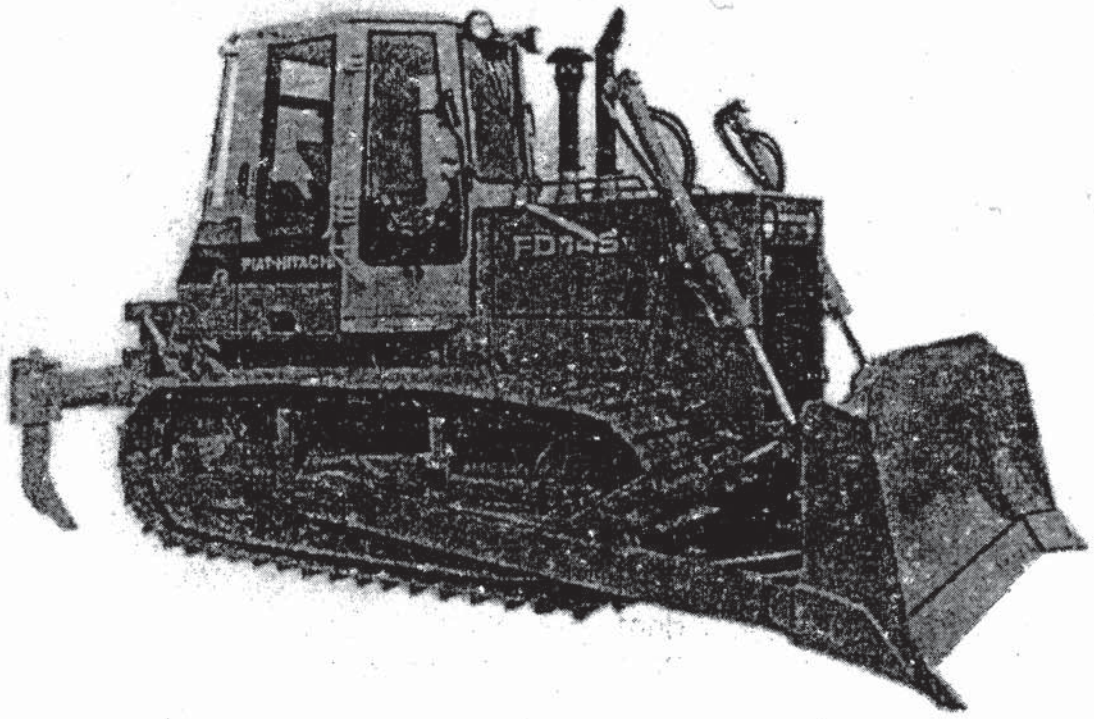
FIATALLIS®

FD 145

crawler tractor

Service Manual

Form 604.06.580 English



AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, 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 doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment there are conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident.
The complete observance of one simple rule would prevent many thousand serious injuries each year.
That rule is:

Never attempt to clean, oil or adjust a machine while it is in motion.

WARNING

On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, 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 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.

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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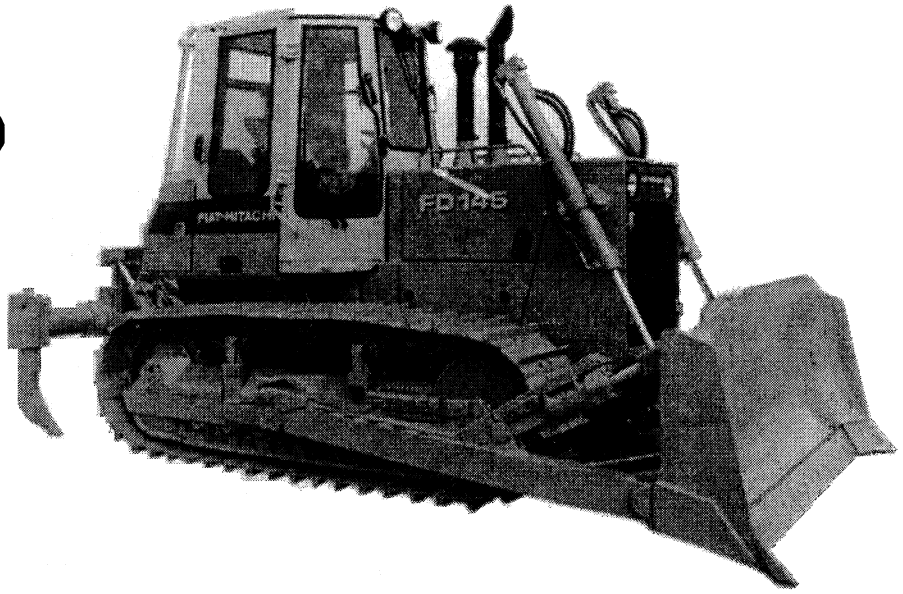

Service Manual

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THIS SYMBOL IS YOUR SAFETY ALERT SIGN. IT MEANS ATTENTION! YOUR SAFETY IS INVOLVED.

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

Read and head all safety instructions carrying the signal words WARNING and DANGER.

WARNING - Warning for not suitable repair interventions, involving the operator's safety.
DANGER - Signalization of possible dangers to the safety of the operator and other people directly or indirectly involved.

IMPORTANT INSTRUCTIONS

All maintenance and repair works of this Manual **must be performed by the Manufacturer's maintenance network only,** according to the specific instructions and by using, if needed, the specific tools.
Anybody performing these operations without following the instructions carefully shall be directly liable for damages.

The Manufacturer and his distribution network, including but not limited to national, regional or local distributors shall not be liable for any damage that may be caused by a misfunction of parts a/or components that are not approved by the Manufacturer and are used in service a/or repair of the product sold by the Manufacturer.
No warranty is given by the Manufacturer for any damage deriving from anomalous operation of parts a/or components that are not approved by the Manufacturer.

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, 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 doing something about it before the accident occurs.
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On machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, 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 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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SAFETY RULES

GENERAL

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

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

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

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

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 machine. Keep two hands and one foot, or two feet and one hand in contact with steps, grab rails and handles at all times.

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

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, hand rails and on the ground.

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

Check safety belt of the seat twice a year at least. If the belt is torn or damaged, which could cause a breaking down, change it.

START

DO NOT START AN UNSAFE MACHINE. Before working the machine, be sure 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 in good operating condition.

Be sure exposed personnel in the area of operation are clear of the machine before moving the machine or its attachments. WALK COMPLETELY AROUND machine before mounting. Sound horn.

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

Fasten seat belts (where needed).

Obey flag man, safety signals and signs.

Because of the presence of flammable liquid on board, never check or fuel the tanks, batteries and accumulators near fire, free flame or sparks.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operation and Maintenance Instruction Manual and as marked on the containers.

DO NOT PUNCTURE OR BURN CONTAINERS.

Store containers in cold, well-ventilated place secure from unauthorized personnel. Follow the Manufacturer's instructions.

Never use these products near fire, free flame or sparks.

OPERATION

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

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

Always keep the operator's area clear of any object, especially if it is not fastened. Do not use machine for object transport, if the objects do not dispose of suitable fastening connections.

SAFETY RULES

Check instruments at start-up and frequently during operation. If brake pressure gauge shows a pressure below the minimum service pressure, stop machine immediately.

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

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

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

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

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

Do not operate machine downhill with idle gear. Choose and insert the most suitable speed to maintain the speed necessary to avoid any control lost.

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

Do not operate a machine with brakes out of adjustment.

Operate the machine at a sufficiently low speed, to ensure a maximum control in any case.

Avoid going over obstacles such as rough terrain, rocks, logs, curbs, ditches, ridges and railroad tracks whenever possible. When obstructions must be crossed, do so with extreme care, at an angle if possible.

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 work area.

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 all areas of travel or work. Keep back windows clean and repaired. Carry blade low for maximum visibility while travelling.

Obtain and use fan blast deflectors where tractors are used a pusher tractors in tandem.

When pulling or towing through a cable or chain, do not start suddenly at full throttle. Take up slack carefully. Guard against kinking chains or cables. Inspect carefully for flaws before using.

Do not pull through a kinked chain or cable due to the high stresses and the possibility of failure of the kinked area.
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 OPERATORS 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 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 areas of restricted visibility.

On machines equipped with suction radiator fans, be sure to periodically check all engine exhaust parts for leaks as exhaust gases are dangerous to the operator. Keep a vent open to outside air all times when operating within a closed cab.
An operator must know the machine's capabilities. When working on slopes or near drops off be alert to avoid loose or soft conditions that could cause sudden tipping or loss of control.

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

Never operate machines equipped with counterweights when these have been removed.

Overtaking operations are possible only if they are absolutely necessary. Pay attention to possible ground obstacles and bad visibility, the presence of other machines or personnel hidden to the view.

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

SAFETY RULES

Never operate the machine as a working platform or support, nor for any other unsuitable operation (such as pushing of wagons, trucks or machines).

Be sure exposed personnel in the area of operation are clear of the machine. Always check work area for dangerous features. The following are examples of dangerous working areas: slopes, overhangs, timber, demolitions, fire, high walls, drop off, back fills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

When roading find out what conditions are likely to be met - clearances, congestion, type of surface, etc. Be aware of fog, smoke or dust element that obscure visibility.

Cross gullies or ditches at an angle with reduced speed after insuring ground conditions will permit a safe traverse.

Avoid going over obstacles such as rough terrain, rocks, logs, curbs, ditches, ridges and railroad tracks whenever possible. When obstructions must be crossed, do so with extreme care at an angle if possible. Reduce speed -down-shift. Ease up to 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 start slipping sideways on a grade, turn it immediately downhill.

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

When working on slopes, no rule is better than the operator's experience and common sense.

Do not operate machine too close to slopes, below and over the machine. Be alert because of falling walls, object falling and earth movements. Remember that these dangers are often invisible (bushes, grass, etc.). When attachments are used to fell trees, the machine always must have its top covers. Do not move machine until the roots during tree felling.

When pushing over trees, the machine must be equipped with a 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 a tree with dead branches.

Avoid brush piles, logs or rocks. DO NOT DRIVE THE MACHINE ONTO BRUSH PILES, LOGS, LARGE ROCKS or other surface irregularities that break traction with the ground especially when on slopes or near drop off.

Be alert because of possible adherence variations, that may cause you to loose the control on the machine. On hills and slopes avoid frozen areas.

Operating in virgin rough terrain that includes previously mentioned hazards is called pioneering. Be sure you know how this is done. Danger from falling branches and upturning roots is acute in these areas.

STOP

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

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

The parking brake is inserted automatically.

Never leave the machine unattended with the engine running.

Always before leaving the operator's seat and after making certain all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position.

Return the controls to hold. Place transmission control in neutral and move engine controls to off position.

Consult Operation and Maintenance Instruction Manual.

Park in non-operating and non-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 or uncontrolled sliding movement. Set the parking brake.

If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and warning 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 turn the master switch to the off position before cleaning, repairing or servicing, and when parking machine to prevent unintended or unauthorized starting.

Never attempt to operate the machine or its tools from any position other than seated in the operator's seat. Sound horn. Be sure that no personnel is present in the operating area. The lowering must be made slowly, if the control is a hydraulic one. DO NOT USE THE SWIMMING POSITION.

Lock and close the machine each time it is left unattended. Give the keys to the corresponding controller. Be sure that all operations according to the Operation and Maintenance Instruction Manual have been made.

MAINTENANCE

GENERAL

Before any use or intervention on the machine:
- read carefully all instructions of this Manual
- read and head all plates and instructions referring to safety, that are present on the machine.

Do not allow unauthorized personnel to operate, service or maintain the machine. Do not make any intervention without authorization. Follow the procedures for maintenance and service.

Keep always the operation section clear of any loose object.

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

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

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

Never perform a maintenance operation on the machine if there are people on the seat, unless they are authorized and help in this operation.

The operator's area, the step surfaces and handles must be clean, and clear of any object, or oil, grease, mud or snow, to reduce any skidding or similar danger. Clean your shoes from mud or grease before entering or operating the machine. Never attempt to operate the machine or its tools from any position other than seated in the operator's seat.

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

Always lock by means of outside devices the machine arms or parts that must be lifted for intervention, while your are below. Do not allow to 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 the machine, unless they are suitably and safely locked.

Do not perform any intervention on the machine with running engine, unless it is prescribed so. Do not wear loose clothes, chains, etc. near the moving parts.

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

Ladders and service platforms must meet with the current accident prevention standards.

Disconnect batteries and tag all controls for indicating that an intervention is being made. Lock machine and any device that must be lifted.

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

SAFETY RULES

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 chance of a static electricity spark, keep contact until after fuel flow is shut off.

While towing the machine, use always the corresponding towing points. Make the connections careful: ensure that pins a/or locks are fastened before tension is applied. Do not stay near the towing bars, ropes or chains under load.

For transporting the machine, use a low-table truck, if available. If towing is necessary, follow the specific instructions.

For loading and unloading the machine, choose a flat surface, that offers a sure support to the truck wheels. Use heavy-duty access ramps, with a suitable height and angle. The truck surface must be clear of earth, oil or similar materials.

Anchor the machine to the loading surface of the truck and lock the tracks according to your need.

Never align holes with your fingers; but only with an appropriate centering tool.

Remove any trace of burr from the processed pieces. For electric heaters, battery loaders, pumps and similar, use only auxiliary supply sources, with a suitable ground, to avoid possible electric unloadings.

If heavy pieces are to be lifted or transported, use suitable hoists. Check that slinging is made in the proper way. Use hoist eyes, if foresee. Keep personnel clear of the machine. Never pour gasoline or oil into open, large and low containers. Never use gasoline, oil or other flammable liquids for cleaning, but only authorize commercial solvents, that are non flammable and non toxic.

If compressed air is used for cleaning parts, always use protective glasses, with side protections. Limit pressure up to 2 bar, according to the current standards.

Do not operate the engine in closed rooms, with suitable ventilation, to eliminate deadly exhaust gases.

Do not smoke, do not use any open flame, or cause sparks when filling in fuel, 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.

Check that all tools are always in a good condition. NEVER USE tools with machined heads. Carry always protection glasses.

Be very careful while operating below the machine or its attachments, and near them. Use always the protective devices: helmets, glasses, shoes, ear protections.

When making equipment checks that require running of the engine, have an operator in the operator's seat at all times with the mechanic in sight. Place the transmission in neutral and set the brakes and lock.

Keep hand and clothing away from moving parts.

If an intervention must be made outside the workshop, position the machine on a flat surface, and lock. If the intervention must be made on a slope, lock machine and attachments previously. Replace in a horizontal position as soon as possible.

Stay clear of draw bars, cables or chain under load. Always carry heavy-duty gloves.

Be sure cables are anchored an 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 POTENTIAL CABLE OR CHAIN BACKLASH.

Keep maintenance area CLEAN and DRY. Remove water or oil slicks immediately.

Remove cloths damped with grease and oil: fire danger! Put them always into a closed metal container.

Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine. Be sure that the operating area of machine and attachments is clear of personnel. Give a horn signal.

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

SAFETY RULES

Do not carry in your pockets any object that can fall, not seen, into open sections of machine.

If there is a possibility of injures because of projection of metal parts, always use safety glasses with side protection, hard hats, special shoes and gloves.

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. 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 of 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.

Metal ropes can become worn. Handle always with care and protection devices (gloves, glasses, etc.).

Handle any part with great care. Keep your hands and fingers far away from slots, wheels and similar. Always use the approved tools and protective devices.

The pneumatic systems can contain water deposits, because of the moisture condensation following to the atmospheric variations. Unload these deposits if necessary, according to the Instructions.

START

Avoid running engine in closed areas that do not dispose of a suitable ventilation, to eliminate deadly exhaust gases.

Keep head, body, limbs, feet, hands and fingers away from rotating fans or belts. Be especially alert around a pusher fan.

STARTING FLUID IS FLAMMABLE. Follow the recommendations as outlined in the Operations 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.

ENGINE

Turn off the radiator cap very slowly, to let the pressure out, before removing it. Fill in coolant with stopped engine only.
Avoid that flammable materials can come into contact with the engine outlet system. If this is not possible, supply the machine with the necessary protection grids or covers.

Never fill in fuel with running engine, particularly if this is hot, to avoid any burning danger.

Do not check or adjust the fan belts tension with running engine.

Do not adjust the fuel pump with running engine. Do not lubricate the machine with running engine.

Do not operate the engine with open air intakes, covers and guards.

ELECTRICALS

Shut down the machine and disconnect batteries before any intervention on the electrical system (cleaning, repair, maintenance).

If auxiliary batteries must be used, remember to connect properly cables and clamps. Consult the Operation and Maintenance Instruction Manual.

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

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

Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding. Do not charge batteries in closed environments: be sure ventilation is good so to avoid accidental explosions due to gas accumulation during charge operations.

SAFETY RULES

HYDRAULICS

A fluid leaking out of a very small hole can be almost invisible, and be strong enough to penetrate the skin. When you must look for leakages, always use a piece of strong paper of wood. NEVER USE YOUR HANDS! If fluid comes into contact with your skin, ask for a doctor immediately. Otherwise you could suffer from serious infections and skin damage.

Turn the engine off and be sure all inside circuit pressures have been discharged before removing covers, boxes, caps, etc.

If you must check pressures, use an instrument with a suitable scale end reading. Always follow the instructions.

TOOLS

Hold always your head, body, feet and hands far away from the dozer or ripper, if these are lifted. Before any intervention, apply the corresponding safety devices according to standards.

If you must operate a tool by means of the hydraulic system, remember that the operation must be performed only when you are sitting on driver's place. Be sure that nobody is within the operating area. Signal your operation by the horn and the voice. Lift tool slowly.

Do not use the machine to transport loose objects, if you do not dispose of suitable devices.

Clutches, brakes and possible auxiliary tools and devices (such as control valve groups, etc.) must always be well adjusted according to the instructions.

Do not make any adjustment with turning engine, if this is not prescribed expressly.

When changing work shifts, check that there are no loosen screws and/or brackets. If necessary, tighten according to the instructions.

⚠ WARNING

Be sure that the tool lays on the ground, before any repair, adjustment or maintenance work or machines with hydraulically, mechanically or cable controlled tools (such as excavators, loaders, crawler tractors, scrapers, etc.). If it is necessary to have the hydraulically, mechanically or cable controlled tool partially or totally lifted, to get an access to some machine parts, be sure that the tool is suitable held in position by means other than lifting cylinders, cables or mechanical devices used for tool control.

UNITS OF MEASURE

The units of measure of this Manual are those of the International System, and substitute the former ones of the M.K.S. System.

Force: decanewton (daN) substitutes kilogram (kg)

Pressure: bar substitutes kg/cm²

Torque: decanewton x meter (daN.m) substitutes kg.m

Units of measure conversion table:

	multiply	by	to obtain
Force	kg	0.9807	daN
Pressure	kg/cm²	0.9807	bar
Torque	kg .m	0.9807	daN.m

Note - For common repair use, the following correspondence is valid: kg = daN; kg/cm² = bar; kg.m = daN.m

CLASSIFICATION OF UNIFIED PARTS FOR TORQUE DETERMINATION

Note - If in the different sections the torque value is not indicated, see table "TORQUES" after identifying the part exactly.

The part is identified by a code number (8 figures).

Example:

l - Normal index number

Always with "1". This number means that the part can be produced in various versions, that differ because of material and coating.

a - b - c - d - e - Normal base number

Always with five figures indicating the part in its dimensional features.

f - Material index number

This number indicates the material that is foreseen for a certain part. The meaning is explained in the following table.

g - Coating index number

This number indicates the coating that is foreseen for a certain part.

Material index (f)	FIAT	Resistance class and material				
		UNI	DIN	SAE	BSI	BNA
0	R40	4D- 4S-4A		1	A	42
1	R50	5S-6S		3	P	56
2	R80	8G		5	T	80
3	R100	100	10K	8	V	100
4	Ottone	Ottone	Messing	Brass	Brass	Laiton
5	Alluminio	Alluminio	Aluminium	Aluminium	Aluminium	Aluminium
6	Rame	Rame	Kupfer	Copper	Copper	Culvre
7		Free for other metallic materials				

WARNING

— Lubricate by motor oil all screws and bolts.

— Tolerance on torque: ± 5%

— Resistance classes R8O, R100, R120 must be understood as follows:

10.9 substitutes R100
12.9 " R120 | for screws

10 substitutes R80
12 " R100 | for nuts

CDT = cadmed; FOSF = phosphated; ZNT = zinked

TORQUE TABLES

If the corresponding torque is not indicated, the following tables can aid you for this purpose.

NUTS (ZNT)					SCREWS (ZNT/DEIDR)		
Resistance class: 10 (R80)					Resistance class: 10.9 (R100)		
Diameter and step mm	Normal daNm	Low type daNm	with polyamide ring		Diameter and step mm	Normal ZNT daNm	Selflocking ZNT daNm
			normal da Nm	low type daNm			
M6x1	1.3	1.2	-	-	M6x1	1.3	-
M8x1.25	3.2	2.6	3.9	3.2	M8x1.25	1.3	3.5
M10x1.25	7.2	5.2	8.2	6.2	M10x1.25	7.1	7.9
M10x1.5	6.5	5	7.7	6	M10x1.5	6.5	7
M12x1.25	13	8.7	14.5	10.2	M12x1.25	12.7	13.9
M12x1.75	11	8.1	12.9	9.6	M12x1.75	11	12
M14x1.5	19.5	13	21.6	15	M14x1.5	20	22
M14x2	18	12.5	20	14.6	M14x2	18	19
M16x1.5	30	17	34	20	M16x1.5	30	33
M16x2	-	-	-	-	M16x2	-	-
M18x1.5	45	25	50	29	M18x1.5	45	48
M18x2.5	-	-	-	-	M18x2.5	-	-
M20x1.5	60	30.5	64.5	35	M20x1.5	60	65
M20x2.5	-	-	-	-	M20x2.5	-	-
M22x1.5	80	41	-	-	M22x1.5	80	90
M22x2.5	-	-	-	-	M22x2.5	-	-
M24x2	100	47	108	52.5	M24x2	100	110
M24x3	-	-	-	-	M24x3	-	-
M27x2	95	40.1	-	-	M27x2	100	-
M30x2	130	49.4	-	-	M30x2	140	-
M33x2	170	-	-	-	M33x2	190	-
M36x3	220	-	-	-	M36x3	240	-

TECHNICAL DATA FD145

ENGINE

Type 8065.25.099
Max. Power rpm 2100
Max. torque rpm 1500
Min. idle rpm .....800÷880
Max. idle rpm .....2270÷2370
Converter stalling rpm .....2270÷2370
Total stall rpm .....1570÷1770
Max. torque .....56 daNm
Operation clearance (and phase check)
between valves and balance springs :
a - inlet .....0.25 mm
b - outlet .....0.35 mm
Injection anticip. referring to t.d.p. .....25°+1°
Injection sequence 1-5-3-6-2-4
Min. starting temperature :
- 15° C (standard machine)
- 25° C (machine for cold start and heavy batteries)

CONVERTER

Type .....Twin Disc 6F-1301
Cooling of converter/gearbox oil by heat exchanger water/oil
on the engine.
Conversion ratio at stall .....2.34 : 1

GEARBOX

Type .....with contershafts, polited hydraulic
control, 3 forward gears, 3 reverse
Delivery and presure of gear/converter room pump .....70.5 lit./min. / 14÷15 bar
Delivery and pressure of converter recovery room pump .....52.5 lit./min. / 1 bar

BRAKE AND STEER CLUTCH PUMP

Type .....with gears
Delivery at 2785 rpm .....53.1 lit./min.
Max. pressure of safety valve .....37 bar

TOOL ELEMENT PUMP

Type .....gear, with automatic recovery of axial clearance
controlled by a converter transmission gear
Max. operating power .....190 + 5 bar
Delivery at 2007 rpm .....120 lit./min.

IMPLEMENT DISTRIBUTOR

Type .....monoblock with 3 drawers
Max. nominal power .....186 bar
Max. operating power .....210 bar
Rating of safety valve .....230 + 5 bar
Rating of multiple valve .....210 bar

TRACKS

Chains with lubricated and sealed hinges, driving wheels with replaceable sectors.

FLUID CAPACITIES

ITEM	Litres	FIAT PRODUCT	REFILL TYPE
Cooling system	19	PARAFLU 11	50-50 mixture of water and reputable, high quality commercial permanent fluid providing protection against oxidation, corrosion, scale, foam and freezing down to -35°, 15°F
Fuel tank	295	---	Diesel Fuel ASTM 2 - D Grade TT of reputable quality and Make
Engine	12.5	AMBRA SUPER	Engine oil CCMC-D4 or MIL-2124 E level or Api Service CF-4
Converter/Gearbox	34	TUTELA GI/M	ATF Type A SUFFIX A SAE 10W
Conic Couple Steer/brake clutch	29.5	AMBRA SUPER	Engine oil MIL-2104 E level or Api Service CF-4 or CCMC-D4
Attachment hydraulic system "BD" accessory "AD" accessory (mechanic tilt) "AD"accessory (hydraulic tilt-1 cyl)	 56 (°) 54 (°) 56 (°)	IDRAULICAR AP31 (ISO 32) AP46 (SO 46) AP51 (ISO 68)	Hydraulic oil DENISON HF - 0/1/2 or DIN 51524-1 / 51524-2
Side drive units (each)	17	TUTELA W90 / M - DA	Oil for mechanical drives MIL-L-2105 D or Api GL-5
Wheel idlers - Rollers	4 (°)	AMBRA SUPER	Engine oil MIL- L - 2104 E level or Api Service "CE" or CCMC-D4
Grease Fittings	___	TUTELA G 9	Lithium base grease, water/low temperature/ high-load resistant N.L.G.I. No. " consistency.
Cabin tilting pump	0.5 (°)	TUTELA GI/M	

The quantities listed above are those required for periodic maintenance operations following the draining and refilling procedures detailed for each component
(°) Only first refill.

KEY TO TYPE GRADE OF LUBRIFICANT				AMBIENT TEMPERATURE °C
GROUP TO REFILL	FIAT	INTERNAT. DESIGNATION	VISCOSITY	-40 -30 -20 -10 0 10 20 30 40 50
ENGINE STEER/BRAKE CLUTCH	AMBRA SUPER	API "CF-4" or MIL - 2104 E level	15W - 40 10W - 30	
ENGINE	--	ARTIC OIL	--	
SIDE DRIVE UNITS	TUTELA W90M-DA	MIL - L - 2105D API GL - 5	80W / 90EP	
HYDRAULIC SYSTEM	IDRAULICAR AP	DIN 51524-1 or DIN 51524-2	31 (10W) 51 (20W)	
CONVERTER/ GEARBOX	TUTELA GI/M	ATF type A SUFFIX A		
GREASE FITTINGS	TUTELA G9	LITHIUM BASE GREASE NLGI No. 2 CONSISTENCY		

NOTES

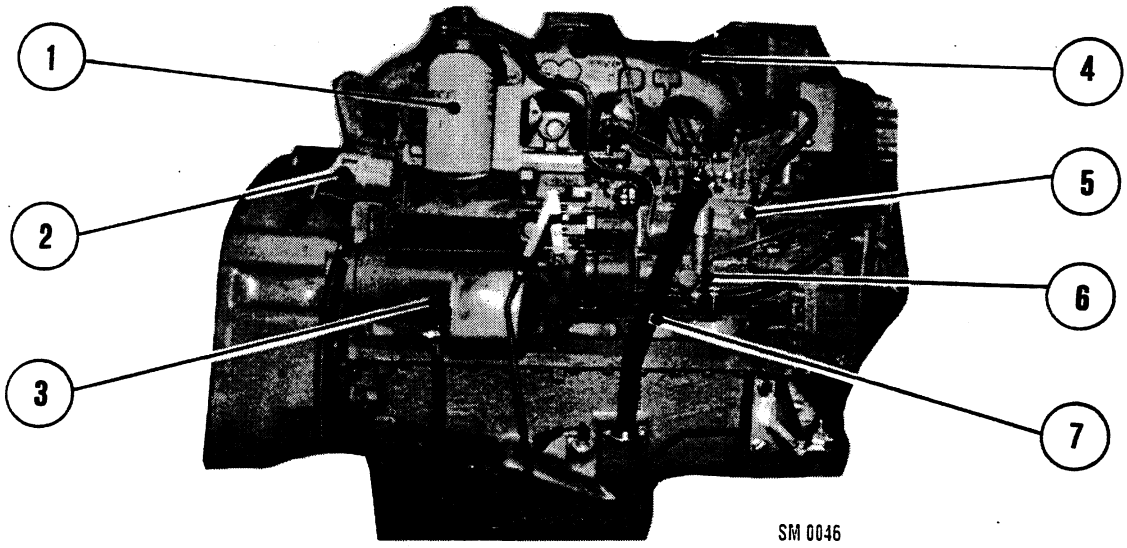
SECTION 1

ENGINE RELATED COMPONENTS

TABLE OF CONTENTS

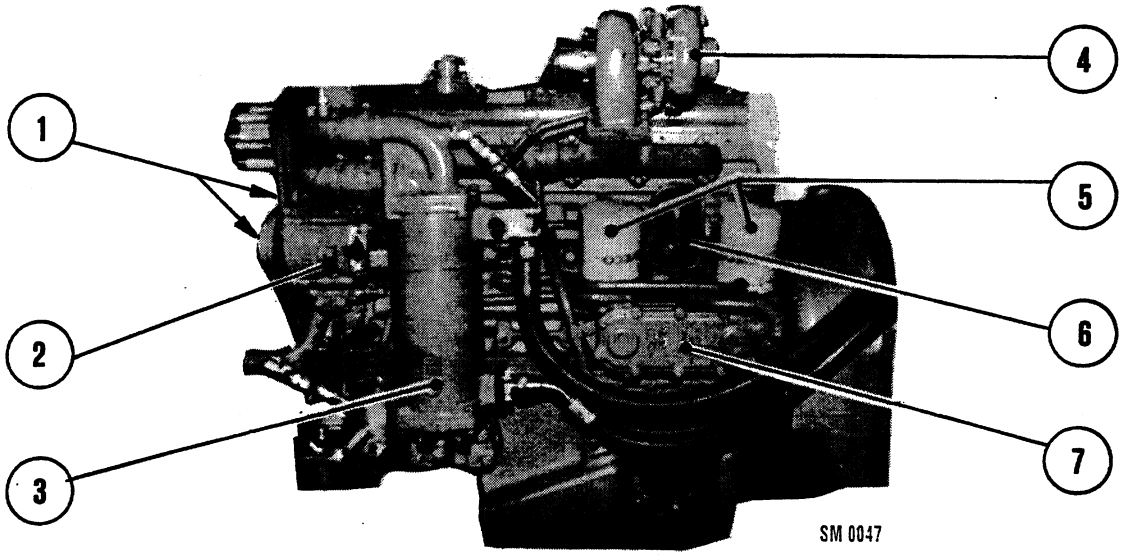
1.1 GENERAL DESCRIPTION

The engine used in the FD145 is an 8065.25.099 FIAT IVECO. The engine is turbocharged. Rebuild procedure as well as troubleshooting and testing for this engine is found in service manual 604.06.299



ENGINE RIGHT SIDE

1. Fuel filter; 2. Electro-stop; 3. Starter motor; 4. Engine oil filling cap; 5. Injection pump; 6. Fuel primer pump; 7. Engine oil dip stick.



ENGINE LEFT SIDE

1. Belts; 2. Alternator; 3. Gearbox oil heat exchanger; 4. Turbocharger; 5. Engine oil filters; 6. Engine breather; 7. Engine oil heat exchanger.

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

1.2 TROUBLESHOOTING

Troubleshooting of the engine 8065.25.099 is found in manual 604.06.299 in this set.

1.3 TESTING

For tests not comprised in this manual, refer to manual 604.06.299.

1.3.1 DATA OF ENGINE 8065.25.099 AT WORKBENCH

Testing conditions:
- motor on workbench, without fan, air filter and muffler;
- atmosphere pressure 740 ± 5 MM HG;
- ambient temperature 20° ± 3°C
- relative moisture 70% ± 5;
- specific weight of fuel 830 ± 10 g/l
- ignition anticipation 25° ± 1° b.u.d.p. of cylinder no. 1 in compression

Position of gas control	R.P.M.	Corresponding power with trained engine for:		Hour fuel consumption	Relative pressure of air delivery
		2 hours KW (CV)	50 hours KW (CV)	Kg/H	bar
Maximum	2100	≥ 97.8 (132,9)	≥ 99.3 (135)	21.2 ÷ 21.9	0.85 ÷ 0.90
Torque	1500	≥ 86.7 (116,4)	≥ 87 (118)	18.2÷ 18.9	0.65 ÷ 0.70
High idle	2325 ± 2375				
Low idle	975 ± 1000				

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

1.3.2 DATA FOR INJECTION PUMP RATING

Injection pump: PES6A90D410 RS2813 (BOSCH)
Regulator: RQV300 - 1050AB1265-3L
Fuel pump: FP/KG24AD207

Pressure tubes (ENGINE): dia. 6 x dia. 1.5
Injector rating (ENGINE): 230 + 8 bar
Standstill engine min. speed: 800 ± 880 rpm
Pump adjustment on engine 25°±1° before TDC, no. 1 in delivery start position, and piston no. 1 in compression phase.

Workbench characteristics according to ISO 4008/1 E 4008/2.
Tubes: dia. 6 x dia. 2 x 600 mm (according to ISO 4093.3)
Injectors according to ISO 7440 - 411 (gauged hole pads)
Injector rating 172 + 175 bar
Test liquid: ISO 4113 - temperature: 38 ÷ 42° C
Supply pressure: 1.5 ÷ 1.8 bar
Emptying time: 30"
Overpressure valve: 1.3 ÷ 1.5 bar

INSIDE PUMP TIMING (Spill point test - Stop block removed)	
Piston lift (at gap)	2.75 ÷ 2.85 mm (from BDC)
Injection sequence	1 - 5 - 3 - 6 - 2 - 4
Direction of rotation	clockwise

PUMP BASE RATING (Stop block removed)					
Operation	r.p.m.	Rod stroke (mm)	cm³/1000 deliveries	Max. unbalance (cm³)	Pressure on LDA (bar)
Rating	1050	12.7 ÷ 12.8	77 ÷ 78	3	0.7
Check	750		85 ÷ 87	3	0.7
Check	500		65 ÷ 67		0.0
Check	425	5.2 ÷ 5.6	6.0 ÷ 10	2	0.0

1.3.2 DATA FOR INJECTION PUMP RATING

REGULATOR PERFORMANCES TESTING (Stop block removed)					
FAST r.p.m.			SLOW r.p.m.		
Lever position	pump rpm	rod stroke (mm)	Lever position	pump rpm	rod stroke (mm)
113° ÷ 121° towards horiz. posit.	1125 1230 1320	11.7 4 0 ÷1	75° ÷ 83° towards horiz. posit.	425 325	8.5 11 min.

PUMP FINAL RATING - WITH REGULATOR - With stop block installed - horizontally				
Operation	pump rpm	cm^3/1000 deliveries	Max. unbalance (cm^3)	Pressure on LDA (bar)
Regulator timing Min. Starting	1125 425 100	 6.0 ÷ 10 105 ÷ 115	2	0.7

1.3.3 INJECTION PUMP TIMING WITH ENGINE

WARNING

Do not work below or near a machine tool or parts not safely supported and blocked.

For injection pump timing with engine proceed as follows:

- release injectors and turn driving shaft until cylinder piston no. 1 is at TDC at the compression stage; this can be checked by balancing suction and discharge valves of symmetrical cylinder.

- Rotate driving shaft so to match the "INIEZ" or "-" tag on engine flywheel with the reference index on flywheel housing sump.

- Install pump matching double seat of toothed bushing with coupling double teeth;

- after installing pump, be sure notch on support flange matches with that on pump body, then fasten pump with locking nuts.

For a further check, verify timing with the spill point test.

The spill point test must be performed on the first or on the sixth element of the pump as follows:

- remove injection delivery tube, unscrew pressure pipe fitting and temporarily remove reduction cap, spring and delivery valve;

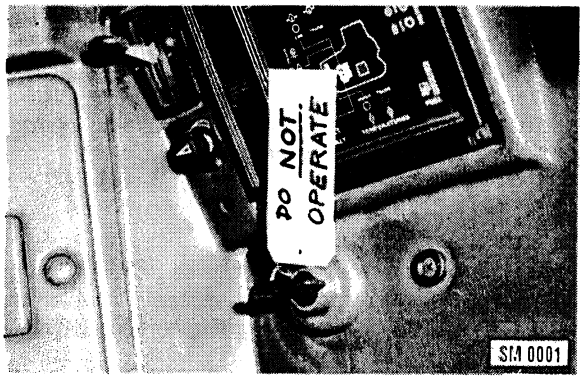
- tighten pressure pipe fitting again;

- set accelerator lever to max position and operate priming pump and vent feeding circuit;

- slowly rotate driving shaft clockwise , check through pump tappet inspection cover that piston of first element is at TDC and operate priming pump for fuel downflow from pipe fitting;

- continue driving shaft rotation and when fuel flow stops check that timing fix index corresponds with "INIEZ" or "-" tag on flywheel; if not, loosen locking nuts and rotate injection pump upwards for delaying or downwards for anticipating. Tighten pump locking nuts tosupport.

1.4 REPAIR PROCEDURES



1.4.1 ENGINE & CONVERTER

1.4.1.1 REMOVAL

1.4.1.1.1

Place machine on a level surface. Turn master electrical switch to the "OFF" position. Tag the unti with a "DO NOT START" tag.

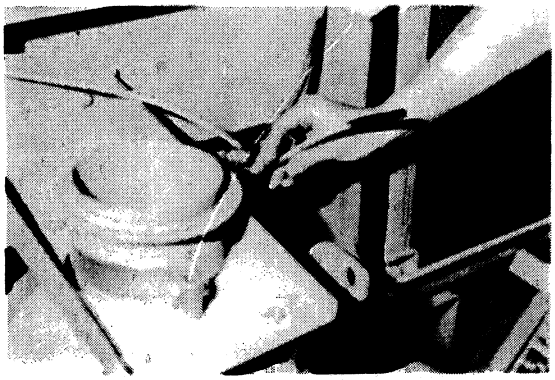
Refer to the CAB Section of this manual and tilt the cab.

⚠ WARNING

Always turn the master switch to the "OFF" position before cleaning, repairing, servicing or parking the machine to prevent injury.

1.4.1.1.2

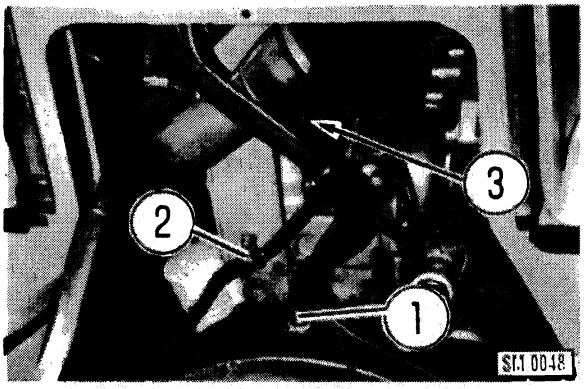
Remove the center belly guards.



1.4.1.1.3

Disconnect windshield and door window washer hoses from engine, hood and side doors support.

NOTE: Plug lines to keep from draining reservoirs.

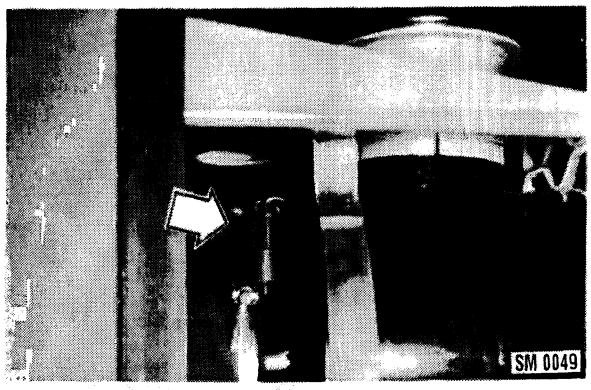


1.4.1.1.4

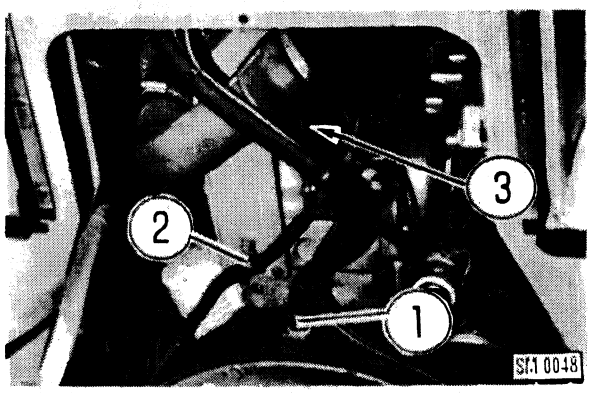
Disconnect vent hose from flywheel housing from vent.

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

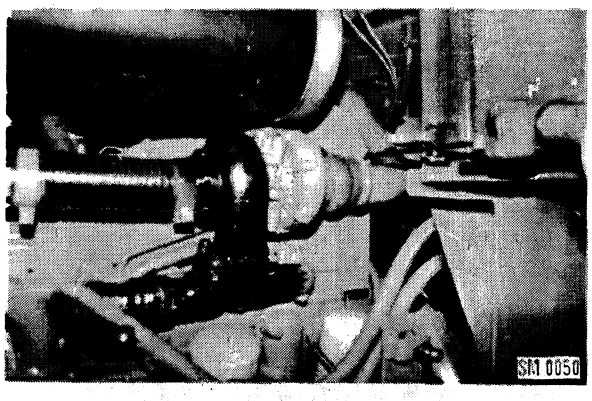
1.4.1.1.5
Disconnect sensor wires from air cleaner.



1.4.1.1.6
Disconnect wire at locations 2 and 3 on engine.



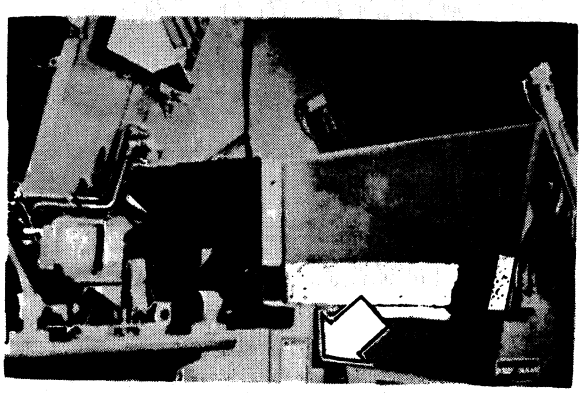
1.4.1.1.7
Disconnect air cleaner hose from turbocharger.



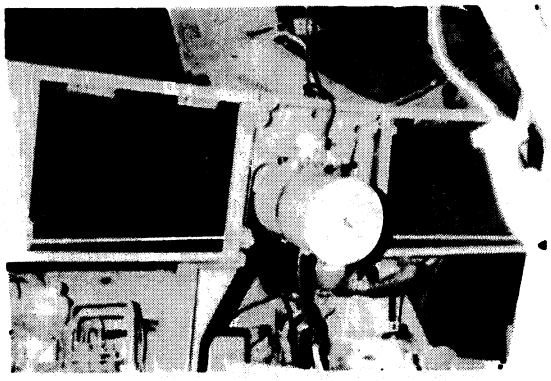
1.4.1.1.8
Support engine hood and side doors support with suitable lifting device and then remove the screws between support and frame.

⚠ WARNING

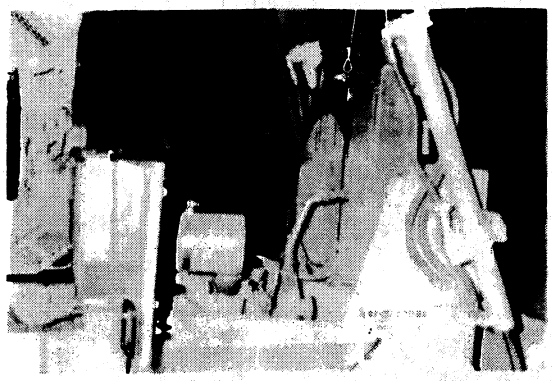
Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided.



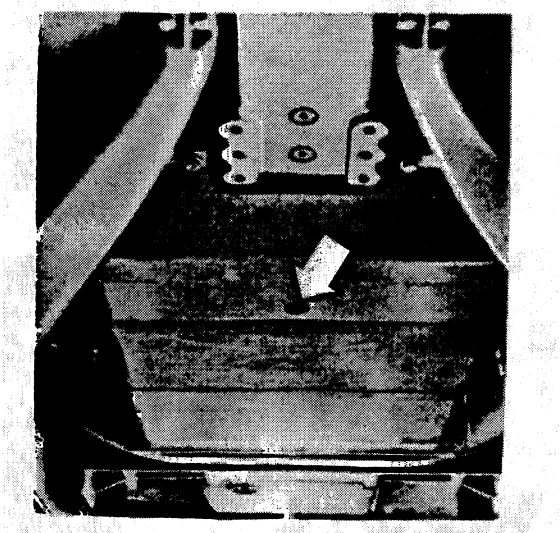
1.4.1.1.9
Remove side doors support mounting capscrews.



1.4.1.1.10
Remove engine hood and side doors support.



1.4.1.1.11
Refer to the 1.4.7 and remove radiator.



1.4.1.1.12
Drain transmission housing.