FIATALLIS®

FR140.2

EFF. S/N 180-UP

WHEEL LOADER

SERVICE MANUAL

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ISSUE 1
JULY 1998

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SERVICE MANUAL

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⚠ THIS ALERT SYMBOL SIGNALS IMPORTANT MESSAGES INVOLVING YOUR SAFETY.

Read and heed carefully the safety instructions listed and follow the precautions recommended to avoid potential risks and to safeguard your health and safety.

You will find this symbol in the text of this Manual referred to the following key words :

WARNING - Cautions directed to avoid improper repair interventions involving potential consequences for the operator's safety.

DANGER - These warnings qualify specifically potential dangers for the safety of the operator or other persons directly or indirectly involved.

IMPORTANT NOTICE

All maintenance and repair interventions explained in this Manual must be performed exclusively by the Service Organization or the Manufacturer, observing strictly the instructions explained using, whenever necessary, the recommended specific tools.
Whoever performs the operations reported without following exactly the precautions is responsible on his own, for the damages that may result.

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AVOID ACCIDENTS

Most accidents and injuries occurring in industry, on the farm, at home or on the road, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason, MOST ACCIDENTS CAN BE PREVENTED by recognizing the real cause and taking the necessary precautions, before the accident occurs.
Regardless of the care used in design and construction of any type of equipment, there may be conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.
A careful operator is the best insurance against accidents. The complete observance of one simple rule would prevent many thousands serious injuries each year.
This rule is : Never attempt to clean, lubricate or adjust a machine while it is in motion.

WARNING

On machines having hydraulically, mechanically and/or cable controlled equipment (such as showels, loaders, dozers, scrapers etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing.
If it is necessary to have the equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical device used for controlling the equipment.

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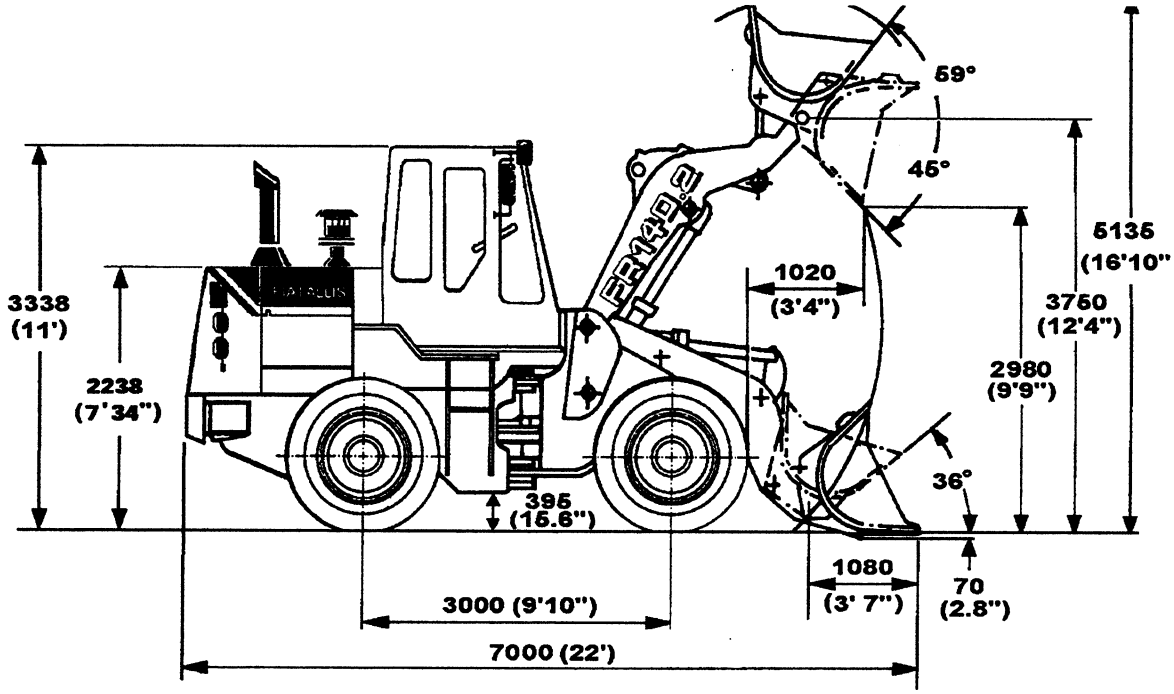
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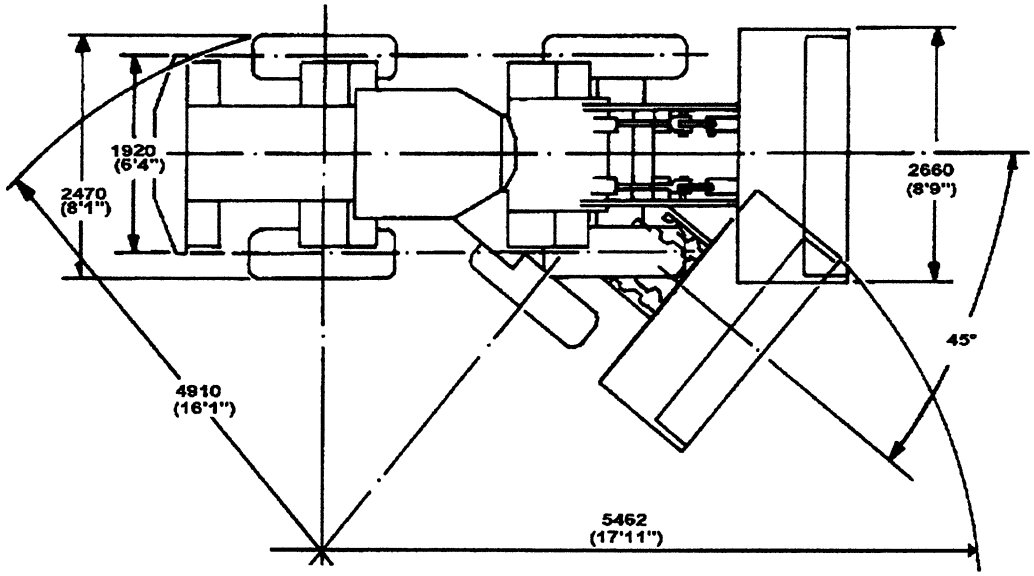
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IDENTIFICATION

FR 140.2 ..... WHEEL LOADER

ENGINE

Make ..... Cummins
Model ..... 6 CT 8.3
Type: Diesel, in line, vertical, 4 stroke , direct injection, turbocharged, open combustion chamber, water cooled.
Number of cylinders 6
Bore ..... 114 mm (4.5 in)
Stroke ..... 135 mm (5.3 in)
Total displacement ..... 8.270 cm^3 (505 in^3)
Net flywheel power
- (DIN 6270) ..... 163 CV (120 KW)
- (SAE J 1 349) ..... 160 HP (120 kW)

Maximum torque (at 1.500 rpm) ..... 651 Nm
..... 480 lb.ft
Governed rpm 2.200
Fuel Injection Pump ..... Robert Bosch
Low Idle ..... 700-800 RPM
High Idle ..... 2372 - 2460 RPM
Compression Ratio 17.3:1
Valve Clearance:
- Intake (engine cold) ..... 0.30 mm (0.012")
- Exhaust (engine cold) ..... 0.61 mm (0.024")

Fuel Injection Timing ..... 22° before TDC

LUBRICATION

Type ..... full pressure, full flow
Pump type ..... gear pump
Filter: ..... replaceable micro filter

INJECTION SYSTEM

Fuel pump ..... Robert Bosch
Firing order 1-5-3-6-2-4
Valve opening pressure ..... 1.5 Bar
Fuel injectors release pressure ..... . .206 to 213 bar
..... 2990 to 3090 PSI

RADIATOR

Type Soldered construction, brass tube and copper fin core
Core size
Cap release pressure ..... 0.49 Bar (15 PSI)

AIR FILTER

Make ..... Turbofil
Type: Turbo dust air, dry, aspirated with secondary element

OIL FILTER

Type ..... Single replaceable element
BY PASS pressure ..... Bar

FUEL FILTERS

Two cartridges in series.

TRANSMISSION

Make ..... Clark
Model ..... 13 HR 28.441 series 01 6154
Full power-shift, countershaft, 4 forward and 4 reverse speeds, electric over hydraulically operated by a single lever on steering column. Operator selected transmission cut- off. Four wheel drive.

Speeds Forward & reverse)	km/h	mph
1st	6.4	4.0
2nd	12.2	7.6
3rd	24.0	14.9
4th	36.2	22.5

TORQUE CONVERTER

Type ..... single stage
Multiplication ratio 3.2:1

AXLES

Axles with hypoid gear and pinion. Torque proportioning differentials. "Max trac" type.
Rear axle with vertical oscillation of 25° (420 mm/ 16.50" stroke). Planetary reductions at axles end.

Total reduction ratios:

Front axle ..... 1 : 21.097
Rear axle ..... 1 :21.097
Make ..... FIATALLIS (GRAZIANO)

SERVICE BRAKES

Four wheel multidisk oil bath brakes, power assisted hydraulically with an independent circuit for each axle.

Safety : Each of the circuits in the service system is equipped with a nitrogen accumulator that maintains braking efficiency, even with the engine turned off.

PARKING BRAKE

Mechanically actuated, drum type, installed on transmission front axle output shaft

STEERING SYSTEM

Hydraulically controlled by steering wheel and power assisted with a vane pump (also provides hydraulic system control.

Two, double acting power cylinders.

As the steering wheel is turned, one cylinder retracts and the other extends. This causes the loader to pivot (articulate) where the front and rear frame sections are joined.

Type ..... Hydrostatic

Maximum pressure ..... 185 Bar (2680 PSI)
Displacement ..... 800(CM^3/rev)

Impeller thickness ..... 38.1 mm (1.50")
Pump min. flow ..... 44.40 l/min(11.7 gpm))
Steering pump type ..... vane

Cylinders ..... 02 (two)
Bore and stroke ..... 80 x 45 x 440 mm (3.1 x 1.8 x 17.3 in)
Prior flow nom. ..... 88 l/min (23 gpm)
Maximum pressure ..... 185 kgf/cm^2 (2630 PSI)

Emergency steering (optional)

IMPLEMENT HYDRAULICS

Pressurized reservoir, electrically welded and chemically treated for total protection.
Hydraulic line provided with suction and return filter.
Reservoir filler neck provided with screen type filter.
Bucket and boom operated by a single lever. Boom kick-out and bucket automatic leveler are electromagnetic.

PUMP

Double stage vane pump, tandem assembled supplies hydraulic power for implement and steering system.

Make ..... VICKERS
Main flow ..... 160 l/min (42 gpm)
Maximum pressure ..... 200 kgf/cm^2 (2843 PSI)

CONTROL VALVE

Three spool control valve with built-in relief and retaining valves.
Model ..... REXROTH M1-4082-02

CYLINDERS

Boom cylinders
Bore and stroke ..... 125 X 63 x 849 mm (4.9 x 2.5 x 33.4 in)

Bucket cylinders ("Z" linkage)
Bore and stroke ..... 110 x 63 x 560 mm (4.3 x 2.5 x 22.0 in)

IMPLEMENT RESPONSE TIME

Boom lift ..... 6.8 s
Boom Lower ..... 2.1 s
Bucket dump ..... 1.1 s
Bucket retract ..... 1.0 s

ELECTRIC SYSTEM

Operating voltage 24V
Battery ..... 142 Ah

ALTERNATOR

Make ..... Robert Bosch
Output ..... 45 A
Optional ..... 70 A

STARTER MOTOR

Make ..... Robert Bosch
Type ..... 24 V
Power ..... 5.5 Kw

BATTERIES

Quantity 2
Capacity 20h
Starting AMP ..... 460 A
Charge duration ..... 240 min
Make ..... Prestolite
Model ..... BSER 21 -P

FRAME

Articulated, consisting of front and rear sections coupled through two ball joints.

Both sections are made of welded sheet steel box sections, carrying the different operational units

WHEELS AND TIRES

Rims ..... 17"
Tires:-
20.5 x 25 - 12 PR tubeless, L3.... ..... standard
17.5 x 25 - 12 PR tubeless, L2.... ..... optional
17.5 x 25 - 16 PR tubeless, L3.... ..... optional
20.5 x 25 - 16 PR tubeless, L3.... ..... optional

CAPACITIES

	liters	U.S gallons
Cooling system	38.0	10.0
Engine oil	20.3	5.4
Fuel tank	200.0	52.8
Axles (front/rear, differential & wheels)	72.0	19.0
Converter and transmission	27.0	7.1
Hydraulic system	123.0	32.5

ACCESSORY EQUIPMENT

Some of the equipment items described and illustrated are supplied to certain markets to meet specific requirements.

Other special devices and attachments are also available as optional equipment. Check with the Sales Organization.

GENERALITIES

Study this Manual before starting, operating, maintaining fuelling or servicing the machine.

Read and heed all safety rules before any intervention.

Do no allow unauthorized personnel to operate service or maintain this machine.

Do not wear rings, wrist watches, jewelry, loose or hang-up apparels, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can attach on moving parts. Wear proper safety equipment as recommended for the job. Examples : hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.

Keep operator's compartment, stepping points, grabrails 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.

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

Do not use controls or hoses as hand holds 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.

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.

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

Do not leave the machine until it is completely stopped.

Check the seat safety belt at least twice a year. If there are signs of wear or fraying or other signs of weakness that could lead to failure, replace it.

STARTING

NEVER START OR OPERATE AN UNSAFE MACHINE. Before operating a machine, always insure that any unsafe condition has been satisfactorily remedied.

Check brakes, steering and attachment controls before moving, Advise the proper maintenance authority of any malfunctioning part or system.

Be sure all protective guards or panels are in place, and all safety devices are in place and in good operating conditions.

Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. WALK COMPLETELY AROUND the machine before mounting. Sound horn. Obey flag man, safety signals and signs.

Before starting machine, check, adjust and lock the operator's set for maximum comfort and control of the machine.

Fasten your seat belt (when provided).

Obey all flag signals and signs.

Due to the presence of flammable fluids on the machine, never check or fill fuel reservoirs or batteries near open flames, smoking materials or sparks.

REMEMBER THAT STARTING FLUID IS FLAMMABLE. Follow recommendations printed on containers and in the Operation and Maintenance Instruction Manual.

DO NOT PUNCTURE OR BURN CONTAINERS.

Containers must be stored in fresh, well ventilated places, out of reach of unauthorized persons. Follow strictly the instructions provided by the Manufacturer.

Never use these products near open flames, smoking materials or sparks.

OPERATING

Check the fasteners of wheels and rims before starting a working shift. If necessary, retighten to the prescribed torque.

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

Roll Over Protective Structures (ROPS) are required on loaders, dozers, graders, excavators. NEVER OPERATE machines without ROPS.

Make sure the Operator's compartment is free of foreign objects, specially if not firmly secured. Never use the machine to transport objects, unless proper securing points are provided.

DO NOT CARRY RIDERS ON MACHINE

Study and familiarize with escape routes alternate to normal exit routes.

Seat belts are required to be provided with Roll Over Protective Structures or cabs. Keep safety belts fastened around you during operation.

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

Make sure that exposed persons in the area of operation are clear of the machine, before starting the engine and operating the equipment. Obey all indications provided by flags and signals.

NEVER COAST the machine down grades and slopes with the transmission in neutral or neutralized, on power shift type machines, or clutch disengaged on manually shifted machines.

Do not operate machine with brakes out of adjustment.

Operate the machine at speeds slow enough to insure complete control at all times.

Travel slowly over rough terrain, on slopes or near dropoffs, in congested areas or on ice or slippery surfaces.

When backing, always look to where the machine is to be moved. Be alert to the position of exposed personnel. DO NOT OPERATE if exposed personnel enter the immediate working area. STOP THE MACHINE.

Maintain a safe distance from other machines. Provide sufficient clearance for ground and visibility conditions. Yield right-of-way to loaded machines.

Maintain clear vision of areas of travel or work. Keep cab windows clean and repaired.

When machines are operating in tandem, the pusher (rear) must be equipped with the appropriate deflectors to protect the unit in front from the air stream coming from the radiator.

When pulling or towing through a cable or chain, do not start suddenly at full throttle ; take-up slack carefully.

Inspect carefully for flaws or damage before using.

Avoid kinking chains or cables. Do not pull through a kinked chain or cable due to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chains or cables.

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

DO NOT PULL UNLESS OPERATOR's COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.

Be alert to soft ground conditions close to newly constructed walls. The fill material and weight of the machine may cause the wall to collapse under the machine.

In darkness, check area of operation carefully before moving in with machine. Use all lights provided. Do not move into area or restricted visibility.

In engine has tendency to stall for any reason under load or idle, report this for adjustment to proper maintenance authority immediately. Do not continue operating the machine, until condition has been corrected.

On machines supplied with suction radiator fans, be sure to periodically check engine exhaust parts for leaks, as exhaust fumes are dangerous to the operator.

Operators must know thoroughly the performance of the machine before operating . When working on slopes or near sudden level drops of the terrain, avoid areas where ground is loose or soft since rolling-over or loss of control of machine could result.

Where noise exposure exceeds 90 dBA for 8 hours, wear approved ear protection.

When counterweights are provided, do not work machine if they have been removed.

Transport a loaded bucket tipped-back and in as low a position as possible for maximum visibility, stability and safest transport of the machine. Move at a proper speed for the load and ground conditions.

The bucket load must always be properly arranged; move with extreme care when transporting oversized loads.

Use only the type of bucket recommended for the machine and the materials to be handled. Follow the recommendations for the loading capacity and the arrangement of the materials, the specifications of the terrain and the job to be performed.

Do not lift and haul loads overhead where persons are standing or working, or downhill when working on slopes; in the latter case, the bucket must be unloaded on the uphill side, whenever possible.

With a full bucket, start and stop the machine carefully; avoid starting without first reducing the engine r.p.m.

Overtaking maneuvres must be performed only when absolutely necessary and unavoidable. Beware of possible uneven terrains, poor visibility conditions, the presence of other machinery or persons out of sight.

Operate the machine at a speed adequate to the working conditions in the site and slow enough to insure complete control at all times.

Check monitoring instruments at start-up and frequently during operations. In case of abnormal condition warnings, immediately stop the machine.

Never use the bucket as a man lift or to carry riders.

Never use the machine as a work platform or scaffolding, nor other inappropriate operations (i.e. pushing railway cars, trucks or other machines).

Be alert of people in the operating area of the machine. Load trucks from the driver's side whenever possible.

When operating a machine, know what conditions will be encountered, overhead doors, cables, pipes, bearing load limitation of ground, bridges, floors and ramps.

When roading, find-out what conditions are likely to be encountered, clearances, traffic congestion, type of road surfacing etc. Beware of fog, smoke or dust elements that obscure visibility.

When crossing gullies or ditches, move at an angle with reduced speed after insuring ground conditions will permit a safe traverse.

Explore the working area to identify potential risks such as : slopes, overhangs, pits, demolition rubble, fires, ravines, ditches, soft terrain, heavy traffic, crowded parking areas, closed ambients. In such conditions, proceed with extreme care.

Whenever possible, avoid going over obstacles such as rough terrain, rocks, logs, highly irregular ground, steps, ditches, railroad tracks. When obstructions must be crossed, do so with extreme care at an angle, if possible.

Reduce speed, shift-down. Ease up the brake over point, pass the balance point slowly on the obstruction and ease down on the other side.

In steep downhill operation, do not allow engine to overspeed. Select proper gear before starting down grade.

Avoid side hill travel, whenever possible. Drive up and down the slope. Should the machine slip sideways, turn it immediately downhill.

The grade of slope you should attempt will be limited by factors such as condition of the ground, load being handled, type of machine, speed of machine and visibility.

There is no substitute for good judgement when working on slopes.

Avoid operating equipment too close to an overhang or high wall, either above or below the machine. Be on the lookout for caving edges, falling objects and slides. Beware of concealed brush and undergrowth .

When pushing-over trees, the machine must be equipped with proper overhead guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.

Avoid brush piles, logs or rocks.

NEVER DRIVE OVER THEM or other surface irregularities that brake traction with the ground, especially when on slopes or near drop-offs.

Be alert to avoid changes in traction conditions that could cause loss of control. DO NOT DRIVE on ice or frozen ground conditions when working the machine on steep slopes or near drop-offs.

Working in virgin and rough terrains is characterized by the presence of all the perils and risks listed above. In these conditions, it is emphasized the danger represented by large tree limbs (possibly falling on the machine), large roots (acting as a leverage under the machine when uprooted causing the roll-over of the unit) etc.

STOPPING

When the machine is stopped for whatever reason, follow the instructions of chapters "Stopping the Machine" and "Stopping the Engine" of the Operation and Maintenance Instruction Manual.

Always remember to position the transmission drive control in neutral and engage the control lock to secure the machine.

Set parking brake (when provided).

NEVER LEAVE THE MACHINE UNATTENDED with the engine running. Always before leaving the operator's seat and after making sure all people are clear of the machine, slowly lower the attachments or tools flat on the ground in a positive ground support position.

Park in a non-operating and no-traffic area or as instructed. Park on firm level ground if possible. Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movements. Set parking brake.

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and signals as required. Also provide advance warning signals in the traffic lane of approaching traffic.

Keep head, body, limbs, hands and feet clear of the dozer, arms, bucket or ripper in lifted position.

Always disconnect the master switch before any intervention (i.e. cleaning, repairing, maintaining, refuelling etc.). Do the same when parking for prolonged periods of time to avoid accidental or unauthorized starting.

Never lower attachments or tools other than seated

in operator's seat. Sound horn. Make sure area near the attachment is clear. Lower the attachment slowly. DO NOT USE FLOAT POSITION of hydraulic system.

Securely block the machine and lock it every time you leave it unattended. Return keys to authorized security. Make sure all shut-down procedures of the Operations and Maintenance Instruction Manual were followed. Every time you leave the machine, engage parking brake (if equipped).

MAINTENANCE

GENERALITIES

Before operating or performing any intervention on the machine :

- read carefully all the rules contained by this Manual;

- read and obey all safety related plates and instructions located on the machine.

Do not allow unauthorized personnel to perform any maintenance operation. Do not perform maintenance operation without prior authorization. Follow all recommended maintenance and service procedures.

Keep operator's compartment free of all loose objects that are not properly secured.

Do not wear rings, wrist watches, jewelry, loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can attach to moving parts. Wear proper safety equipment as recommended for the job. Examples : hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.

Do not perform any service operation on the machine with a person seated in the operator's compartment, unless he is an authorized operator cooperating in the operation to be performed.

Keep operator's compartment, stepping points, grabrails 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.

Keep shoes free of mud or grease before climbing or operating the machine.

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

Never stand under the boom.

When maintenance operations require moving hydraulically operated attachments by means of machines's hydraulic system, remember that all maneuvres must be made only when seated in the operator's seat. Before starting machine or moving attachment or tools, set brakes, sound horn and call for an all clear. Raise attachment slowly.

Always lock by means of outside devices the machine arms or parts that must be lifted for intervention, while you are below. Do not allow anybody to pass near or even below the lifted and not locked device. If you are not absolutely sure about your safety, do not stay below the lifted device even if it is locked.

Do not place head, body, limbs, feet, hands and fingers near rotating fans or belts or cutting parts of machine, unless they are suitably and safely locked.

Never perform interventions with the engine running, except as called for in a Manual. Do not wear loose clothing or jewelry near moving parts.

When servicing or maintenance require access to areas that cannot be reached from the ground, use a ladder or step platform that meet local an national regulations, to reach the service point. If such ladder or platform are not available, use the machine hand holds and steps as provided. Perform all service or maintenance carefully.

Shop and/or field service platforms or ladders must be constructed and maintained in accordance with local and national regulations.

Disconnect batteries and TAG all controls according to current regulations to warn that work is in progress. Block machine and all attachments that must be raised, according to current regulations.

Due to the presence of flammable fluids, never check or fill fuel tanks, batteries, nor use starting fluid near lighted smoking materials or open flames.

Do not check or fuel the tanks, batteries and accumulators, nor use the starting fluid if you smoke or near open flames. These fluids are flammable !

BRAKES ARE INOPERATIVE when manually released for servicing. Provisions must be made to maintain control of the machine by blocking or other means.

The fuel filling hose must be kept constantly inside the filling neck. From the beginning to the end of the fueling operation to avoid the possibility that sparks due to static electricity are generated.

Use only designated towing or attaching points. Use care in making attachments maintenance. Make sure pins and/or locks are secure before pulling. Stay clear of drawbars, cables or chains under load.

To move a disabled machine, use a trailer or a lowboy, if available. In case towing is needed, use all necessary signals required by local and national regulations, and follow the directions provided in this Manual.

To load/unload a machine from transporter, choose a level surface insuring firm support to the wheels of truck or trailer. Use strong access ramps, with adequate height and angle. Keep surface free of mud, oil or slippery materials.

Anchor the machine securely to the bed of truck or trailer and block wheels or tracks with appropriate wedges.

Never align hole with fingers or hands; always use appropriate aligning tools.

Eliminate all sharp edges and burrs from re-worked parts.

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

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

Never pour gasoline or diesel fuel into open, wide and low containers. Never use gasoline, solvent or other flammable fluid to clean parts. Use exclusively qualified, non-flammable, non-toxic commercial solvents.

When using compressed air for cleaning parts, use safety glasses with side shields or goggles. Limit pressure to 2 bar (30 psi) , in accordance with local and national regulations.

Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.

Do not smoke or permit any open flames or spark near when re-fueling or handling flammable materials.

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

Make sure that all mechanic's tools are in good conditions. NEVER USE tools with mushroomed heads or frayed edges. Always wear eye protections.

Move with extreme care when working under the machine, its attachments and or on or near them. Always wear protective safety equipment as required, such as hard hat, goggles, safety shoes, ear plugs.

When performing operations requiring running of the engine, have a qualified operator in the operator's seat at all times with the mechanic on sight. Place the transmission in neutral and set the brakes and safety lock. KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.

For field service, move machine to level ground, if possible and block it. If work on an incline is absolutely necessary, first block machine and its attachments securely, then move it to level ground as soon as possible.

Do not trust worn and/or kinked chains and cables: do not use them for lifting or pulling operations. To handle them, always use heavy gloves.

Avoid kinking chains or cables. Do not pull through a kinked chain or cable due to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chains or cables.

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

DO NOT PULL UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.

Keep the area where maintenance operations are performed CLEAN and DRY. Eliminate immediately all water and oil spillages.

Do not pile oily or greasy rags; the represent a fire hazard. Store in closed metal container.

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine. Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. Sound horn.

Rust inhibitors are volatile and flammable. Use only in well ventilated areas. Keep open flames away - DO NOT SMOKE - Store containers in a cool well ventilated place, secure against unauthorized personnel.

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

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 welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes, when welding or burning. Wear dark safety glasses near welding zones. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.

Know your jacking equipment and its capacity. Be sure the jacking point use on the machine is appropriate for the load to be applied. Be sure the support of the jack at the machine and under jack is appropriate and stable. Transfer load to appropriate blocking as a safety measure, before proceeding with service or maintenance work, according to local and national regulations.

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.

Steel cables are frayed after prolonged use; always wear appropriate protections (heavy gloves, goggles, etc.). ' Handle all parts carefully. Keep hands and fingers away from structures, gears or moving parts. Use and wear always the appropriate protections.

Compressed air systems can have water deposits created by moisture condensation due to changes of atmospheric conditions. If required, discharge deposits, as instructed.

Before performing any maintenance or service operation, lock the frames of the machine with the appropriate safety device. Remember to remove it at the end of the operation.

If the machine is equipped with hydraulic brakes, make sure that the reservoir is always filled up to the correct level.

Always block all wheels, front and rear, before proceeding with any maintenance or service operation involving the bleeding of braking system or removal of piping or cylinders.

STARTING

Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.

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

REMEMBER THAT STARTING FLUID IS FLAMMABLE. Follow recommendations printed on containers and in the Operation and Maintenance Manual.

Containers must be stored in well ventilated places, out of reach of unauthorized persons. Follow strictly the instructions provided by the Manufacturer.

DO NOT PUNCTURE OR BURN CONTAINERS.

ENGINE

Loosen the radiator cap very slowly, to release pressure from the system, before removing it. All coolant level top ups must be performed with engine OFF.

Avoid that flammable materials touches exhaust parts. Should this be possible, provide the necessary protections.

Do not run engine when refuelling and use care if the engine is hot due to the increased 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 machine is moving. Do not lubricate the machine with engine running.

Do not run the engine with air intakes, doors or protections open.

ELECTRICAL SYSTEM

Disconnect batteries prior to any intervention on machine

or electrical system (cleaning, repair, maintenance).

Should booster batteries be used, remember to connect both ends of the booster cables in the proper manner (+) with (+) and (-) with (-). Avoid short-circuits of the terminals. Follow thoroughly the instructions of this Manual.

Before any intervention, make sure that the main switch is OFF.

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

Before any intervention, make sure that there are no fuel or electrolyte leakages; eliminate them before proceeding with further work.

HYDRAULIC SYSTEM

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.

Stop the engine and release all pressures in the system before removing panels, housings, plugs or covers.

In case pressures must be measured, use instruments of adequate capacity. Always follow the recommended procedures.

TOOLS

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

Prior to any intervention, install all safety devices according to current rules and regulations. In case equipment on the machine must be operated by hydraulic systems, remember to proceed only after seating in the operator's compartment. Make sure that there are no persons in the operating area of the machine. Alert people before operating using the horn and by voice. Move the equipment very carefully.

Do not use machine to transport loose objects, unless proper devices for this purpose are provided.

Clutches and brakes of this machine and eventual auxiliary equipment and attachments (such as operating cylinder or winches control valves) must always be properly adjusted in accordance with the instructions provided by the Manuals of the Manufacturer. Never perform adjustments with engine running, except when called for by the above instructions.

TIRES AND WHEELS

Make sure that the inflation pressure of the tires is according to the specifications issued by the Manufacturer and check it periodically.

Should the pressure be changed, stand on the side of the tire at a safe distance.

Pressure check operations must be performed with unloaded machine and cold tires.

Never use reconditioned tire rims, since eventual welding, heat-treatment or repairs not performed correctly can weaken the wheel, thus causing subsequent damages or dangers.

Do not perform torch cutting or welding operations on rims with inflated tires installed.

Spare tires must be inflated only as far it is necessary to keep the rim components assembled; remember that when not installed on the machine, a tire inflated to maximum pressure can explode.

Maximum care must be taken when handling a tire inflated to maximum pressure.

Before operating on tires, block all wheels, front and rear,

After jacking the machine, block it with stands according to current safety rules and regulations.

Before removing objects from the tire tread, deflate it.

Never inflate tires with flammable gas; explosions and serious bodily injuries may result!

When changing work shift, check that wheel or rim securing screws and brackets are not loose; if necessary, retighten to the prescribed torque.

WARNING

On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, excavators etc.) be certain the equipment is lowered to the ground before servicing, adjusting and/or repairing. If it is necessary to have the hydraulically, mechanically, and/or cable controlled equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the hydraulic lift cylinders, cable and/or mechanical devices used for controlling the equipment.

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1.1 DESCRIPTION

Model FR 140.2 Wheel Loader is equipped with a turbo charged Cummins 6.CT 8.3 diesel engine.

The repair procedures as well as the trouble shooting and testing procedures are listed in the Cummins Shop Manual for the C Series Engines.

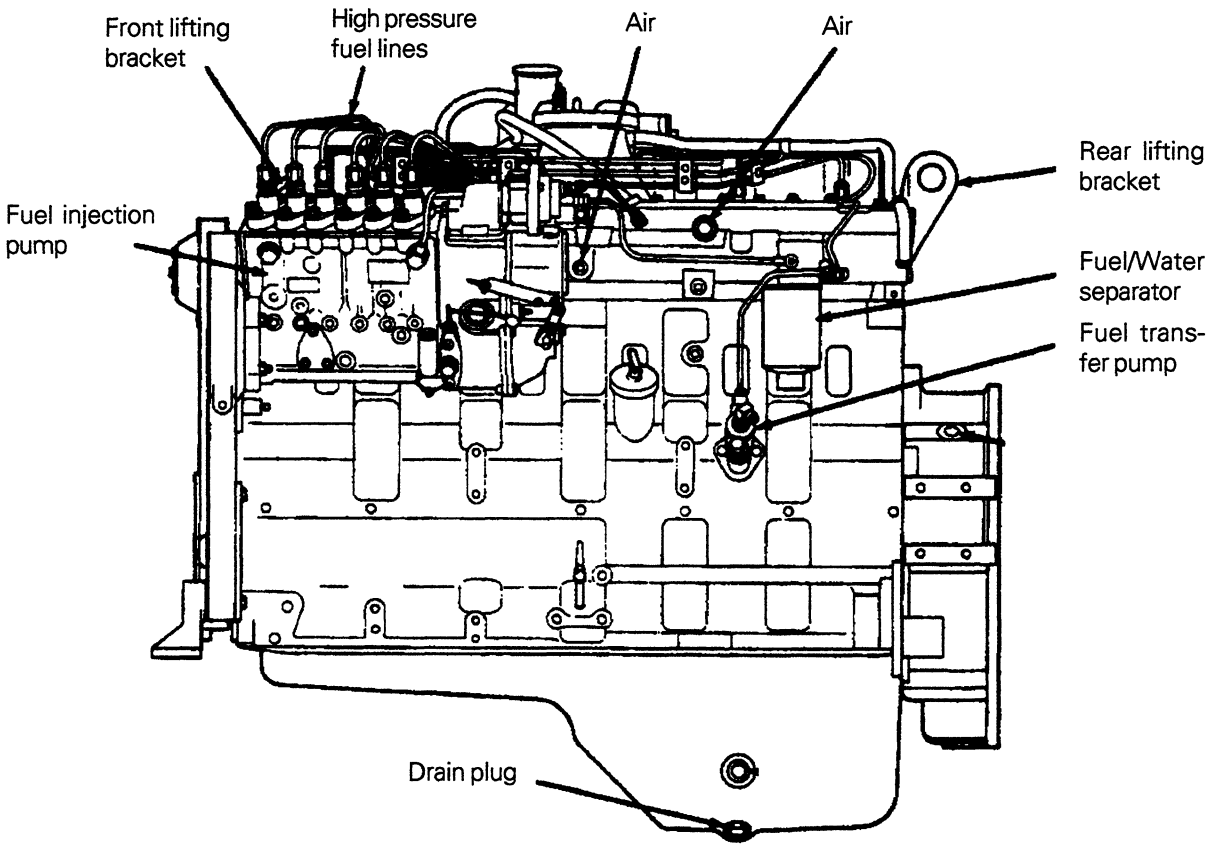

Fig. 1.1 Engine (Fuel pump side view)

1.2 REMOVAL AND INSTALLATION

⚠ WARNING

Position the machine on a flat surface and set the parking brake on .

Position bucket flat on the ground.

⚠ WARNING

*Always turn the master switch to the **OFF** position before cleaning, repairing, servicing or parking the unit, to prevent injuries.*

Remove radiator guards, upper hoods and side panels;

Remove hydraulic reservoir plug and drain oil completely. Collect it in a proper clean container;

Disconnect the hoses from hydraulic reservoir and remove it from the machine;

Disconnect the water and hydraulic oil radiators hoses and remove both radiators from the machine;

Disconnect the fuel system hoses, electric wiring and brake pump hoses mounted on engine side;

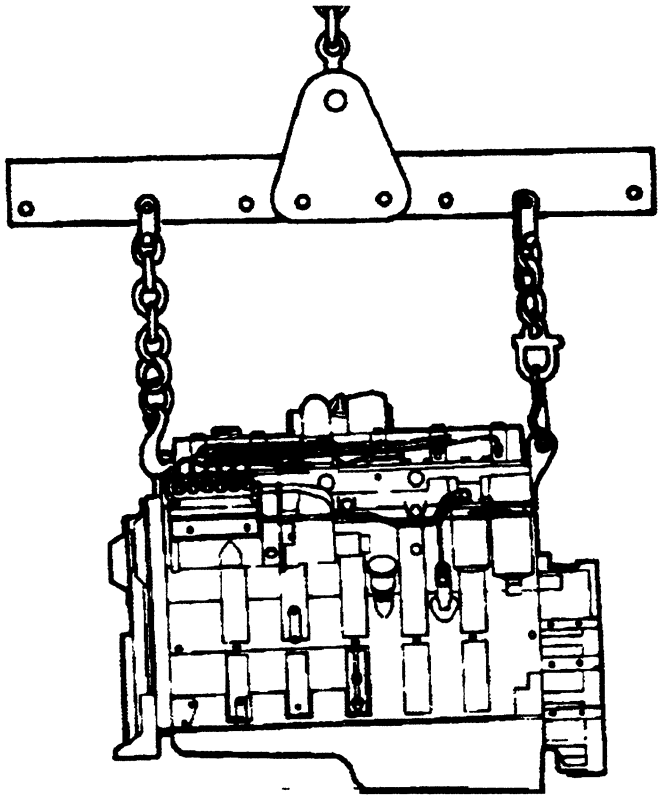

Fig. 1.2 Engine lifting

⚠ WARNING

Lift and handle all heavy parts with equipment of adequate capacity. Make sure that heavy parts are lifted by appropriate links and hooks. Use lifting eyes provided. Watch out for people in the vicinity of the load being lifted.

Secure the hooks of a hoist to the engine lifting eyes, to hold and balance the load of the engine.

Remove the screws **1** (8 x 70926166) fixing transmission housing to engine;

Remove the engine mounts securing screws **2** (4x11112431);

Lift the engine gently and extract it from the machine, pulling it forward.

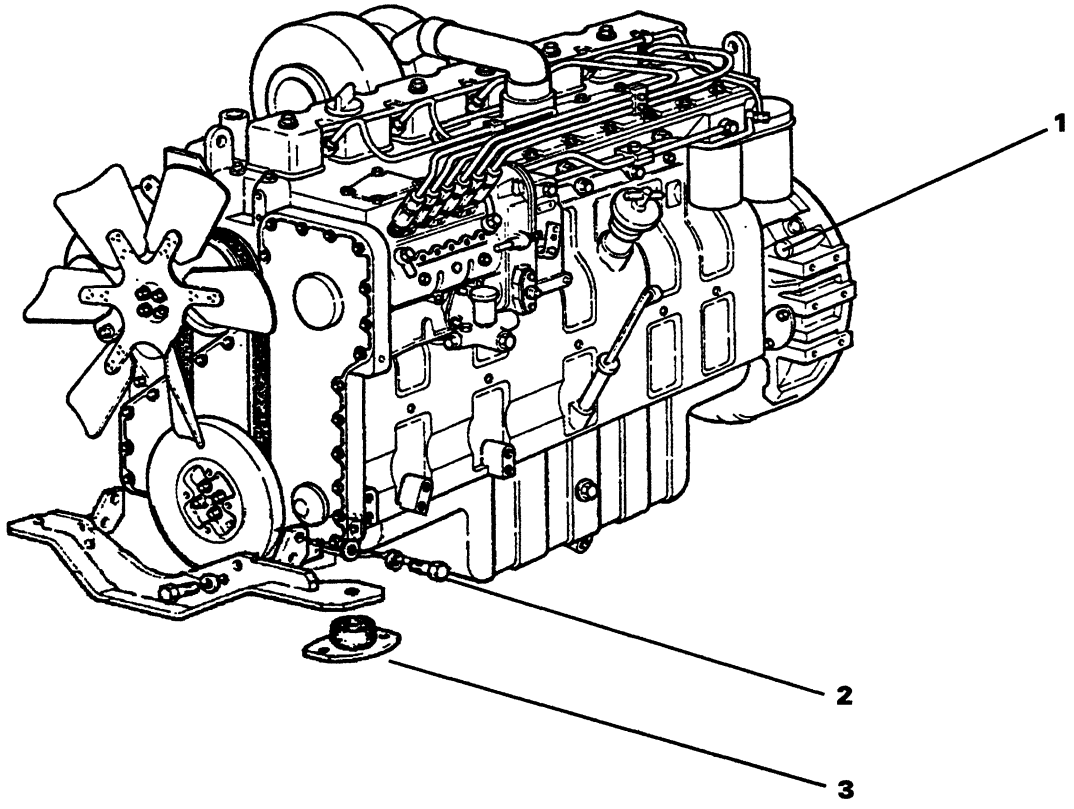

Fig. 1.3 Engine supports

1. Screw fixing engine to transmission housing - **2**. Engine bracket securing screws- **3**. Cushion

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2.1 DESCRIPTION

Model FR 140.2 Wheel Loader is equipped with a Clark 28000 Powershift transmission.

The repair procedures as well as the trouble shooting and testing procedures are listed in the Clark Manual for the transmission 28000 R & HR models.

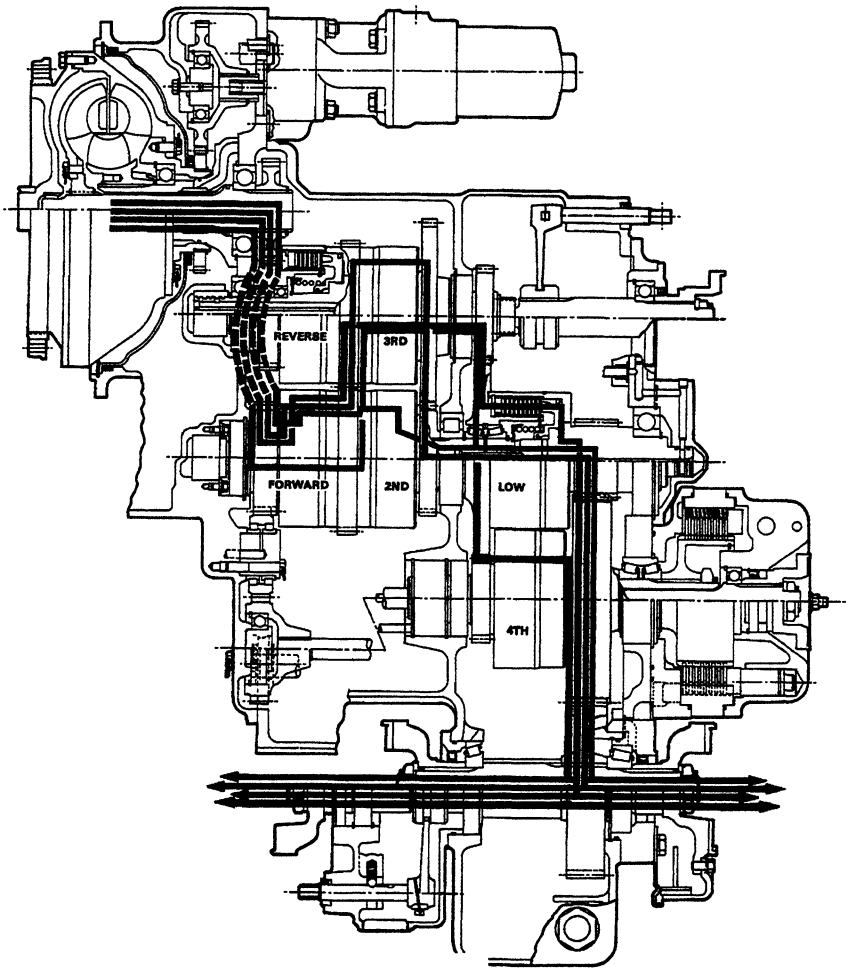

Fig. 2.1 Transmission section view

2.2 REMOVAL AND INSTALLATION

⚠ WARNING

Position the machine on a flat surface and set the parking brake on .

Position bucket flat on the ground.

⚠ WARNING

*Always turn the master switch to the **OFF** position before cleaning, repairing, servicing or parking the unit, to prevent injuries.*

After removing the engine as described in chapter 1, proceed as follows ;

Sling appropriately the transmission and place it in a lifting position with the hoist;

Remove the front and rear propeller shafts;

Tag and remove the transmission oil control level hoses;

Disconnect and tag the sensor wirings;

Tag and remove the hydraulic pump to control valve hoses;

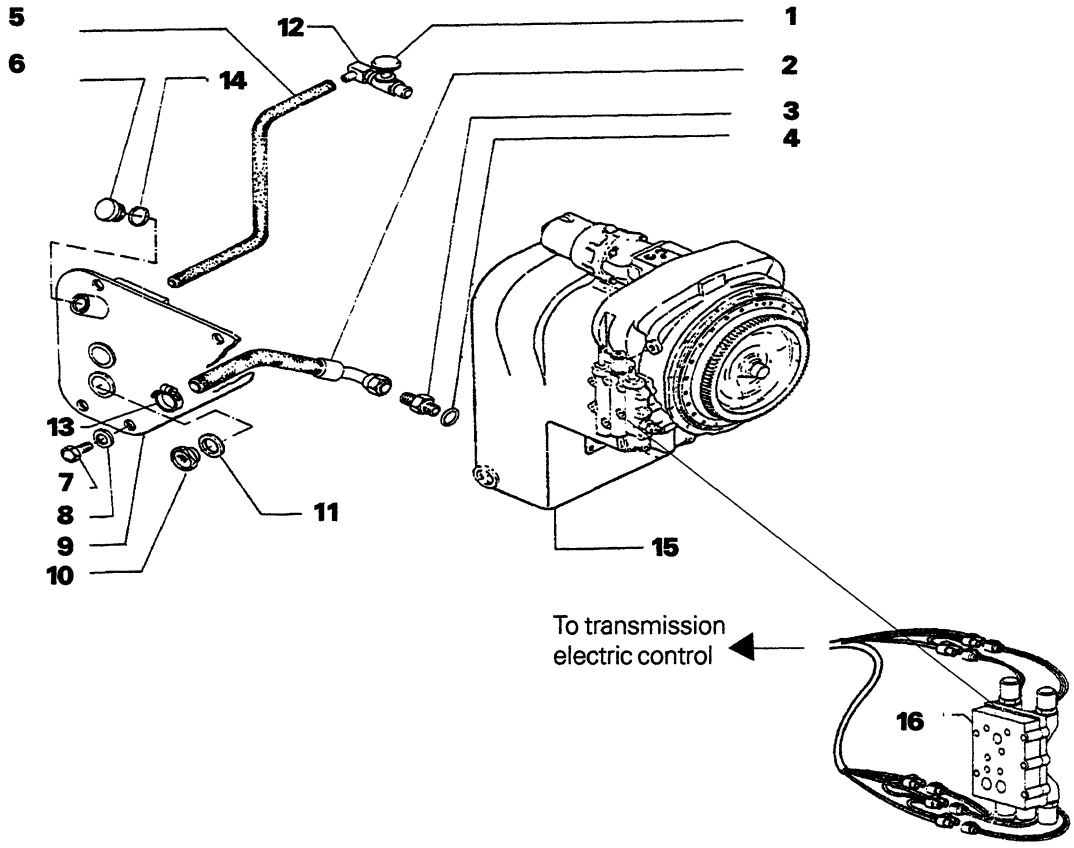

Fig. 2.2 Transmission electric & oil check connections

1. Fitting - **2**. Hose - **3**. Nipple - **4**. Seal ring - **5**. Hose - **6**. Cover - **7**. Screw - **8**. Cover - **9**. Lock Washer - **10**.- Oil level indicator - **11**. Seal ring - **13**. Elbow - **14**. O'ring - **15**. Transmission - **16**. Control valve

⚠ WARNING

Lift and handle all heavy parts with equipment of adequate capacity. Make sure that heavy parts are lifted by appropriate links and hooks. Use lifting eyes provided. Watch out for people in the vicinity of the load being lifted.

Loosen and remove the two nuts (12164521) fixing the transmission to the supports;

Lift the transmission carefully and remove it from the machine;

For installation, reverse the operations described for removal.

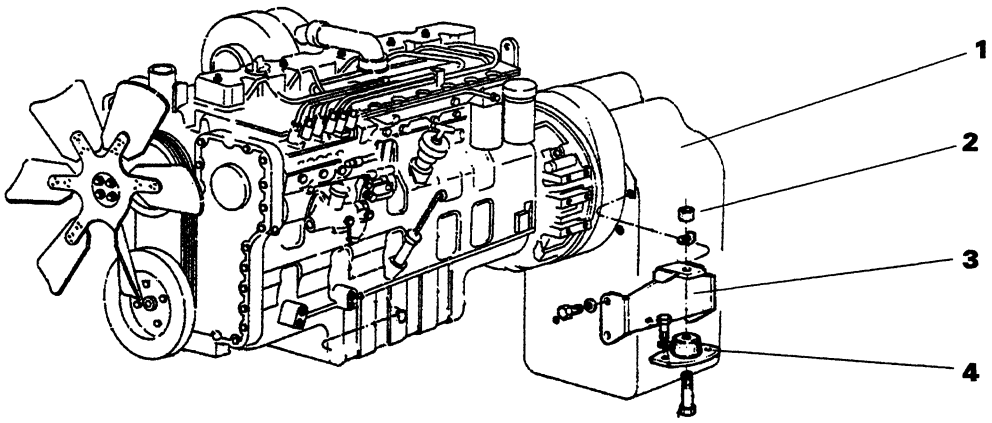

Fig. 2.3 Transmission supports

1. Transmission **2**. Nut (12164521) - **3**. Bracket - **4**. Mount

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3.1 DESCRIPTION

Rigid full-floating type front axle.

Oscillating, full floating type rear axle with a support rigidly mounted on the machine frame

The axles are constantly engaged and are driven by the shafts connected to the transmission output.

Each axle includes :

Bevel gear unit, differential, planetary final drives and built-in brakes.

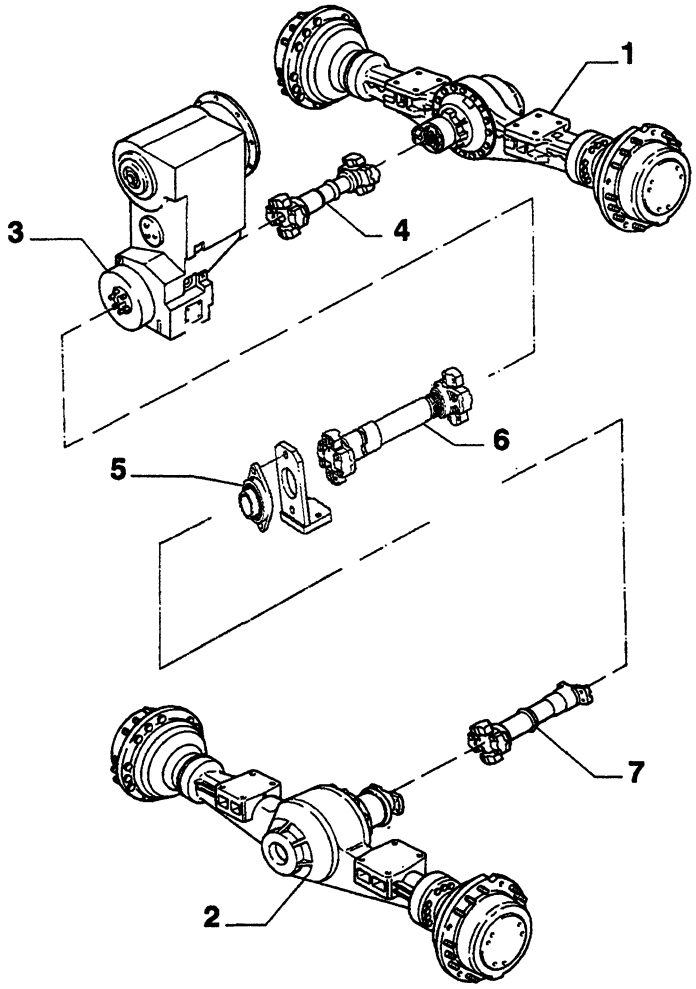

Fig. 3.1 - Axle drive diagram.

1. Rear axle - 2. Front axle - 3. Transmission - 4. Rear axle drive shaft - 5. Support - 6. Front axle intermediate drive shaft - 7. Front axle drive shaft