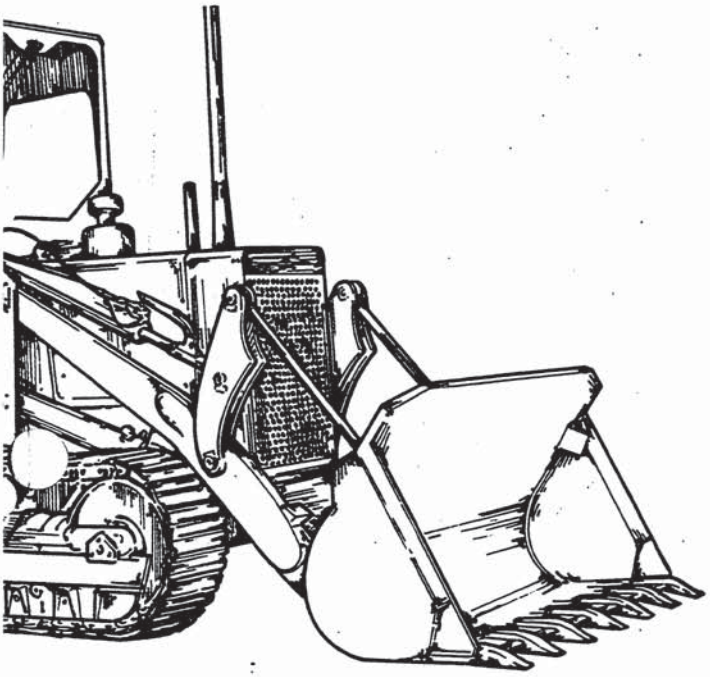
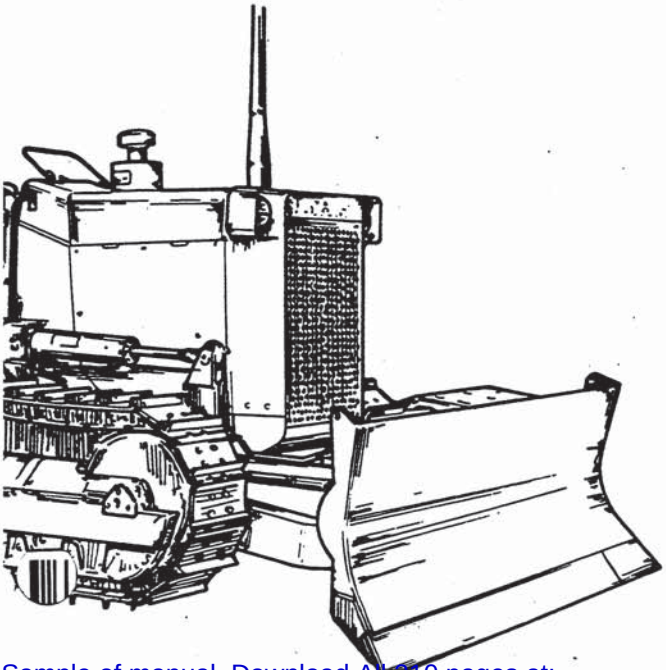
FIATALLIS





FL5
FL5B
FD5

Service manual

604.06.358

FIATALLIS

FL5 -FL5B FD5

Service manual

Form N° 604.06.358 - 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 IN 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.

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 borders and lettering for warning and red with white borders and lettering for danger points.

Do not allow unauthorized personnel to service or maintain this machine. Do not perform any work on equipment that is not authorized. Follow the Maintenance and Service procedures. Study the Operation and Maintenance Instruction Manual before starting, operating, maintaining, fueling or servicing this machine.

Always wear safety glasses with side shields.

Do not wear rings, wrist watches, jewelry, or 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 vest, or respirators. Consult your employer for specific safety equipment requirements.

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 may also be inadvertently moved causing accidental machine or equipment movement.

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

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.

Keep operator's compartment, stepping points, grab-rails and handles clean 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.

Never attempt to operate the machine or its tools from any other position than seated in the operator's seat.

Keep operator's compartment clear of loose objects.

If movement of an attachment by means of the machine's hydraulic system 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 attachment or tool, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.

Always block with external support any linkage, parts, or machine according to local or national requirements.

Never allow anyone to walk under or be near unblocked raised equipment. Avoid working or walking under raised blocked equipment unless you are assured of your safety.

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

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

When servicing or maintenance requires access to areas that cannot be reached from the ground, use a ladder or step platform that meets local or national requirements to reach the service point. If such ladders or platform are not available, use the machine handholds and steps as provided. Perform all service or maintenance carefully.

Shop or field service platform and ladders used to maintain or service machinery should be constructed and maintened according to local or national requirements.

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

Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.

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

Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.

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.

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

Remove sharp edges and burrs from reworked parts.

Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

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

Never place gasoline or diesel fuel in an open pan. Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flam-

mable, non-toxic solvents.
When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 2 bar (30 psi) according to local or national requirements.
Do not smoke or permit any open flame or spark near when refueling, or handling highly flammable materials.
Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.
Be sure all mechanic's tools are in good condition. DO NOT use tools with mushroomed heads. Always wear safety glasses with side shields.
Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.
When making equipment checks that require of the engine, have an operator in the operator 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. Shut off engine and disengage the Power Take-Off Lever before attemting adjustments or service.
Never use the bucket as a man lift.
The articulation point between frames will not clear a person. Stay clear when engine is running. Support, using device provided when servicing. Return support to carry position and secure before moving machine after servicing. See Operation and Maintenance Instruction Manual.
For field service, move machine to level ground if possible and block machine. If work is absolutely necessary on an incline, block machine and its attachments securely. Move the machine to level ground as soon as possible.
Guard against kinking chains or cables. Do not lift or pull through a kinked chain or cable. Always wear heavy gloves when handling chain or cable.
Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain. DO NOT PULL OR TOW UNLESS OPERATOR'S COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED against accidental cable or chain backlash.
Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.
DO NOT pile oily, greasy rags – they are a fire hazard. Store in a closed metal container.
Before starting machine or moving attachment check and adjust and lock operator's seat. Be sure all personnel in the area are clear before starting or moving machine and any of its attachments. Sound horn.
Rust inhibitors are volatile and flammable. Prepare parts in well-ventilated place. Keep open flame away – DO NOT SMOKE. Store container in a cool well-ventilated place secured against unauthorized personnel.
Do not carry loose objects in pockets that might fall unnoticed into open compartments.
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 manufacturer at all times. DO NOT adjust machine with engine running except ad specified.
Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.
Wear welder's protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Wear dark safety glasses near welding. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.
Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support for the jack at the machine and under the jack is appropriate and stable. Any equipment up on a jack is dangerous. Transfer load to appropriate blocking as a safety measure before proceeding with service or maintenance work according to local or national requirements.
Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves, safety glasses when handling.
Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.
Inspect your seat belt at least twice a year for signs of fraying, wear, or other weakness that could lead to failure.
Where it is necessary to use diesel fuel as a lubricant make sure all smoking material and open flames are extinguished or that no sparks are near. Place all parts in a closed container of clear diesel fuel for use as needed.
To minimize dangers of fire and explosion, it is recommended that before any welding is done on a fuel tank, the tank be completely drained of fuel, fuel lines disconnected and the ends closed to protect them, and the tank be steam cleaned. All traces of fuel must be removed before welding is started. Flood the tank with carbon dioxide (CO_2) before and during welding. Caps must be removed and vents and other openings left open during welding.
Dry ice (solid carbon dioxide) is extremely cold and will freeze flesh on contact. Use care to prevent contact with skin, eyes, or other parts of the body to avoid personal injury.
When work is required under or between components, block with an external support capable of holding the components in place according to local or national requirements.

START UP

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
Do not place head, body, limbs, feet, fingers, or hands near a rotating fan or belts. Be especially alert around a pusher fan.
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. Follw the recommendation of the manufacturer for storage and disposal.

ENGINE

Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot. See Operation and Maintenance Instruction Manual.
Do not run engine when refueling and use care if engine is hot due to the incresed possibility of a fire if fuel is spilled.
Never attempt to check or adjust fan belts when engine is running.
Do not adjust engine fuel pump when the machine is in motion.
Never lubricate a machine with the engine running. Avoid running engine with open unprotected air inlets. If such running is unavoidable for service reasons, place protective screen over all inlet openings before servicing engine.

ELECTRICAL

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.
Always turn the master switch (key switch if so equipped) to the off position when maintaining or servicing machine.
BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventialtion 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.
Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.
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.
Disconnect batteries before working on electrical system or repair work of any kind.

HYDRAULIC

Fluid escaping under pressure from a very small hole can be almost invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. DO NOT USE HANDS. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately. Shutt off engine and be sure all pressure in system has been relieved before removing panels, housing, covers, and caps. See Operation and Maintenance Instruction Manual.
When making pressure checks use the correct gage for expected pressure. See Operation and Maintenance Instruction Manual or Service Manual for Guidance.

ATTACHMENTS

Keep head, body, limbs, feet, hands and fingers away from blade, bucket or ripper when in raised position. Use authorized blocking as a safety measure before proceeding with service or maintenance according to local or national requirements.
If movement of an attachment by means of the machine's hydraulic system 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, make sure to set brakes, sound horn and call for an all clear. Raise attachment slowly.
Do not use machine to carry loose objects by means other than attachments for carrying such objects. Never use any gas other than dry nitrogen to charge accumulators. See Operation and Maintenance Instruction Manual.
Keep clutches and brakes on machine and attachments as power control units, winches and master clutches adjusted according to Operation and Maintenance Instruction Manuals of the Manufacturer at all times. DO NOT adjust machine with engine running except as specified.

TIRES (APPLICABLE MACHINES)

Be sure tires are properly inflated to the manufacturer's specified pressure. Inspect for damage periodically. Stand to one side when changing inflation of tires. Check tires only when the machine is empty and tires are cool to avoid overinflation. Do not use reworked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.
Never cut or weld on the rim of an inflated tire. Inflate a spare tire only enough to keep rim parts in place – a fully inflated tire might fly apart when it is not installed on a machine.
Use care if you must transport (haul) a fully inflated tire. When servicing tires block the machine in front and back of all wheels. After jacking up, place blocking under machine to protect from falling according to local or national requirements.
Deflate tires before removing objects from the tread. Never inflate tires with flammable gases. Explosion and personal injury could result.

FIATALLIS

FL 5 - FL5B
FD 5

CONTENTS

1. GENERAL

1.1 MAIN DATA

IDENTIFICATION AND TYPE

FD5 model
- technical identification of frame 2601.200.00.1
- type of Fiat engine 8045.04.189

FL5 model
- technical identification of frame 2601.100.00.1
- type of Fiat engine 8045.04.189

DIMENSIONS AND WEIGHT

Dimensions . . . . . see fig. 1-1 and 1-2.
Weight of unit (with fuel and operator):
FD5 . . . . . .5450kg (12015 lb)
FL5 . . . . . .7080kg (15608 lb)

ENGINE

Cycle . . . . . Diesel, aspirated
Strokes 4
Fuel injection . . . . . direct
No. of cylinders 4
Bore . . . . . 103 mm (4.05 in)
Stroke . . . . . 110 mm (4.33 in)
Total displacement . . . 3666cm^3 (223.6cu.in)
Compression ratio . . . 17
No. of main bearings . . 5
Direction of crankshaft rotation (as seen from fan side). clockwise
Max. power speed . . . . 2400 rpm
Max. torque speed . . . 1500 rpm
Weight (without fluids) about . . . . . 435 kg (959 lb)
Contrarotating weights vibration damper housed in the oil pan.

Timing system: ohv (two per cylinder) with camshaft in the block.

Valve clearance:

-intake opens . . . . 3° before T.D.C.
closes. . . . 23° after B.D.C.
-exhaust opens. . . 48°30' before B.D.C.
closes . . . 6° after T.D.C.

Operating valve clearance:

- intake . . . . . 0.25 mm (0.0098in)
- exhaust . . . . . 0.35 mm (0.013 in)

HOUR METER

Electronic, controlled by the engine oil pressure switch.
The hour meter is automatically started when the engine oil reaches pressure.

FUEL SYSTEM

Air cleaning: dry filter with pre-cleaner and two renewable paper elements provided with transmitter for clogging warning light on instrument panel.
Oil-bath filter optionally available.

Fuel cleaning: renewable filter.

Fiat injection unit (BOSCH licence) with four in-line pumping elements, with speed regulator (for all operating speeds) and automatic advance variator.

Type . . . . . PES 4A 80B-L4/203
Injection order. . . 1-3-4-2
Injector calibration pressure. . . . . 225-235bar (3200-3342 psi)

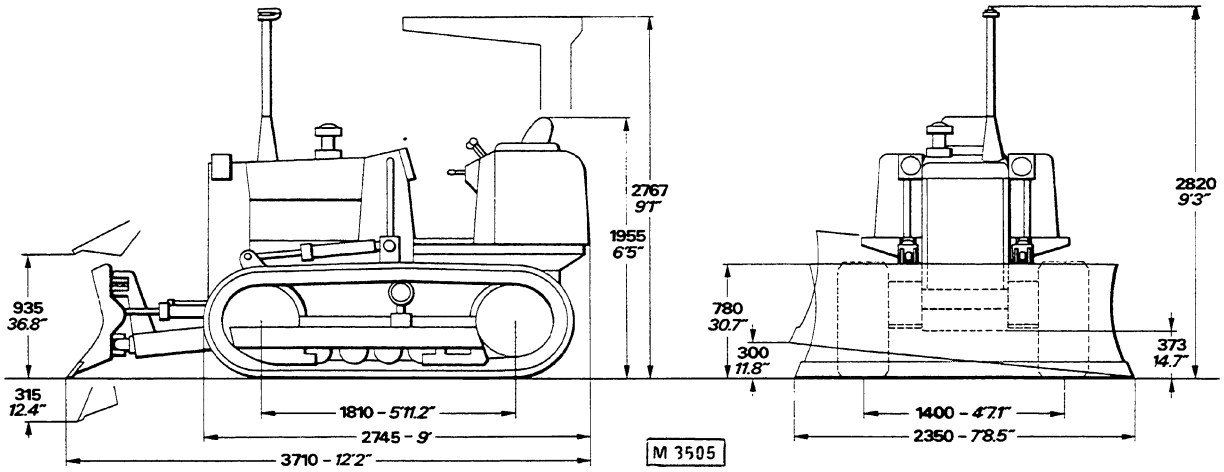


Fig.1-1.Main dimensions of dozer FD5.

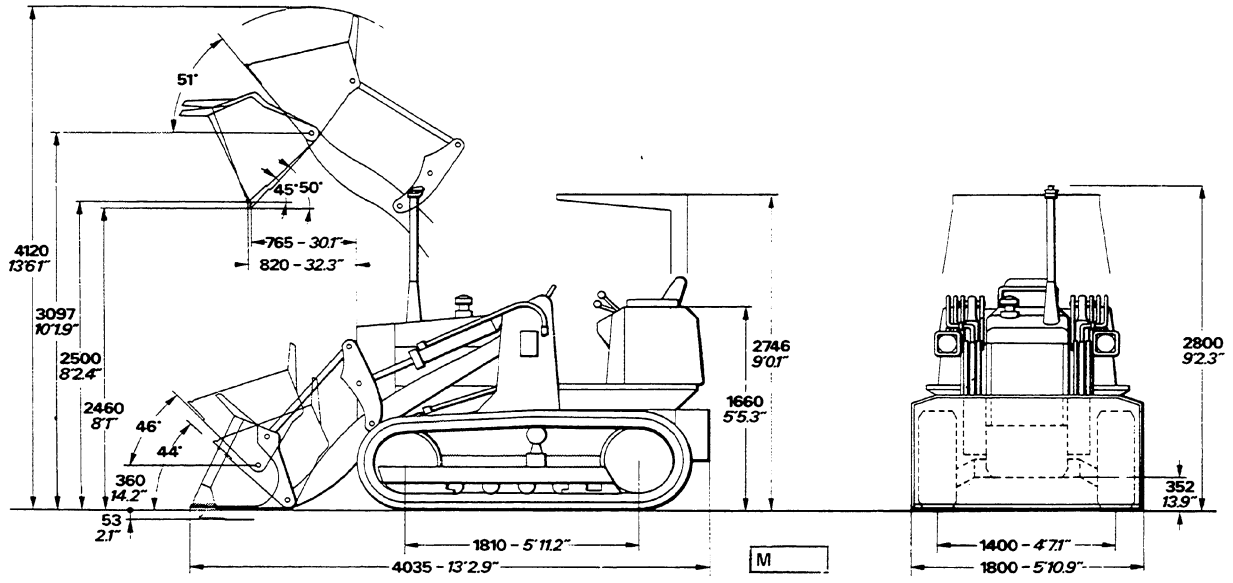


Fig1-2.Main dimensions of loader FL5.

LUBRICATION

Forced-feed type, with gear pump provided with pressure relief valve;

- engine rpm-to-oil pump rpm ratio 2-to-1

Total oil filtering on the delivery through a filter with renewable paper element.

COOLING SYSTEM

Water pressure type with centrifuagal blade pump and thermostat:

- engine rpm-to-water pump rpm ratio 1-to-1.83

Water cooling: radiator with 4 rows of pipes and a 7-blade fan.

TRANSMISSION

CLARK-HRS-18301-1 converter-gearbox unit.

Hydraulic monostage torque converter, 11.2" diameter,with rubber diaphragm.

- convertion ratio at stall 2.6-to-1

Oil cooling through heat exchanger connected to the engine cooling system.

A two-joint shaft connected by a stiff element transmits motion between gearbox and bevel gear set.

Total power-shift countershaft gearbox, with hydraulic control on three forward and three reverse speeds (5 multi-plate clutch engagements).

FD5 model

Speed	1st	2nd	3rd
Forward kph	3.36	5.87	10.13
Backward "	3.96	6.86	11.49

FL5 model

Speed	1st	2nd	3rd
Forward kph	3.35	5.84	9.99
Backward kph	3.96	6.83	11.31

Safety devices:

- No electric engine starting when the locking lever is in "Unlocked" position;
- Gear lever neutral locking lever hinders the driver getting off if the lever is not in "Locked" position.

Converter-gearbox hydraulic control fed by a gear pump.

Oil cleaning: two full-flow filters, one mesh type on the suction, the other one, paper, on the delivery.

POWER TAKE-OFF

Provision is made for the application of a power take-off cardan shaft.

Motion is taken from the gearbox and through a rear aperture on the transmission casing.

Power take-off shaft speed: 1231 rpm

Shaft rotation (as seen from rear of machine): clockwise.

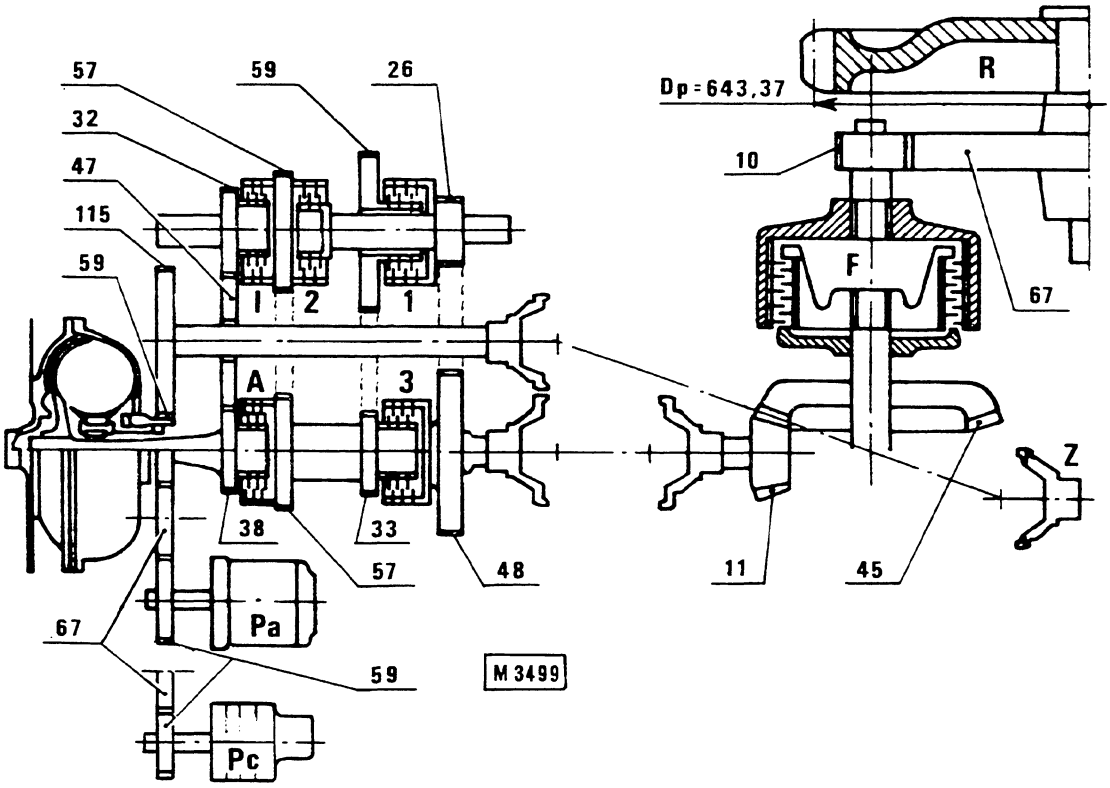


Fig. 1-3. Transmission layout - FD5 and FL5 models.

BEVEL GEAR SET

Central reduction with helical bevel gears and added bevel ring gear:

- reduction ratio (11/45) 1-to-4.091

STEERING CLUTCHES

Hydraulically controlled multiple-plate side clutches in oil bath:

- qty. of friction plates for each clutch 7

Two independent control pedals.

BRAKES

Service

Band brakes in oil bath, acting on outside drums of steering clutches, both mechanically operated by a single pedal:

- drum diameter 340mm (13.38in)
- band width 60mm (2.36in)

Parking

A locking lever keeps the brakes applied.

STEERING CLUTCHES HYDRAULIC SYSTEM

Fed by a Plessey A42X hydraulic gear pump.

Nominal pump delivery at max. rotation speed . . . . . 45 liters/min

Oil cleaning

Full-flow filter with magnetic plug on pump suction.

Renewable paper element on oil return line to the transmission casing; a safety valve ensures lubrication in case of cartridge clogging.

Hydraulic distributor with two distributor rods directly controlled by the steering clutches pedal.

FINAL DRIVES

Straight toothed side reduction:

- reduction ratio (10/67) . . .1-to-6.7

SPROCKETS

One-piece crown gear:

- No. of teeth 25
- Pitch diameter 643mm (25.3in)
- width of toothing. 54-56mm(2.12-2.2in)

UNDERCARRIAGE

Rigid boxed track frames connected front and rear to the machine frame:

- No.of shoes (per track) 35
- Shoe width:
  . FD5 . . . . . 400mm (15.74in)
  . FL5 . . . . . 360mm (14.17in)
- Ground contact area:
  . FD5 . . . . . 14,480cm^2(2244sq.in)
  . FL5 . . . . . 13,032cm^2(2020sq.in)
- Specific pressure on ground:
  . FD5 . . . . . 0.43bar (6.11psi)
  . FL5 . . . . . 0.56bar (7.96psi)
- No. of track rollers (per track) 5
- No. of carrier rollers (per track) 1

Spring track release mechanism with hydraulic track chain tension adjustment:

- pressure relief valve setting . 800-850bar (11,378-12,089psi

Lube-free track idlers; track rollers and carrier rollers with metal long-life front seals.

SUSPENSION

Front suspension: rigid cross beam resting on the track frames.
Rear suspension: rigid cross beam secured to the rear transmission casing and resting on the track frames.

EQUIPMENT

Hydraulic system fed by a gear pump:

- nominal delivery at max. engine rpm (2400 rpm):
  type C88XP . . . . . 96 liters/min
  type TA 22-90/38D. . .91.2 liters/min

Full-flow oil filter with renewable metal filter element and magnetic plug on pump suction; paper element on oil return line.

FD5 MODEL

Max. system operating pressure 150bar (2133psi)

A three-spool hydraulic control valve controls:

- blade tilt, raise and lower and tilt float (single control lever);
- blade horizontal angle or raising-lowering of a ripper (optionally supplied) with the help of a diverter valve.

The control valve is provided with:

- pressure relief valve;
- multiple back-flow and safety valve on blade lift circuit;
- multiple back-flow and safety valve on blade lower circuit;
- two back-flow valves on blade horizontal angle circuit or ripper raise-lower;
- three non return valves, one for each circuit.

Two double-acting cylinders for blade raise and lower:

- bore x stroke 80x363mm (3.14x14.29in)

One double-acting cylinder for blade tilt.

Two double-acting cylinders for blade horizontal angle:

- bore x stroke 80x363mm (3.14x14.29in)

Moreover:

- safety valve on blade angle circuit;
- delivery regulating valve on blade tilt circuit.

FL5 MODEL

Max. system operating pressure 155bar (2204psi)

A three-spool hydraulic control valve controls:

- bucket retract and dump, lift arms raise, lower and float (single control lever);
- ripper raise and lower (optionally).

The control valve is provided with:

- pressure relief valve;
- multiple back-flow and safety valve on bucket retract circuit;
- multiple back-flow and safety valve on bucket dump circuit;
- back-flow valve on lift arms lower circuit;
- three non return valves, one for each circuit.

Two double-acting cylinders for lift arm raise and lower:

- bore x stroke 100x608mm (3.93x23.93in)

Two double-acting cylinders for bucket rotation:

- bore x stroke 90x506mm (3.54x19.92in)

Adjustable lift arm stroke stop device.

Automatic bucket leveler mounted on the R.H. rotation cylinder.

Double-acting cylinder for ripper 85 (optionally on both models FD5/FL5):

- bore x stroke 110x250mm (4.33x9.84in)

ELECTRIC SYSTEM

Voltage . . . . . 24 Volt

Two in-series batteries (12 V each) with nominal discharge capacity in 24 hours of . . . . . 77 Ah

Three-phase self-rectifying alternator with built-in voltage regulator:

- type . . . . . DELCO-REMY
- nominal rating . . . . . 45 A

DELCO-REMY starter motor:

- type . . . . . 30 MT
- nominal rating . . . . . 4 kW

Headlamps with rubber mountings, 115mm (4.52in) diameter.

Instruments

Warning lights:

- gearbox oil low pressure
- air cleaner clogging
- equipment oil filter clogging
- transmission oil filter clogging
- fuel low pressure
- faulty battery recharge system.

Gauges:

- fuel level
- water temperature
- engine oil pressure
- gearbox oil temperature
- gearbox oil pressure
- electronic hour meter.

1.2 NOTES FOR SPARES

To ensure perfect machine operation, only original parts should be used for replacements.

When ordering spares, specify:

- chassis No. and type;
- engine No. and type;
- catalog part No. of the part requested.

When equipment parts are ordered (bucket and ripper) also indicate type and number of the equipment.

For machine identification data see the "Operation and Maintenance Manual".

1.3 FILL-UPS

See the "Operation and Maintenance Manual"

1.4 GENERAL INSTRUCTIONS

INSTALLING FLOATING RING SEALS

Thoroughly inspect metal rings M ensuring that their sealing surfaces are free from score marks, dents or signs of wear due to misalignment or flatness errors.

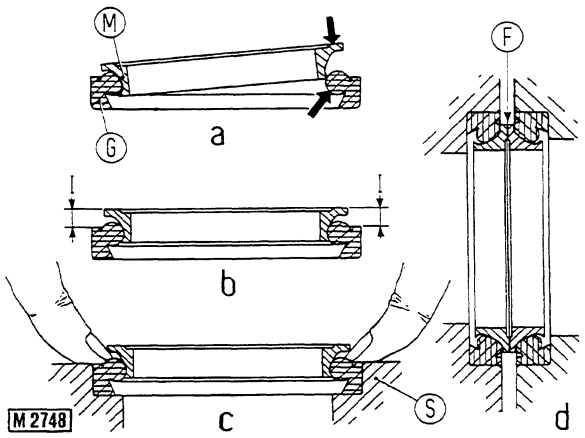
Both metal rings M with rubber seals G should be renewed even if only one is found to be defective.

Do not pair new and worn metal rings together, nor used rings of different pairs.

To install seals proceed as follows:

- remove all sharp corners and burrs and thoroughly clean rubber seal housings;
- thoroughly clean the rubber seals;

- couple each metal ring M to the associated rubber seal G as shown in a, pushing as indicated by the arrows;
- ensure that each metal ring is correctly seated. Dimension I (detail b) should be equal all round;
- place each seal assembly in position by manually pressing the rubber seal as shown in detail c;
- before pairing the seal assemblies (see detail d) clean sealing surfaces F using a lint-free cloth and smear a light film of thin oil on the contact surfaces.



INSTALLING ROTARY SHAFT SEALS

To install rotary shaft seals proceed as follows:

- prior to installation soak the seals for at least half an hour in the same oil as that in which they will operate;
- thoroughly clean the shaft and ensure that the contact surface is free from damage;
- turn sealing lip towards the fluid; if of the thrower lip type, turn the grooves so that during shaft rotation the fluid is thrown back;
- smear the sealing lip with a thin film of lubricant (oil is better than grease);
- install the seal into the housing by pressing or using a flat ended punch; on no accounts use a hammer;
- avoid entry of the seal into the recess in a tilted position. After installation ensure that the seal is pressed fully home;
- to prevent sealing lip damage during installation, use some sort of protection between seal and shaft.

INSTALLING O-RINGS

Lubricate O-rings before installation and do not twist them when installing, otherwise leakage will result.

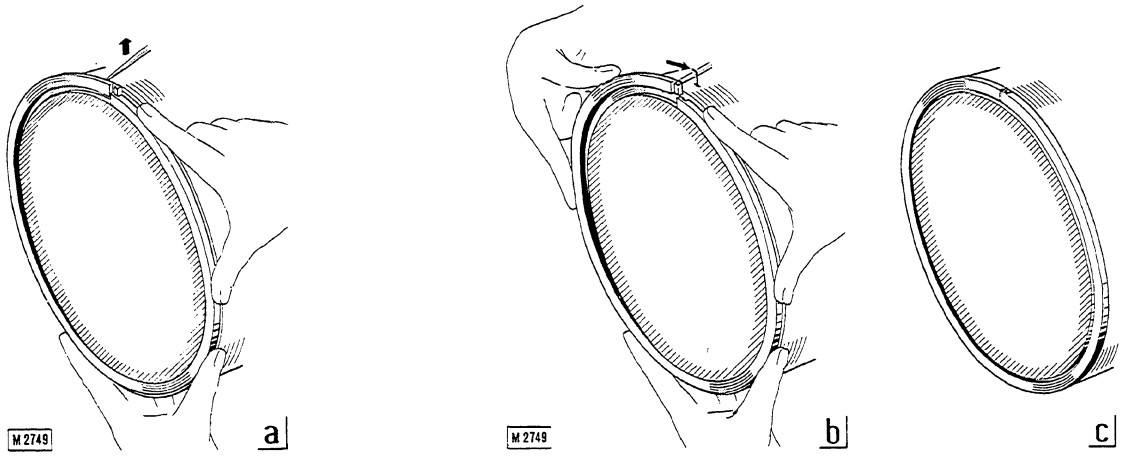
REMOVING/INSTALLING FACE SEALING RINGS

To remove proceed as follows:

- press one end of the ring into its seat (see a);
- hold ring in position and insert a scriber point beneath the other end to separate the interlocking ends as shown (a);

To install proceed as follows:

- press one end of the seal into the seat (b);
- hold in position and lift the free end (b) to lock the two ends together (c).



ADVICE FOR DISASSEMBLY AND REASSEMBLY OF UNITS

The following general information is aimed at helping disassembly and reassembly of units. Read it attentively and bear it in mind when carrying out the work.

CLEANING

After disconnecting the electric system thoroughly clean the parts to be disassembled, if possible with a jet of steam.

Many repair or service shops use caustic compounds to remove traces of grease, dirt, paint and remains of gaskets etc. Such compounds are extremely useful and effective if employed correctly, but may cause considerable damage to certain materials.

Materials such as aluminium, rubber, fibers, sintered bronze and binding agents are particularly sensitive to all high-concentration caustic compounds.

Certain heat exchangers and radiators have aluminium fins. To clean both inside and outside of these parts we recommend the use of solvents that do not react with aluminium.

DISASSEMBLY

When operating on the engine or on other units removed from the machine always use stands. Place small items in containers. Be careful not to damage the machined surfaces of components and rest them on shelves or on wood blocks.

When dismantling alike components, such as valves, valve lifters etc., place them in suitable containers to avoid incorrect reassembly.

ASSEMBLY

Carefully clean all parts to be refitted as described in the manual. We recommend the use of the special tools illustrated. Whenever possible, drive in bushings to their correct position using a press. If it is necessary to use a hammer to install the bushing, employ a suitable punch to prevent any damage.

Lubricate ball bearings before assembly and bushings prior to installing their pins. Lubricate the sealing lip on all seals before installing (see section 1.4).

Wherever possible, use new seals. Cylinder head gaskets should always be new.

Use screws with the dimensions and characteristics indicated, making reference to part numbers in the Spare Parts Catalog.

Where indicated, use safety washers, cotter pins, locking wire etc.

Respect specified torque loadings as indicated in the appropriate section of this manual, using a suitable torque wrench.

Self-locking nuts should be replaced every time a disassembly operation is carried out, so as to guarantee a constantly good seal.

1.5 TROUBLESHOOTING

GENERAL

For a quick troubleshooting abide by the following rules:

a) Acquaintance with the machine.

It is impossible to look for causes and find a solution without a thorough knowledge of the machine. Therefore we recommend to study the descriptions given in the manuals about composition and operation of the various units.

b) Check up with the operator.

Many troubles originate from incorrect use or poor maintenance. Check with the operator whether the machine has already suffered from similar trouble and whether repairs were carried out with suitable equipment and original spares. Also check the machine environmental and operating conditions and see how the routine service is carried out.

c) Operating the machine.

The best way for monitoring machine condition is to test it under effective working conditions. On that occasion check:

- that instruments function properly;
- that the machine performs as specified;
- that there are no smells or signs of overheating;
- if anomalous noises are detected, identify their origin and the operating conditions under which they occur.

d) Machine inspection.

After the test indicated in c) stop the machine and visually check it. Also check for any leaks, loose bolts, breakages or distortions etc.

e) Diagnosis.

Once the fault has been identified, make a list of the possible causes with the aid of the suggestions given in the appropriate section of the manual and identify the correct one by means of practical tests, starting with the most likely causes and the easier tests.

1.6 MEASUREMENT UNITS

The measurement units used in this manual are those adopted by the International System (I.S.), replacing the MKS system used previously.

Force: decanewton (daN) replaces kilogram (kg)

Pressure: bar replaces kg/cm^2

Torque: decanewton x meter (daNm) replaces kg.m

Apply the following table to convert measurement units:

	multiply	by	to obtain
Force	kg	0.9807	daN
Pressure	kg/cm^2	0.9807	bar
Torque	kg.m	0.9807	daNm

NOTE - For everyday use, the following equivalences may be considered valid: kg=daN kg/cm^2=bar kg.m=daN.m

2. ENGINE RELATED COMPONENTS

NOTE - Data, characteristics and instructions for repair given in this manual refer exclusively to installation of the 8045.04.189 engine on FD5 and FL5 models. Other engine parts are dealt with in the Service Manual - Engine 8045, print No. 604.06.295.

⚠ WARNING

This symbol is your safety alert sign. It means ATTENTION! BECOME ALERT! YOUR SAFETY INVOLVED.

Read and heed all safety instruction carrying the signal words WARNING and DANGER.

⚠ 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.

⚠ WARNING

Use linkage safety support provided whenever it is necessary to put linkage in the raised position for any reason. Implement must be empty when using safety supports. Remove support and secure immediately after use for operation and transporting according to the Operation and Maintenance Instruction Manual. Do not substitute any other device for these supports. Lock up linkage with an external support capable of holding up the linkage when work is required under the linkage, according to local or national requirements.

⚠ WARNING

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

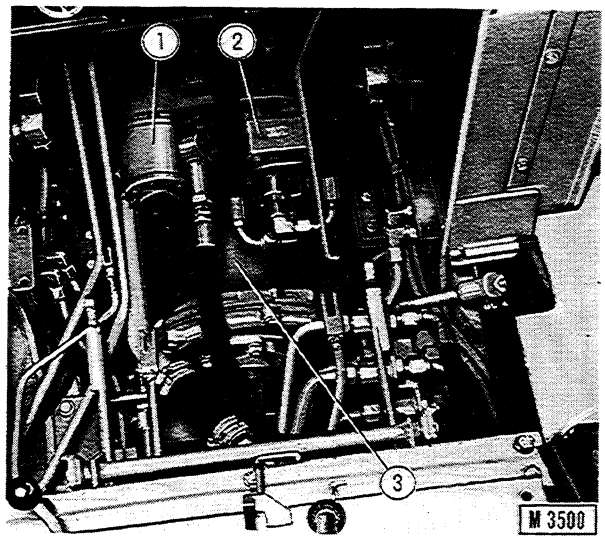


Fig. 2-1. Top view of converter-gearbox unit.

1.Equipment pump.-2.Converter-gearbox pump.-3.Gearbox.

2.1 REMOVING ENGINE-CONVERTER-TRANSMISSION UNIT

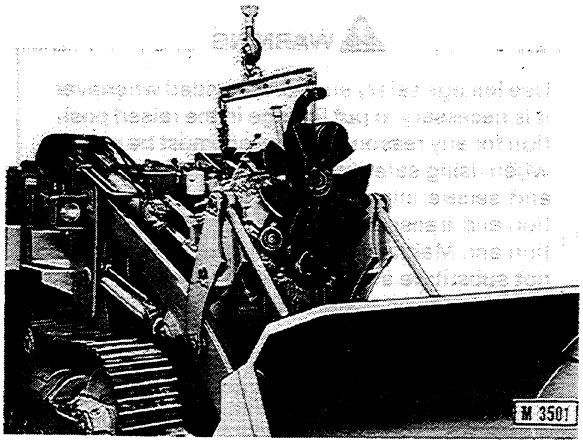


Fig.2-2.Removing/installing engine.

WARNING

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

- Remove engine side panels, lower guards and rear platform;

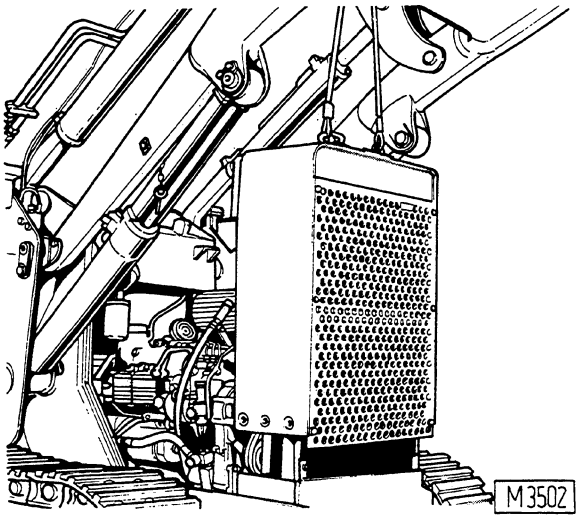


Fig.2-3.Removing radiator grill.

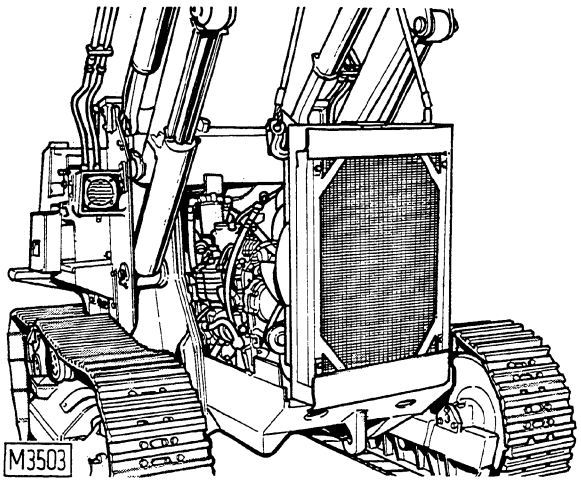


Fig.2-4.Removing radiator.

- disconnect battery earth lead;
- disconnect intake manifold-to-air cleaner duct;
- remove top cowling with air cleaner, pre-cleaner and exhaust muffler;
- drain coolant through bottom tap. Remove radiator cap to ease the operation;
- remove radiator grill capscrews and withdraw grill using a hoist as shown in fig. 2-3;
- remove fan grill;
- disconnect water hose from radiator and withdraw radiator as shown in fig.2-4;
- drain the oil from the converter-gearbox unit and from the equipment fluid reservoir;
- tilt driver's seat and close fuel tap;
- remove pins from steering clutches and brake linkages;

- disconnect accelerator and decelerator;
- remove front footboard with pedal gear;
- disconnect all tubes connecting engine-converter-gearbox unit to fixed part of machine;
- disconnect all wires and tubes connecting instrument panel to engine-converter;
- disconnect transmission coupling;
- prepare lift-hook 75297231 and tension with the hoist;
- free gearbox-to-frame mounting brackets and rubber blocks;

WARNING

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cables or chain.

WARNING

Guard against kinking chain or cables. Always wear heavy gloves when handling chain or cable.

- lift out engine-converter-gearbox unit as shown in fig.2-1.

2.2 ENGINE OVERHAUL

Remove converter-gearbox unit from engine following the instructions given in the Service Manual - Sections 3 and 4 -

Mount engine on revolving stand and adhere to what described in the Service Manual - Engine 8045 - Print No. 604.06.295.

2.3 INSTALLING ENGINE-CONVERTER-TRANSMISSION UNIT

To install engine-converter-gearbox unit proceed as described in this Service Manual, Sections 3 and 4.

Prepare lift chain 75297231, lift engine-converter-gearbox unit and place on the machine reversing the removal operations.

2.4 TESTS

2.4.1 Engine compression test

WARNING

Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.

WARNING

Warn all people who may be servicing or working around machine before starting engine.

WARNING

Keep clothing far from moving parts and be careful to prevent hand injuries.

In case of poor engine performance, besides checking the injection system, also check compression of each cylinder.

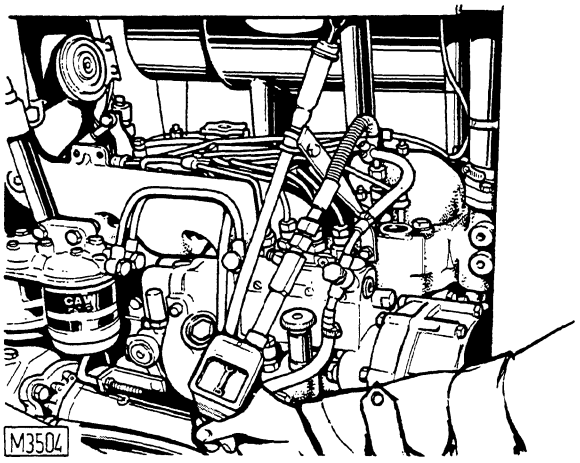


Fig.2-5.Checking cylinder compression with compression tester 75291310 and dummy injector 75292634.

To this purpose use test equipment 7529-1310 as shown in fig.2-5 and perform the operation as follows:

- thoroughly remove all dirt, oil and diesel oil from engine outside;
- bring engine to normal operating temperature, then switch it off;
- remove the injectors from the four cylinders;
- install dummy injector 75292634 in place of the injector of the cylinder under test and ensure tightness by fitting a copper washer on the bottom of the injection holder;
- connect the instrument to the dummy injector by means of the special flexible pipe;
- keep injection pump in "STOP" position and take the measurements by cranking the thermal engine by means of the starter motor.

Under normal operating conditions the compression measured with an oil temperature in the pan of 40-60 deg C at sea level atmospheric pressure (760mm mercury) should exceed 25 bar (355psi).

Minimum permissible compression of a worn engine should be $22^{+}_{-}2$ bar ($313^{+}_{-}28$ psi).

Bear in mind that an altitude of 100 meters above sea level entails a 1% decrease of the atmospheric pressure.

Maximum permissible deviation of the compression among cylinders is 3 bar (42.6 psi).

Compression anomalies may be originated by defective operation of the following parts: valves and seats, pistons and rings, cylinder sleeves and cylinder head gasket.

NOTE - Test results do not have an absolute significance, as the test is mainly aimed at checking the uniformity of compression in the various cylinders.

FL 5 - FL5B
FD 5

3. TRANSMISSION

CONTENTS

3. TRANSMISSION

3.1 REMOVAL AND 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.

WARNING

Guard against kinking chain or cables. Always wear heavy gloves when handling chain or cable.

WARNING

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cables or chain.

Remove the transmission from the machine as follows:

- Position machine in a workshop equipped with a hoist.

- Remove engine-transmission assembly as described in the "Engine Related Parts" section of the appropriate manual.

- Rest assembly on stand 75297150 (B, fig. 3-1).

- Remove starter on R.H. side of engine and loosen screws securing flywheel to flexible coupling (1, fig. 3-5) through aperture in flywheel housing as shown in fig. 3-2.

- Support assembly using hook 75296618 (A, fig. 3-3) and take up slack in chain.

- Loosen screws connecting transmission to flywheel housing and remove assembly (fig. 3-3).

IMPORTANT

Screws connecting transmission housing to engine block are 11 only, as the hole corresponding to control valve is not used. This to allow removal and installation of transmission group including control valve on engine block.

To install the transmission, reverse the removal procedure, bearing in mind the following points:

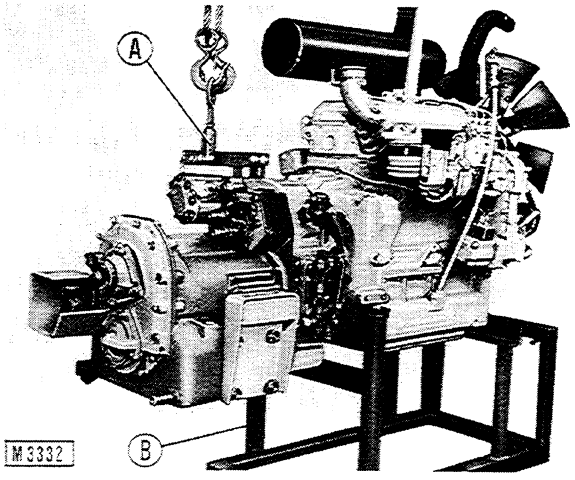


Fig. 3-1 - Engine - transmission assembly in position on stand 75297150 (B)
A. Lifting hook 75296618

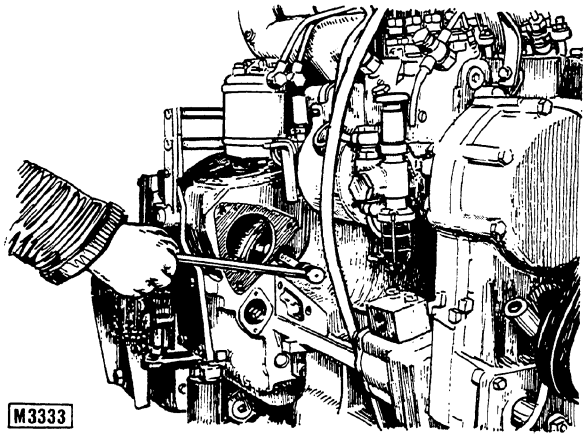


Fig. 3-2 - Disassembling (assembling) screws securing flexible coupling to flywheel.

WARNING

Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable, non-toxic solvents.

WARNING

Use proper tools to bring holes into alignment. DO NOT USE FINGERS OR HANDS.

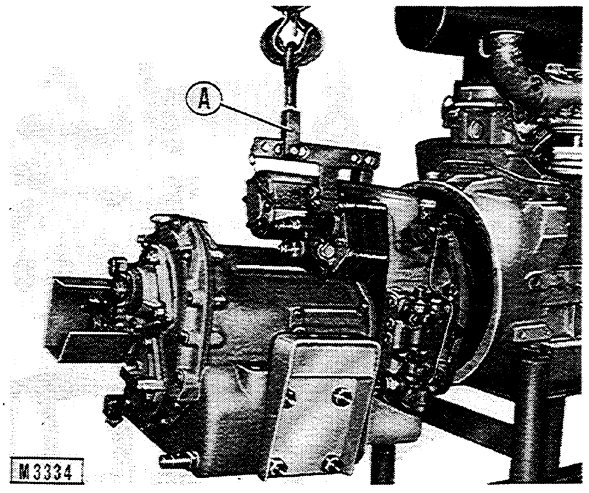


Fig. 3-3 - Removing (installing) transmission from engine.
A. Lifting hook 75296618.

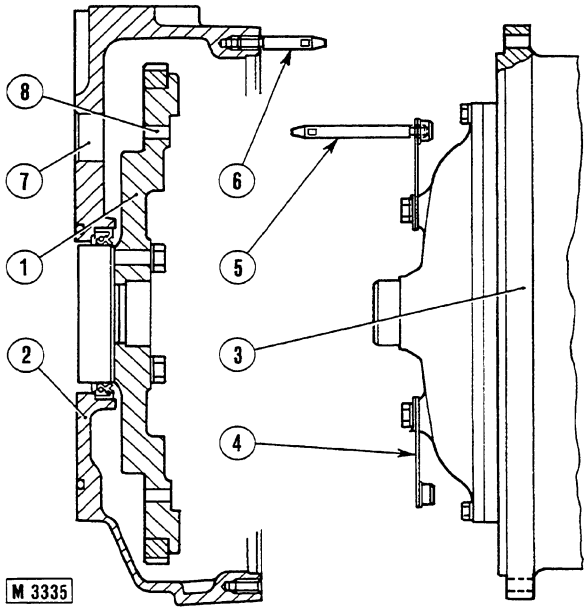


Fig. 3-4 - Transmission connection to engine. 1. Flywheel - 2. Flywheel housing - 3. Transmission case - 4. Torque converter - flywheel flexible coupling - 5. Pilot pin 75297151 - 6. Pilot pins 75297152 - 7. Aperture on housing (2) for access to coupling screws - 8. Holes for screws securing coupling (4) to flywheel.

DANGER

Adhesive are extremely flammable. Follow the manufacturers instructions when applying.

- Thoroughly clean transmission and engine-mating surfaces and apply VIT type C or BETTER sealant.

- Thoroughly clean flywheel center hole and flexible coupling mating surfaces.

- Measure crankshaft end float using a dial gauge and record value.

- Install two pilot pins 75297152 (6, fig. 3-4) in two top flywheel housing holes.

- Turn flywheel until one of holes (8) is aligned with hole (7) on housing.

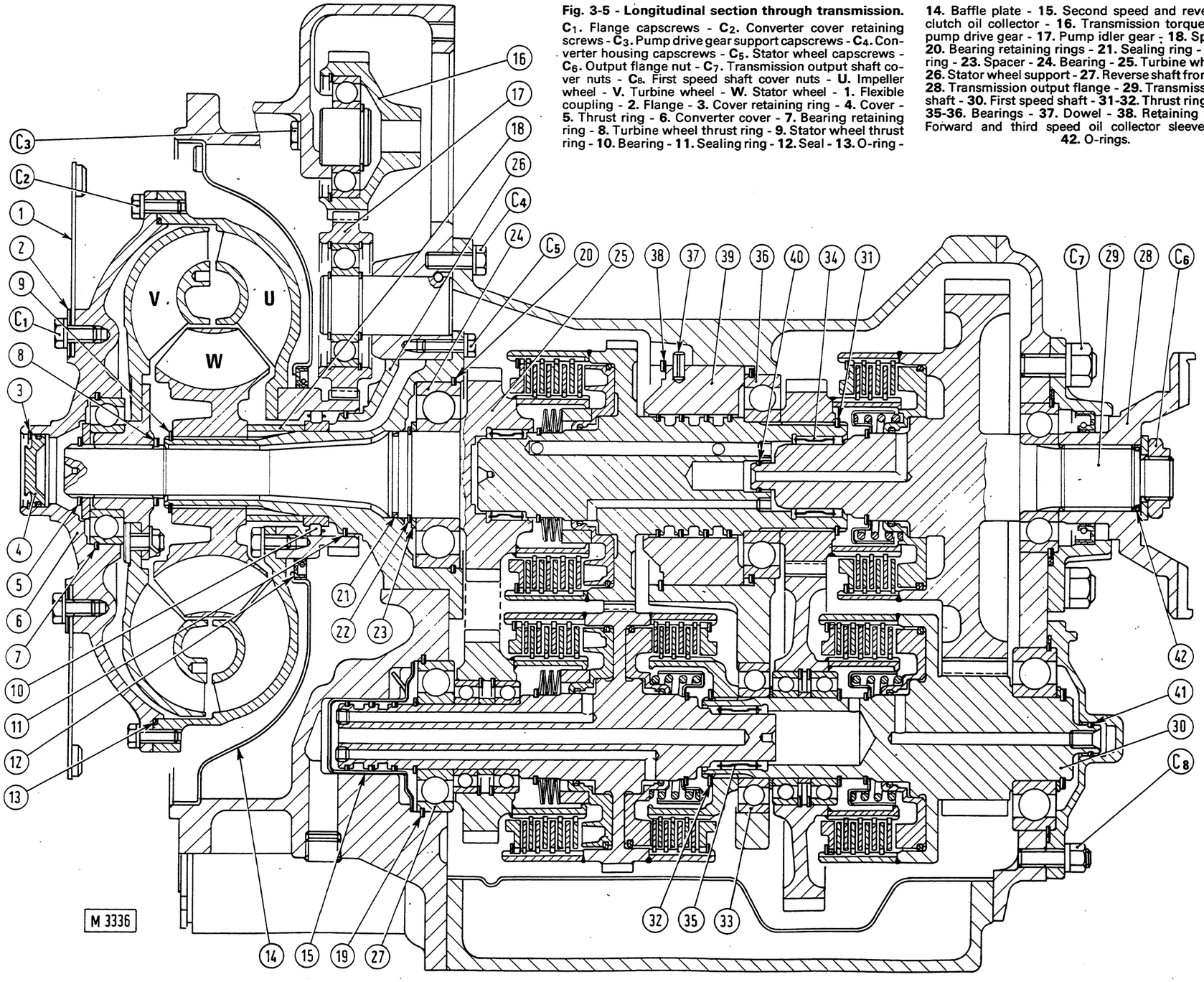


Fig. 3-5 - Longitudinal section through transmission.
C_1. Flange capscrews - C_2. Converter cover retaining screws - C_3. Pump drive gear support capscrews - C_4. Converter housing capscrews - C_5. Stator wheel capscrews - C_6. Output flange nut - C_7. Transmission output shaft cover nuts - C_8. First speed shaft cover nuts - **U.** Impeller wheel - **V.** Turbine wheel - **W.** Stator wheel - **1.** Flexible coupling - **2.** Flange - **3.** Cover retaining ring - **4.** Cover - **5.** Thrust ring - **6.** Converter cover - **7.** Bearing retaining ring - **8.** Turbine wheel thrust ring - **9.** Stator wheel thrust ring - **10.** Bearing - **11.** Sealing ring - **12.** Seal - **13.** O-ring - **14.** Baffle plate - **15.** Second speed and reverse speed clutch oil collector - **16.** Transmission torque converter pump drive gear - **17.** Pump idler gear - **18.** Spacer - **19-20.** Bearing retaining rings - **21.** Sealing ring - **22.** Thrust ring - **23.** Spacer - **24.** Bearing - **25.** Turbine wheel shaft - **26.** Stator wheel support - **27.** Reverse shaft front bearing - **28.** Transmission output flange - **29.** Transmission output shaft - **30.** First speed shaft - **31-32.** Thrust rings - **33-34-35-36.** Bearings - **37.** Dowel - **38.** Retaining ring - **39.** Forward and third speed oil collector sleeve - **40-41-42.** O-rings.

- Install pilot pin (5, fig. 3-4) 75297151 on flexible coupling (4) and turn coupling to align pin (5) with holes (8 and 7).

- Connect transmission housing (3) to flywheel housing (2), install capscrews and tighten to specified torque. Remove pins (6) and replace with capscrews.

- Remove pin (5) through front aperture on flywheel housing and replace with a capscrew and washer, hand tightening only.

- Turn flywheel and hand tighten the remaining screws retaining coupling (4) to flywheel. When all screws are in position torque to 1.9 to 2 daN.m (14 to 15 lb ft).

- Check that crankshaft end float is within ± 0.025 mm (.001 in) of previous measurement with the engine detached from the transmission.

3.2 TORQUE CONVERTER

See section 4 for a description of the transmission and hydraulic system (oil pump, valve block, valves) operation.

3.2.1 CONVERTER HOUSING REMOVAL

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.

Position transmission on revolving stand 75295740 (fig. 3-6) by means of brackets 75296679 and proceed as follows:

- Remove transmission torque converter pressure pump.

- Using retainer 75297149 secure transmission output shaft as shown in fig. 3-7.

- Loosen screws (C_1, fig. 3-5) retaining flange (2) and flexible coupling (1).

- Remove retaining ring (3) and cover (4).

- Take off thrust ring (5) through cover centre hole as shown in fig. 3-8.

- Loosen screws (C_2) and withdraw converter cover (6).

- Withdraw turbine wheel (V) from splined shaft.

NOTE - The turbine wheel (V) may remain in the converter cover (6) in which case withdraw wheel from cover.

- Remove turbine wheel thrust ring (8).

- Take off retaining ring (9) and withdraw stator wheel (W) and spacer (18).

- Remove impeller wheel (U) complete with pump drive gear.

- Using tool 75296845 withdraw sheet metal baffle plate (14) separating converter housing from transmission case as shown in fig. 3-9.

- Loosen all but two of converter housing screws (C_4, fig. 3-5).

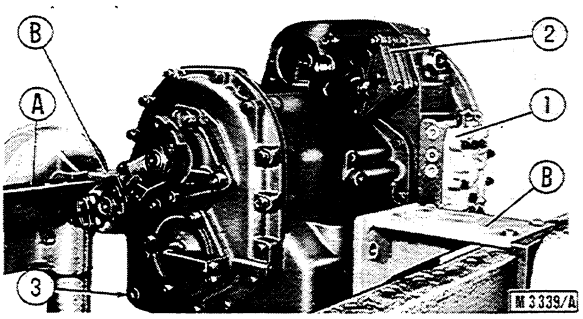


Fig. 3-6 - View of transmission in position on revolving stand
A. Revolving stand 75295740 - B. Brackets 75296679 - 1. Valve block - 2. Transmission - torque converter pressure pump - 3. Oil filler line.

- Rotate stand so that transmission is vertical as shown in fig. 3-10.

- Support converter housing using lifting chain 75291517 (A, fig. 3-10) and loosen the last two screws (C_4, fig. 3-5) securing converter housing to transmission case.

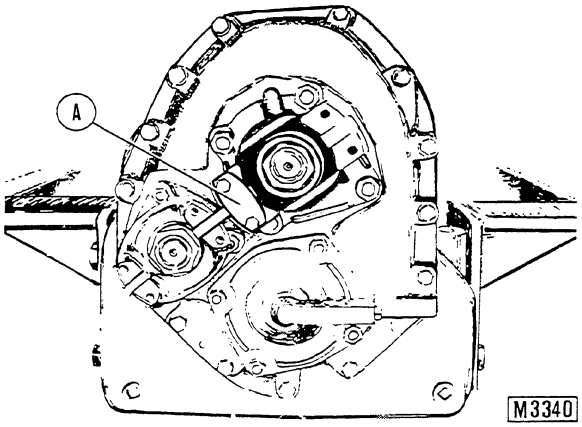
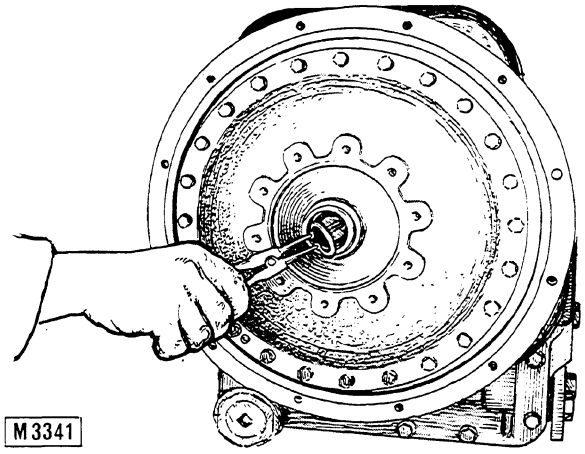


Fig. 3-7 - Securing transmission output shaft using retainer 75297149 (A).

- Using the pliers shown in detail a) fig. 3-10, open out reverse speed clutch front bearing retaining ring (19, fig. 3-5). Hold the ring open and lift converter housing off transmission case and lower to ground.



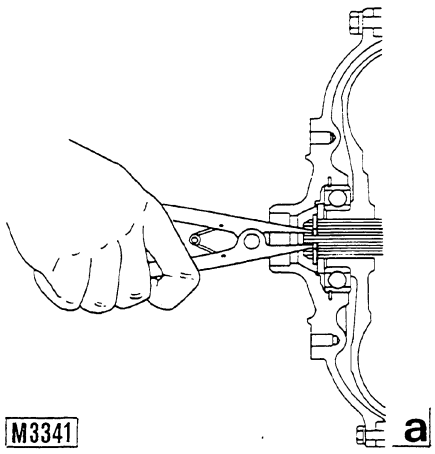


Fig. 3-8 - Removing or installing converter cover bearing retaining ring.
a. Detail.