 4. To cylinder rod side - 5. Check valve (9) seat - 6, 7 and 8. O-rings - 9. Check valve - 10. Flow regulating valve - 11. Valve plunger - 12. Valve spring - 13. Damper.

## SPECIFICATIONS (cont'd)

Spring specifications for:	Length				Test Load	
	Free		Under load		daN	lbs
	mm	in	mm	in		
– Check valve (4) . . . . .	73	2.87	32	1.25	2.19-2.43	4.9-5.4
– Spool return (2) . . . . .	165	6.49	37	1.45	2.03-2.23	4.5-5.0
– Cam roller guide (12) posi- tioning for blade float . . . . .	47.5	1.87	31.5	1.24	30.9-34.1	69.4-73.6
<b>Relief Valve (5, Fig. 47)</b>						
Setting pressure . . . . .					155 bar	2204 psi
Setting adjustment . . . . .					Through adjusting screw	
Main pressure relief valve plunger spring (7):						
– Nominal free length . . . . .					43 mm	1.692 in
– Length under 1.74 to 1.92 daN (3.9 to 4.3 lb) load . . . . .					16 mm	0.620 in
Pilot valve plunger spring (6) data:						
– Nominal free length . . . . .					51 mm	2.007 in
– Length under 19.7 to 21.6 daN (44.3 to 48.7 lb) load . . . . .					42 mm	1.653 in
<b>Multi-function overload and make-up valve (Fig. 52, det.a)</b>						
Overload valve relief pressure, blade circuit . . . . .					180 bar	2560 psi
No. of disc springs for safety valves (5) . . . . .					44	
Valve (5) adjustment shim thickness (S) . . . . .					0.2-0.5-1 mm	0.0079-0.0196- 0.0393 in
<b>Overload valve (Fig. 52 det.b)</b>						
Setting pressure, ripper circuit . . . . .					165 bar	2346 psi
Spring data (6):						
– Nominal free length . . . . .					55.5 mm	2.18 in
Length under 74.8 to 83.2 daN (168 to 187 lb) . . . . .					mm	in
					42	1.65
Valve adjustment shim thickness (S) . . . . .					0.2-0.5-1	0.0079-0.0196- 0.0394
<b>Quick-drop valve (Fig. 58)</b> . . . . .					Two, located in blade lift cylinder lines	
Spring (12) data for flow regulating valve plunger:						
– Spring free length . . . . .					84.5	3.327
– Length under 13.4 to 14.8 daN (31 to 33 lb) . . . . .					35	3.78
Plunger (11) to valve body clearance:						
– Short section (A) . . . . .					0.015 - 0.025	0.0006 - 0.0010
– Long section (B) . . . . .					0.025 - 0.103	0.0010 - 0.0041



## SAFETY RULES

Always before leaving the operator's seat and after making certain all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position. Move any multi purpose tool to positive closed position. Return the controls to hold. Place transmission control in neutral and move engine controls to off position. Engage all control locks, set parking brake, and open and lock the master (key, if so equipped) switch. Consult Operation and Maintenance Instruction Manual.

Always follow the shut down instructions as outlined in the Operation and Maintenance Instruction Manual.

### MAINTENANCE

Do not perform any work on equipment that is not authorized. Follow the Maintenance or Service Manual procedures.

Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the servicing.

Shut off engine and disengage the Power Take Off lever if so equipped before attempting adjustments or service.

Always turn the master switch (key switch if so equipped) to the *OFF* position before cleaning, repairing, or servicing and when parking machine to forestall unintended or unauthorized starting.

Disconnect batteries and *TAG* all controls according to local or national requirements to warn that work is in progress. Block the machine and all attachments that must be raised per local or national requirements.

Never lubricate, service or adjust a machine with the engine running, except as called for in the Operation and Maintenance Instruction Manual. Do not wear loose clothing or jewelry near moving parts.

Do not run engine when refueling and use care if engine is hot due to the increased possibility of a fire if fuel is spilled.

Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials.

Always place the fuel nozzle against the side of the filler opening before starting and during fuel flow. To reduce the chance of a static electricity spark, keep contact until after fuel flow is shut off.

Do not adjust engine fuel pump when the machine is in motion.

Never attempt to check or adjust fan belts when engine is running.

When making equipment checks that require running of the engine, have an operator in the operator's seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock. **KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.**

Avoid running engine with open unprotected air inlets. If such running is unavoidable for service reasons, place protective screens over all inlet openings before servicing engine.

Do not place head, body, limbs, feet, fingers, or hands near rotating fan or belts. Be especially alert around a pusher fan.

Keep head, body, limbs, feet, fingers, or hands away from bucket, blade or ripper when in raised position.

If movement of an attachment by means of machine's hydraulic system or winches is required for service or maintenance, do not raise or lower attachments from any position other than when seated in the operator's seat. Before starting machine or moving attachments or tools, set brakes, sound horn and call for an all clear. Raise attachments slowly.

Never place head, body, limbs, feet, fingers, or hands into an exposed portion between uncontrolled or unguarded scissor points of machine without first providing secure blocking.

Never align holes with fingers or hands - Use the proper aligning tool.

Disconnect batteries before working on electrical system or repair work of any kind.

Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.

**BATTERY GAS IS HIGHLY FLAMMABLE.** Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flame away from batteries. Do not smoke near battery to guard against the possibility of an accidental explosion.

Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.

Be sure to connect the booster cables to the proper terminals (+ to +) and (- to -) at both ends. Avoid shorting clamps. Follow the Operation and Maintenance Instruction Manual procedure.

Due to the presence of flammable fluid, never check or fill fuel tanks, storage batteries or use starter fluid near lighted smoking materials or open flame or sparks.

Rust inhibitors are volatile and flammable. Prepare parts in well ventilated place. Keep open flame away - **DO NOT SMOKE.** Store containers in a cool well ventilated place secured against unauthorized personnel.

Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

**DO NOT** pile oily or greasy rags - they are a fire hazard. Store in a closed metal container.

## 1.2 OPERATION PRINCIPLES

When the cell is charged, the active material of the positive electrode is lead peroxide ( $\text{PbO}_2$ ), of the negative electrode spongy lead ( $\text{Pb}$ ) and of the electrolyte sulfuric acid ( $\text{H}_2\text{SO}_4$ ) diluted to a density of 1280 g/L. During cell discharge (current is supplied to users) the passage of current in the cell causes the following chemical reactions to take place:

- Most of the lead peroxide on the positive plates combines with the sulfuric acid ( $\text{H}_2\text{SO}_4$ ), forming lead sulfate ( $\text{PbSO}_4$ ); oxygen atoms ( $\text{O}_2$ ) freed from the lead peroxide ( $\text{PbO}_2$ ) unite with the hydrogen atoms ( $\text{H}_2$ ) left behind by the sulfuric acid and forms water ( $\text{H}_2\text{O}$ ).
- Most of the lead on the negative plates combines with the sulfuric acid ( $\text{H}_2\text{SO}_4$ ) and forms lead sulfate ( $\text{PbSO}_4$ ).

Electrolyte density decreases.

When the cell is fully discharged, most of the active material of the positive and negative plates will consist mainly of lead sulfate ( $\text{PbSO}_4$ ) and the electrolyte ( $\text{H}_2\text{SO}_4$ ) will have changed mainly to water ( $\text{H}_2\text{O}$ ) whereby the density of the solution approximates 1100 g/L.

When the cell is recharged (current supply from generator) the current flowing in causes the following chemical reactions to take place:

- Lead sulfate ( $\text{PbSO}_4$ ) on the positive plates changes into lead peroxide ( $\text{PbO}_2$ ) thus freeing sulfuric acid ( $\text{H}_2\text{SO}_4$ ).

Electrolyte density increases.

If voltage exceeds a given value, water electrolysis will occur: it separates into hydrogen and oxygen which escapes in the form of bubbles emitted from the negative and positive plates, respectively; this phenomenon takes place particularly when the charging voltage is excessive, as a consequence of voltage regulator malfunctions.

## 1.3 ELECTRICAL PERFORMANCE

Starting battery performance is evaluated from its current rating (an indication of cold starting efficiency) and capacity rating (an indication of stored energy reserve available).

Rated current means the constant intensity (Amperes) available to allow discharging the battery at  $-18^\circ\text{C}$  for 3 minutes without the voltage dropping below certain limits (I E C Standards, 8.40V at the 30th second and 6V at the 3rd minute). The capacity of a battery is measured in terms of discharge intensity multiplied by the time in which discharge occurs, the result being expressed in amperes per hour (Ah). For example, as shown in chapter 1.8, the 6 A T M/57 battery has a rated current output of 350 A and a capacity of 77 A h. The discharge is considered to be over when the voltage drops to less than a pre-established value.

For starting batteries, the Italian (C.E.I.) and international standards adopt a 20-hour discharge rate test at  $25^\circ\text{C}$ , until voltage drops to 1.75 V per cell. For example, a 12V battery submitted to the 20-hour discharge rate test will have exhausted its current supply (end of test) once voltage at battery posts has dropped to 10.5V.

One exact method for measuring battery performance is to make the battery deliver a moderate constant current output to the final specified limiting voltage of 1.75V per cell. Results of this check are not reliable, however, unless adequate cautions, testing equipment and instruments are available.



## 2.2 ALTERNATOR AAD 124-28V-47A

This MARELLI alternator is practically of the same design as the type AA 125 - 28V - 30A from which it differs only for its greater current output (see Fig. 2-12).

For alternator servicing, bench testing and trouble diagnosis refer to the procedures described under 2.1.2, 2.1.3 and 2.1.4; for specifications, see the table below.

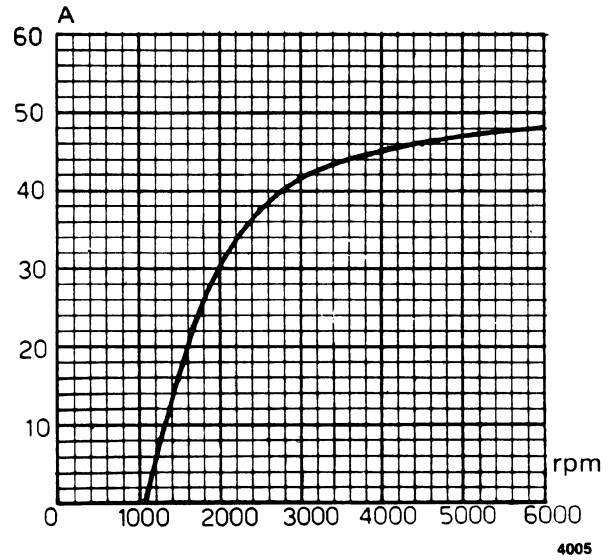


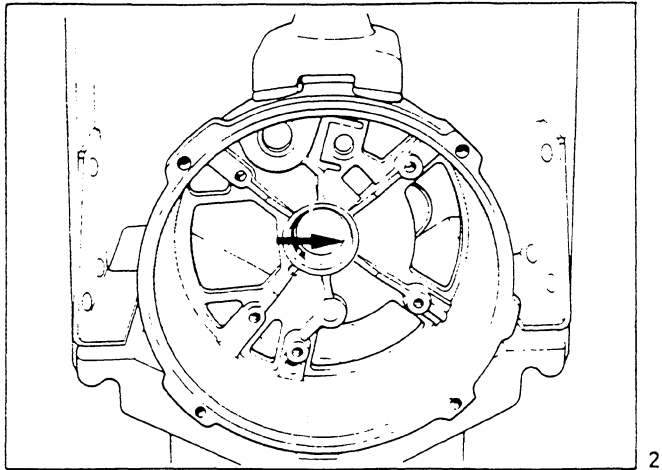
Fig. 2-12 -Marelli AAD124-28V-47A Alternator performance curve.

### 2.2.1 SPECIFICATIONS

<b>Alternator</b> .....	<b>Marelli</b>
Type (three-phase, self-rectifying) .....	AAD 124 - 28V - 47A
Rated voltage .....	28 V
Cut-in speed at 24 V (25°C) (77°F) (*) .....	1250 RPM
Output at 7000 rpm after warm-up (*) .....	47A
Maximum current rating (*) .....	abt 55A
Maximum speed { continuous .....	9000 RPM
{ peak, 15 mins. ....	10000 RPM
Field winding resistance at 25°C (77°F) across the two slip rings .....	8.75 to 9.25
Direction of rotation (pulley side) .....	clockwise
<b>Voltage regulator, incorporated in alternator</b>	
Electronic, type .....	RTT 113 B
Bench test data:	
— Alternator speed for bench tests .....	5000 RPM
— Current output .....	30 1A
— Regulated voltage (to be checked at 25°C (77°F) under above indicated conditions) .....	27.2 to 28 V

(\*) Applicable to fully bedded in brushes





Do not forget the two corrugated washers and the O-ring when assembling the collector-ring end shield (Fig. 2).

When installing a **new** plastic-coated rectifier plate (the diodes are embedded in plastic) be sure to mount **new** D+ terminal studs.

Mount the D+ terminal studs so that they are well insulated. When doing this be sure to observe the following:

First mount the D+ terminal studs in the collector-ring end shield, do not cut off the ends of the wires yet.

Install the plastic-coated rectifier plate in the collector-ring end shield.

Bend the ends of the wires into the soldering eyes provided and only then cut off the wire.

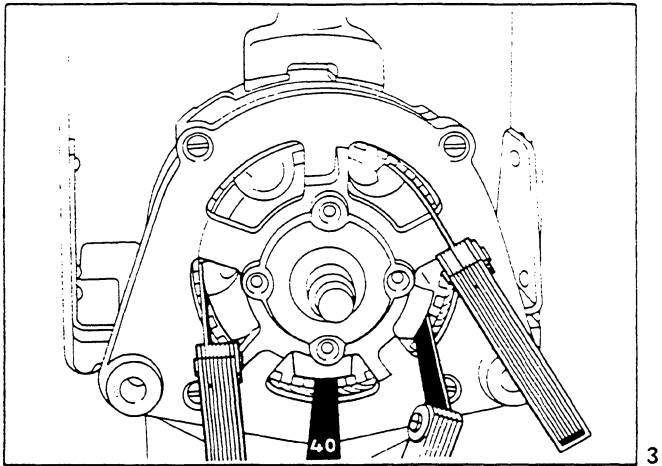
Phase connections at the stator winding are designed the same as those in K 1 generators (except that there is no neutral point terminal in the K 1).

Solder the D+ terminal studs in place before soldering the phase connections. Do not damage the plastic-coated circuit board during soldering (use a 100-W soldering iron).

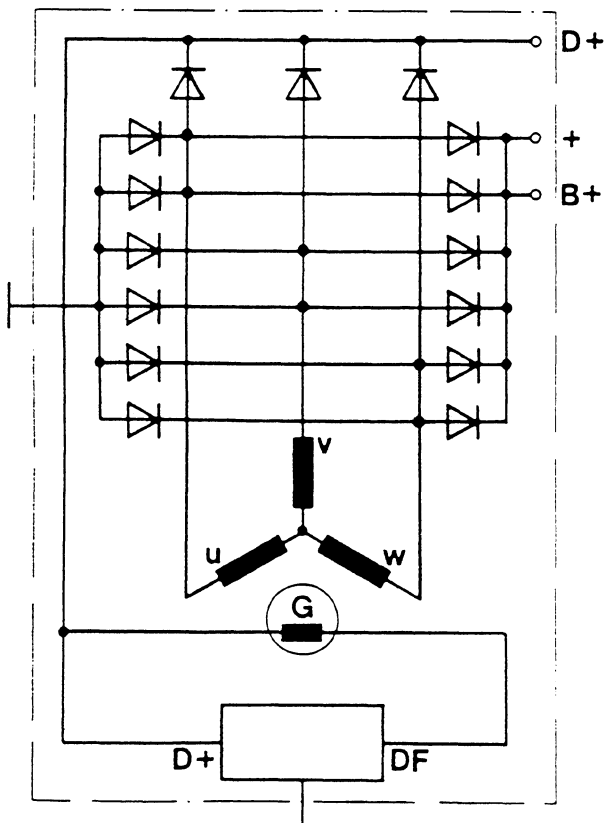
Center the rotor in the stator core using four 0.4-mm feeler gauges (so that it cannot tilt when the bolts are tightened) and only then tighten the through bolts with a torque of 5 N.m (0.5 kgf.m); first tighten two bolts that are opposite each other, then tighten two other bolts opposite each other, etc. (Fig. 3). The first two times round only tighten until resistance to turning is felt.

Maximum tightening torque applied to hexagon nut at the fan and pulley disc: 35 N.m (3.5 kgf.m).

N 1 - 90 A generator has 2 extra diodes (as in wiring diagram 3).



Wiring diagram 1



Shift lever (1, Fig. 3-3) Keeps moving forward as intermediate hollow shaft (3) slides along armature shaft, at the same time compressing helical spring (6). Since the hub and pinion (4) cannot move (because pinion tooth clashes against ring gear tooth) the forward shift of hollow shaft (3) under the action of shift lever, causes hub and pinion to spin relative to armature shaft, through splined helix coupling. The friction torque on head bushes and brushes, plus the rotor inertia torque, exceed the pinion/ring gear tooth friction: as a result, while hollow shaft moves forward, the armature is stationary and the pinion turns until it drops into the space between two ring gear teeth.

During this meshing stage, part of the shift lever travel is absorbed by a corresponding stroke of the freewheel hub relative to intermediate hollow shaft on splined helix.

This relative movement not only rotates the two parts involved but also brings the same two parts closer via the compression of helical spring. The kinematic proportioning designed into the drive unit is such that pinion/ring gear will always mesh in any case before the solenoid core plunger comes to the end of its stroke and "makes" the switch contacts.

When meshing is not yet completed, the switch contacts "make" thus allowing the motor to start rotating and the opposing torque of flywheel ring gear is transmitted, by reaction, to the armature shaft.

Consequently, the freewheel hub "screws" onto the splined helix of the hollow shaft until it contacts the shoulder thus completing the pinion ring gear mesh before engine applies its full power and torque.

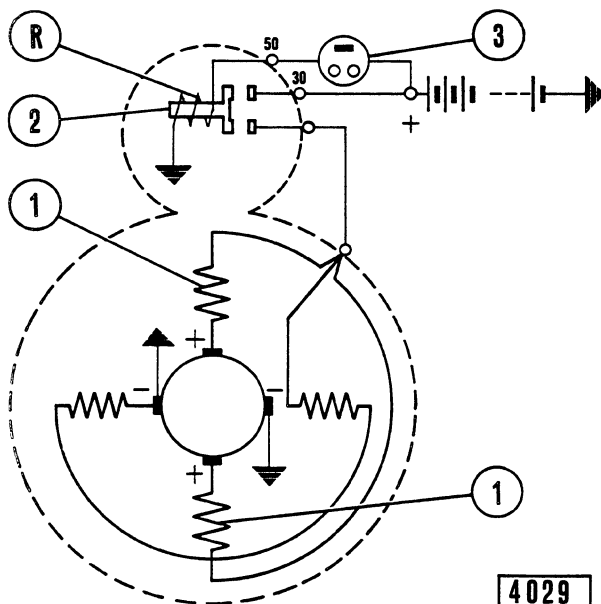


Fig. 3-2 - Marelli M130 - 8/24T wiring diagram.

R. Solenoid coil - 1. Field windings - 2. Solenoid moving contact - 3. Starting button switch.

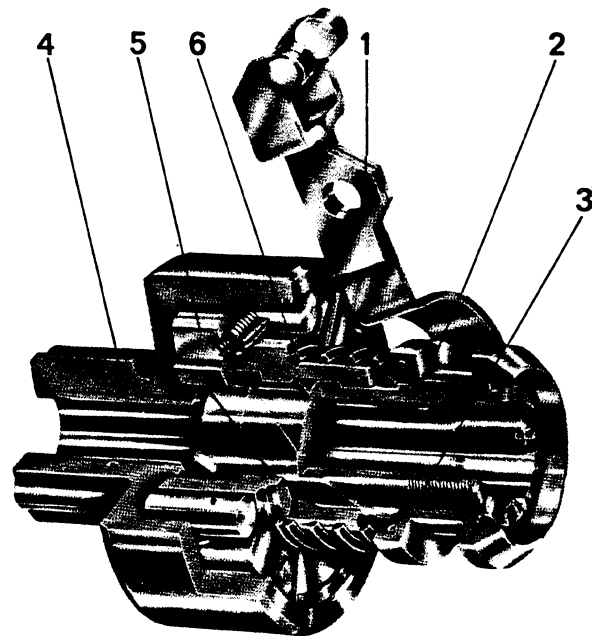
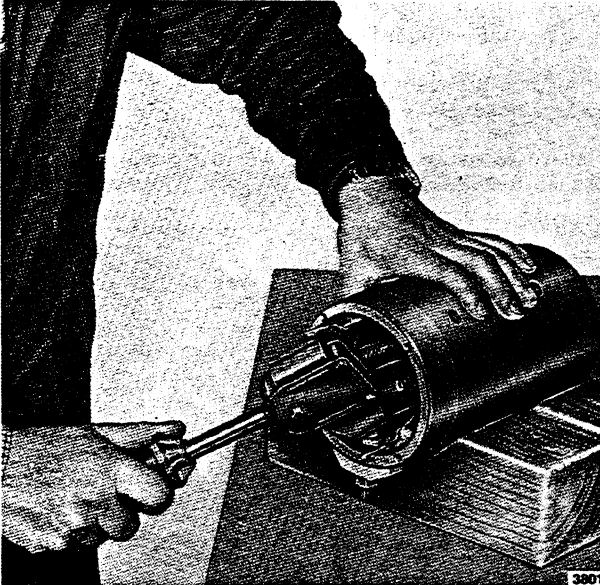


Fig. 3-3 - Cut-away of double helix drive unit.

1. Lever - 2. Guide sleeve - 3. Hollow shaft for drive unit hub - 4. Pinion - 5. Freewheel hub - 6. Engagement spring.

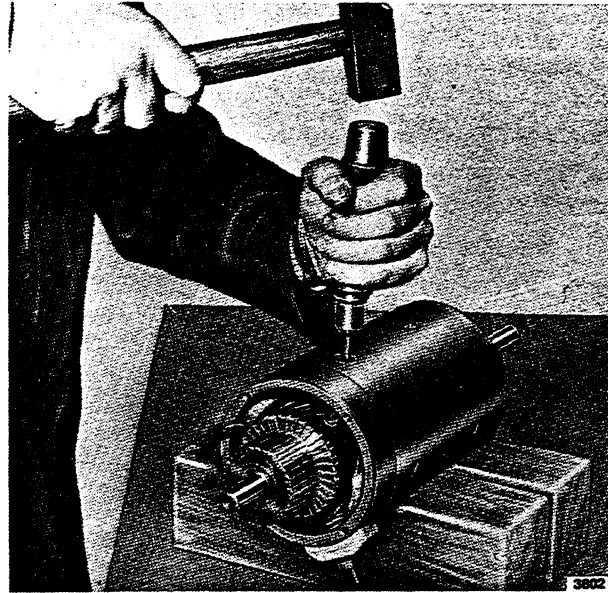
### 3.1.4 FIELD WINDING DISASSEMBLY AND REASSEMBLY

Should field windings need replacement, proceed as shown in Figs. from 3-30 to 3-33.



**Fig. 3-30.**

Disconnect the connection between shunt coils and series coil by unsoldering the terminal nut.

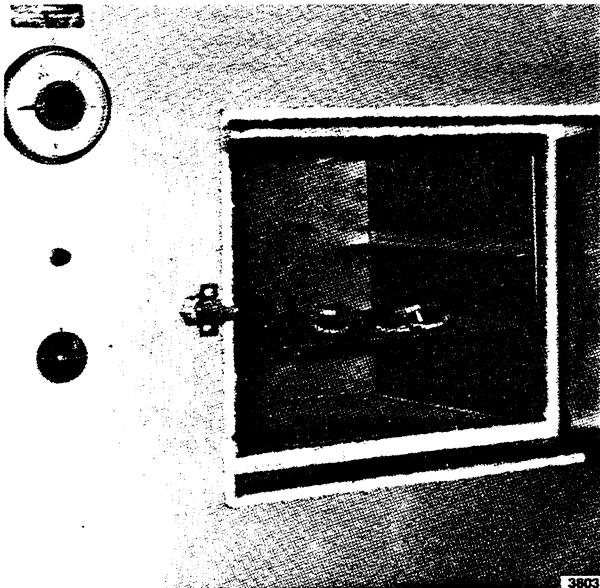


**Fig. 3-31.**

Remove the screws securing pole shoes to motor frame.

**NOTE:** In order to avoid any possible deformation place the armature into the frame prior to disassembling the pole shoes.

Remove the field windings.



**Fig. 3-32.**

Heat the field windings to 50° C (122°F) so as to make them more flexible.

Place the field windings fitted with pole shoes into the motor frame.

Secure pole shoes to motor frame using an arbor press and associated Phillips screwdriver.

**NOTE:** The screws should be tightened with armature placed into the frame so as to avoid any deformation which would not allow to hold the proper air gap.

Moreover, apply the sealant CI 21 L1 = HELDITE (HELD GLUE COMPOUND) to the threads of the pole shoe screws in order to ensure submersibility to the motor.

### 3.2.2 SERVICING

Remove from engine and disassemble on bench, as follows:



#### WARNING

To prevent the possibility of bodily injury, always disconnect the battery-to-ground cable before cleaning, repairing, disconnecting or connecting any of the electrical cables.

- Take off the rear cover (17, Fig. 3-49).
- Lift holder springs 16 and remove brushes.
- Back out terminal, brush and brush holder braids, and field winding screws.
- Remove commutator end head.
- Unscrew field winding to solenoid terminal nut.
- Pull out frame 22.
- Unscrew tie bolts and remove solenoid.
- Extract the clutch actuating lever pin after, backing out its fixing screw.
- Pull off the armature together with clutch and yoke lever.
- Clamp the armature in a vise taking care to use lead liners on jaws.
- Remove retaining ring and pinion stop ring (28).
- Remove the complete clutch unit, the intermediate support with spring and cup.

Reassemble the motor by reversing the above operation sequence.

For further details and illustrations on disassembly operations, component inspection and reassembly, see procedures, described under 3.1.2 to 3.1.5 and refer to SPECIFICATIONS under 3.2.4.

### 3.2.3 BENCH TESTS

Starter motor efficiency is checked by carrying out the test described below. Tests under para. 1 may be run with assembled starter; those under paras. 2, 3, 4, 5 and 6 must be run with disassembled starter.

#### 1 Operation tests.

Load, no-load and breakaway tests are conducted to check starter motor efficiency.

To this end, install the starter on test bench and wire up as shown in Fig. 3-52.

Supply the specified current and check, for each test, that motor meets the specifications quoted under para. 3.2.4.

#### 2 Field winding insulation test.

This test has the purpose of checking that there is no short circuit between frame and pole shoes. With motor frame on test bench connect the specially provided leads to the insulation test inlets of the bench (these receive 220V a.c.) and place one tester pin in contact with the frame and the other with a field winding terminal, as shown in Fig. 3.5.3.

If insulation is adequate, the tell-tale light will stay out; if it lights, replace the winding.

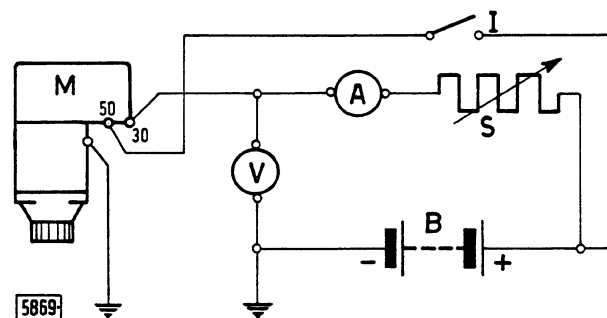


Fig. 3-52 - Starter bench test wiring diagram.

A. Ammeter - B. Batteries (2, 12-Volt, series-connected) - M. Starter under test - 1. Starter switch - S. Rheostat - V. Voltmeter.

- Refit washer (39, Fig. 3-63), which should be positioned in contact with the pinion.
- Connect the field winding terminals as follows (see Fig. 3-66):
  - Terminals (47 and 48) to solenoid lower fixed contact.
  - Terminals (49 and 50) to positive brush holders.
  - Terminals (51 and 52) to solenoid top moving contact.
  - Earth terminal (53) to negative brush holder.
  - Terminal (54) to positive brush holder.

On completion of reassembly, ensure that the terminal and winding retaining screws do not foul the commutator.

running torque, lock torque and no-load torque tests. To this end, fit the starter on the test bench and prepare the connections illustrated in Fig. 3-68.

Apply an input at the starter as prescribed, and check that each test yields the values given in the table "SPECIFICATION" - 3.3.4.

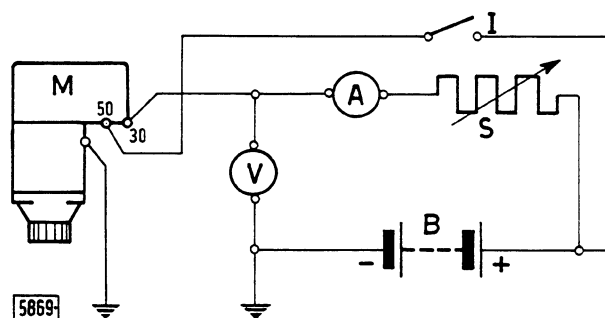


Fig. 3-68 - Starter bench test wiring diagram.

A. Ammeter - B. Batteries (2, 12 Volt, series-connected) - M. Starter under test - I. Starter switch - S. Rheostat - V. Voltmeter.

### 3.3.3 BENCH TESTS

Starter efficiency is assessed by carrying out the

### 3.3.4 SPECIFICATIONS

Type .....	Marelli MT 16 PE
Voltage .....	24 Volts
Output .....	8.5 kW
Direction of rotation (as viewed from pinion end) .....	Clockwise
Number of poles .....	4
Field winding .....	Compound
Drive .....	Sliding armature and clutch
Operation .....	Solenoid
<b>Bench Test Data</b>	
Running torque test (at 20°C)	
- Current .....	900 Amps
- Speed .....	1500 r.p.m.
- Voltage .....	18.6 Volts
- Torque .....	5.3 daN.m (39 lb ft )

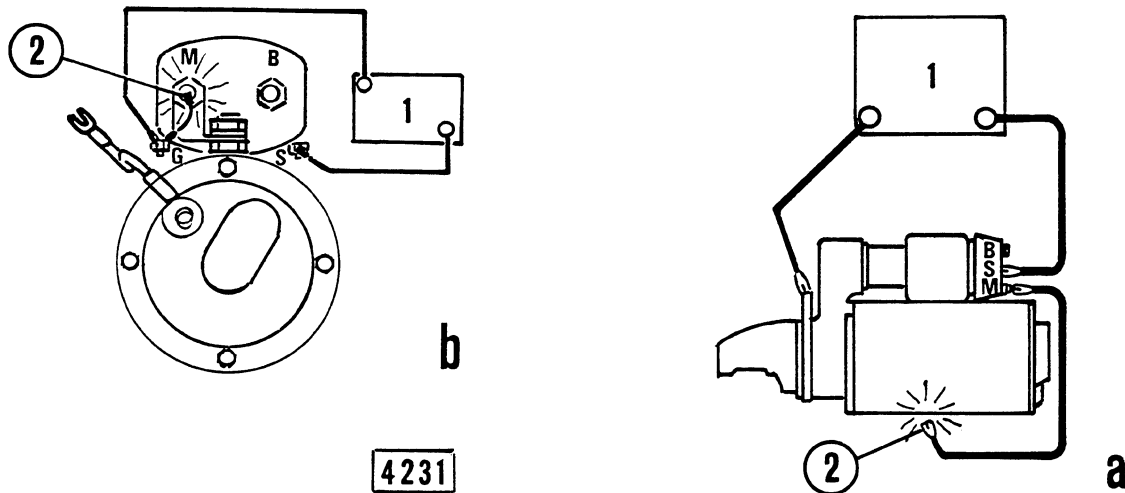


Fig. 3-81 - Pinion clearance check wiring circuit.

a. Type 30 MT/190 starters - b. Types 40 MT/400 and 50 MT/300 - 1. Battery - 2. Jumper contact.

#### 6 Pinion clearance

Check after reassembly to make sure that clearance **G** (Fig. 3-82) between pinion and nose housing is within specifications.

Follow the steps listed below:

- Make connections as shown in Fig. 3-81, leaving contact (2) disconnected. This way, only the hold-in winding is energized.

#### **⚠ DANGER**

Keep hands and fingers away from pinion. Do not place fingers between pinion and support.

- Momentarily flash a jumper lead (2). The drive will now shift into cranking position and remain so until battery is disconnected.

- Push the pinion or drive back towards the commutator end to eliminate slack movement (arrow in Fig. 3-82).

#### **⚠ DANGER**

Keep hands and fingers away from pinion. Do not place fingers between pinion and support.

- Measure the distance **G** between drive and drive stop: it must be within specifications in 3.4.6. If necessary adjust by nut 1 (Fig. 3-82).

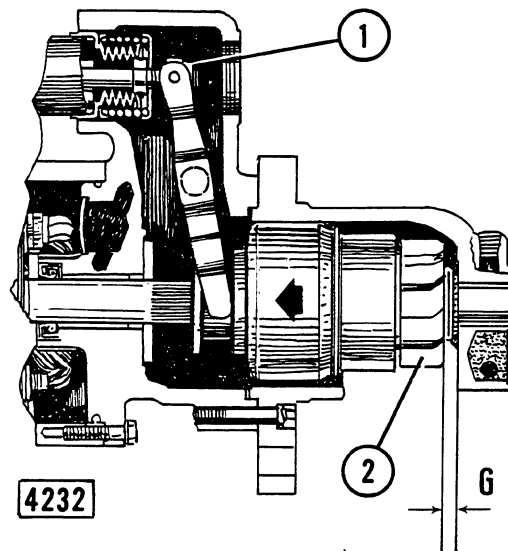


Fig. 3-82 - Pinion clearance measurement.

1. Clearance **G** adjusting nut - 2. Pinion - **G**. Clearance when solenoid is activated.

# 4. WIRING DIAGRAMS

## 4.1 GRAPHICAL SYMBOLS INTERPRETATION GUIDE

The electrical system circuits on FIATALLIS machines is based on the single-conductor cable/negative ground concept: in other words, current is supplied from battery to users through single wire cables whereas current return is handled through machine frame and other metallic components.

In the wiring diagrams this layout is represented by placing the ground sign (  $\text{—}|$  ) next to users and battery negative post.

In order to interpret the graphical representation of the electrical system correctly, some familiarity with the symbols used is necessary. For this reason, symbols and associated meanings are shown in the charts below and on next page.

For easier identification and servicing, all wires in the system are color-coded as follows:

- A Light blue
- B White
- C Orange
- G Yellow
- H Grey
- L Blue
- M Brown
- N Black
- R Red
- S Pink
- V Green
- Z Purple



### WARNING

Do not work under or near unblocked or unsupported linkage, parts or machine.



### WARNING

Shut off engine and be sure all pressure in system has been relieved before removing panels, housings, covers and caps.



### WARNING

To prevent the possibility of bodily injury, always disconnect the battery-to-ground cable before cleaning, repairing, disconnecting or connecting any of the electrical cables.

If two letters are indicated, the former shows the basic color and the latter shows the stripe color.

i.e.:



AN Light blue with black stripes.



### WARNING

Be sure to connect booster cables to the proper terminal, (+ to +) and (– to –) at both ends.

Avoid shorting cable clamps.

	Resistor
	Electric motor

**4.2.5 WIRING DIAGRAM – MOD. S15B**

1. Windshield wiper geared motor.
2. Cab light with integral switch.
- 3.(\* ) Cab-mounted work light switch.
- 4.(\* ) Cab-mounted work light.
5. Windshield washer pump switch.
6. Windshield wiper switch.
7. Hydraulic oil temperature indicator.
8. Horn button.
9. Windshield washer pump motor.
10. Hourmeter.
11. Fuel gauge.
12. Master switch.
13. Alternator charge indicator.
14. Starter button.
- 15.(\* ) Low servo oil pressure switch.
16. Instrument panel light.
17. Power point.
- 18.(\* ) Servo controls pressure switch.
19. Fuse box.
- 20.(\* ) Heater switch.
- 21.(\* ) Heater.
- 22.(\* ) Hydraulic hammer switch.
- 23.(\* ) Solenoid valve.
24. 'Cab-turnstile' connector.
25. Headlights.
- 26.(\* ) Boom-mounted work light.
27. Batteries.
28. Horn.
29. Fuel gauge sender.
30. Electric fuel pump sender.
31. Electric fuel pump.
32. Hourmeter pressure switch.
33. Hydraulic oil temperature switch.
34. Starter.
35. Alternator.

(\* ) Optionals

**4.2.10 WIRING DIAGRAM – MODS. FL14D/FD14**

1. Alternator
2. Thermistor
3. Low fuel pressure indicator switch
4. Restriction indicator vacuum switch
5. Fuel delivery booster coil
6. Transmission oil thermometer thermistor
7. Starter motor
8. Transmission low oil pressure switch
9. Horn
10. Left headlamp
11. Right headlamp
12. Left panel light
13. Right panel light
14. Fuses (9-21-22-23-b-c-d-e)
15. Fuse (26)
16. Fuses (10-11-12-13-23-f-g-i)
17. Light switch with incorporated horn control
18. Starter button
19. Fuse (23-n)
20. Instrument panel connector
21. Engine water thermometer (incorporated with 23)
22. Transmission oil thermometer (incorporated with 23)
23. Multi-function instrument
24. Cab system provision
25. Trouble light current receptacle
26. Central junction box
27. Starter inhibitor switch
28. Master switch
29. Batteries
30. Provision for connection of rear flood lights or ROPS
31. Provision for connection of ROPS flood lights

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