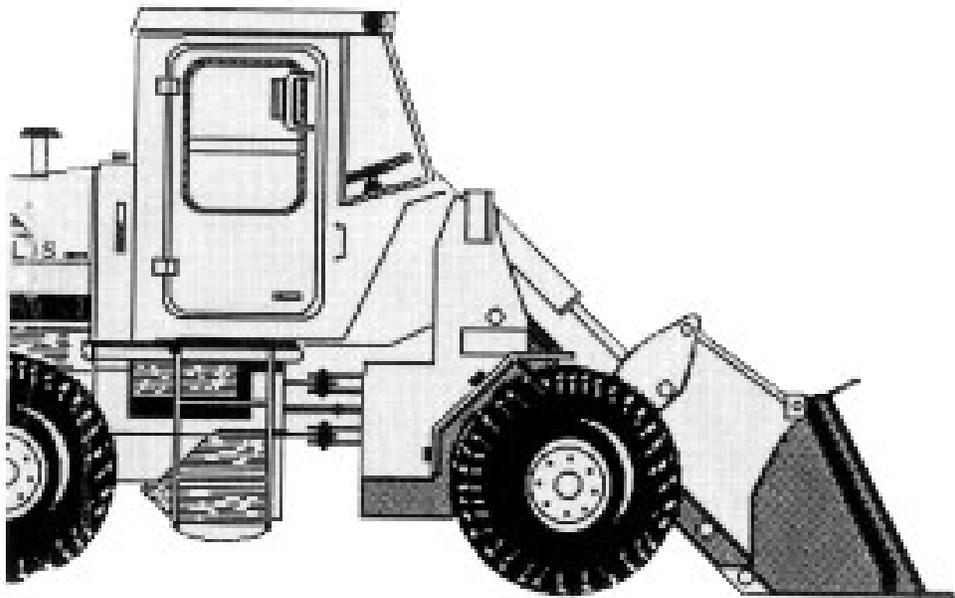


Product: Fiatallis FR10/FR12 Wheel Loader Service Specification Manual  
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# FR 10 FR 12 Wheel Loader

## SERVICE MANUAL

Sample of manual. Download All 98 pages at:  
<https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-wheel-loader-service-specification-manual/>

73145530

Reprinted

## 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.

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# FR10

# FR12

## WHEEL LOADER

### SERVICE SPECIFICATION MANUAL

FR10 S/N 525372, 525395-up (except 525407)

FR12 S/N 550267, 550281-up (except 550303, 550312)

FORM 73145530 English



### WARNING

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



The Operation and Maintenance Instruction Manual provides the instructions and procedures for starting, operating, maintaining, fueling, shutdown and servicing that are necessary for properly conducting the procedures for overhaul of the related components outlined in this Service Manual.



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



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



Machine mounted safety signs have been color coded yellow with black borders and lettering for warning and red with white borders and lettering for danger points.



SUPPLEMENT NO. 3

SERVICE SPECIFICATION MANUAL  
FORM 73145530  
FR10, FR12 WHEEL LOADERS

(6-84)

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This Supplement (3) replaces Supplements No. 1 and 2.  
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REPLACE the following like pages:

Page 1 (No change)  
2 (Revised)

Page 3 (No change)  
4 (Revised)

Page 5 (Revised)  
6 (Revised)

Page 7 (Revised)  
8 (Revised)

Page 63 (Revised)  
64 (No change)

Page 65 (Revised)  
66 (No change)

Page 67 (Revised)  
68 (No change)

**NOTICE**  
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REASON: Previous specifications did not fully cover the various updated modifications to the machines.

Any product change described in this publication is part of the continuing effort of Fiatallis to make its product responsive to customer need and is not to be construed as a field campaign. A product change may be incorporated with or without prior notice and without obligation to Fiatallis or its affiliates.

# SAFETY RULES

## GENERAL

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

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

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

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

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

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

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

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

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

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

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

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

Never leave the machine unattended with the engine running.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

# SAFETY RULES

## OPERATION

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

**DO NOT START OR OPERATE 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 all safety devices provided are in place and in good operating condition.

Check instruments at start-up and frequently during operation.

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

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 flagman, safety signals and signs.

Know the principles of cross steering of crawler tractors. Read section in Operation and Maintenance Instruction Manual on cross steering.

Keep engine exhaust system and exhaust manifolds clear of combustible material. Equip machine with screens and guards when working under conditions of flying combustible material.

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

Never use bucket as a man-lift.

Use recommended bucket for machine and material loadability and heaping characteristics of material, terrain, and other pertinent job conditions.

Avoid abrupt starts and stops when transporting a loaded bucket.

Inspect your seat belt webbing and hardware at least twice a year for signs of fraying, wear or other weakness that could lead to failure.

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.

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 possibility of failure of the kinked area. 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 OPERATORS COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.**

During operation always carry ripper in full raised position when not in use and lower to ground when parked.

When counterweights have been provided, do not work machine if they have been removed unless their equivalent weight has been replaced. See the Operation and Maintenance Instruction Manual.

When operating a machine know what clearances will be encountered, overhead doors, wires, pipes, aisles, roadways; also the weight limitations of ground, floor, and ramps.

Know bridge and culvert load limits and do not exceed them. Know machine's height, width, and weight. Use a signal person when clearance is close.

Be sure that the exact location of gas lines, utility lines, sewers, overhead and buried power lines, and other obstructions or hazards are known. Such locations should be precisely marked by the proper authorities to reduce the risk of accidents. Obtain shut-down or relocation of any such facilities before starting work, if necessary.

Be certain to comply with all local, state, and federal regulations regarding working in the vicinity of power lines.

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

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.

Never travel a machine on a job site, in a congested area, or around people without a signal person to guide the operator.

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

Maintain clear vision of all areas of travel or work. Keep cab windows clean and repaired. Carry blade low for maximum visibility while traveling. Obtain and use fan blast deflectors where tractors are used as pusher tractors in tandem.

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

Carry the bucket low when traveling with a load.

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

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 breakover point - pass the balance point slowly on the obstruction and ease down on the other side.

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

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.

Operate at speeds slow enough to insure complete control at all times. Travel slowly over rough ground, on slopes or near dropoffs, in congested areas or on ice or slippery surfaces.

# SAFETY RULES

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 dropoffs.

Keep the machine well back from the edge of an excavation.

Be especially careful when traveling up or down slopes. Position the bucket in such a way as to provide a possible anchorage on the ground in case of a slide.

When proceeding across a hillside proceed slowly. Never turn sharply uphill or downhill.

Avoid sidehill travel whenever possible. Drive up and down the slope. Should the machine start slipping sideways on a grade, turn it immediately downhill.

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

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

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.

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

To reduce the danger of an uncontrolled machine, choose a gear speed before proceeding down grade that will hold machine to proper speeds for conditions.

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.

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 brushpiles, logs or rocks. DO NOT DRIVE THE MACHINE ONTO BRUSHPILES, LOGS, LARGE ROCKS or other surface irregularities that break traction with the ground especially when on slopes or near dropoffs.

Avoid operating equipment too close to an overhang or highwall either above or below the machine. Be on the lookout for caving edges, falling objects and slides. Beware of concealment by brush and undergrowth of these dangers.

Park in a 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 of uncontrolled sliding movement. Set the parking brake.

Never park on an incline without carefully blocking the machine to prevent movement.

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 for approaching traffic.

Move the machine away from pits, trenches, overhangs and overhead power lines before shutting down for the day.

When stopping operation of the machine for any reason, always return the transmission or hydrostatic drive control to neutral and engage the control lock to secure the machine for a safe start up. Set parking brake, if so equipped.

Never lower attachments or tools from any position other than seated in operator's seat. Sound the horn. Make sure the area near the attachment is clear. Lower the attachment slowly. DO NOT USE float position to lower hydraulic equipment.

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

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

## MAINTENANCE

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

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

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

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

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

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

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

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

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

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

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

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

# SAFETY RULES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Never place gasoline or diesel fuel in an open pan.

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

Do not remove hoses or check valves in the hydraulic system without first removing load and relieving pressure on the supporting cylinders.

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.

Fluid escaping under pressure from a very small hole can almost be 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.

Never use any gas other than dry nitrogen to charge accumulators. See Operation and Maintenance Instruction Manual.

When making pressure checks use the correct gauge for expected pressure. See the Operation and Maintenance Instruction Manual or Service Manuals for guidance.

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.

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

Block all wheels before bleeding or disconnecting any brake system lines and cylinders.

Never use makeshift jacks when adjusting track tension. Follow the Undercarriage Service Manual.

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.

Always block with external support any linkage or part on machine that requires work under the raised linkage, parts, or machine per 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.

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 platforms are not available, use the machine handholds and steps as provided. Perform all service or maintenance carefully.

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

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.

# SAFETY RULES

In lifting and handling heavy parts, slings must be of adequate strength for the purpose intended and must be in good condition.

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.

When using compressed air for cleaning parts use safety glasses with side shields or goggles. Limit the pressure to 207 kPa (30psi) according to local or national requirements.

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.**

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.

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

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

Remove sharp edges and burrs from reworked parts.

Be sure all mechanics tools are in good condition. **DO NOT** use tools with mushroomed heads. Always wear safety glasses with side shields.

Do not strike hardened steel parts with anything other than a soft iron or non-ferrous hammer.

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

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## **FOREWORD**

Always furnish serial number if making an inquiry to dealer or factory about this machine.

Many equipment owners employ the Dealer's Service Department for all work other than routine lubrication and minor service. This practice is encouraged, as our Dealers are well informed and equipped to render efficient service by factory trained mechanics.

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Illustrations show standard and optional items.

## **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.

## TOPIC 1 GENERAL MACHINE DATA

### 1.1 MODEL IDENTIFICATION

NOTE: FR12 is same as FR10 unless otherwise noted.

Model -----	FR10 Wheel Loader	FR12 Wheel Loader
-------------	-------------------	-------------------

### 1.2 ENGINE

Make -----	Fiat	
Model -----	8065.24.091	8065.24.092
Type -----	Direct Injection	
	Diesel, 4 cycle, Turbocharged	
Weight, dry -----	574 kg (1266 lb)	
No. Cylinders -----	6	
Bore -----	103mm (4.058 in.)	
Stroke -----	110mm (4.334 in.)	
Displacement -----	5.5L (336 cu.in.)	
Firing Order -----	1-5-3-6-2-4	
Low Idle -----	750-825 rpm	
High Idle -----	2550-2625 rpm	
Converter Stall -----	2350-2450 rpm	2370-2470 rpm
Pump Stall		
(main hydraulic at relief) ---		
Full Stall		
(main hydraulic & converter) -	1860-1960 rpm	
Exhaust Manifold Temperature ---	510-565°C (950-1050°F)	
at Full Stall		
Intake Manifold Pressure -----	68 cm Hg. (27 in. Hg)	
at Full Stall		
Air Cleaner Restriction (max) --	63 cm H <sup>2</sup> O (25 in. H <sup>2</sup> O)	
Lubrication -----	Full pressure, full flow	
Oil Pressure at 80°C (175°F)		
High Idle -----	3.8-4.1 bar (55-60 psi)	
Valve Clearance-Intake (cold) --	0.250mm (0.010 in.)	
Valve Clearance-Exhaust (cold) -	0.350mm (0.014 in.)	

#### 1.2.1 FUEL INJECTION

Fuel Injection Pump (Mftr.) -----	Fiat Type A	
Manufacturer Part No. -----	PES 6A90B410L4/223	PES 6A90B410L4/224
Fiatalis Part No. -----	04758707	04761243
Type -----	Multiple - plunger, constant stroke, cam actuated (8° retard type for starting)	
Injection Timing -----	28° BTDC (static)	
Pump Rotation -----	CW	
Governor -----	RPVA 415-1200 F282	
Injector Nozzle Engine		
Opening Pressure -----	230-239 bar (3335-3541 psi)	

---

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

**GENERAL MACHINE DATA**

**CALIBRATION DATA**

TEST NOZZLE -----	EFEP 182 (ADN12SD12)
Nozzle Holder -----	EF 8511/9 (AKB50SD15OF)
Holder Springs -----	WSF 2044/4XE
Pressure -----	175.75 kg/cm <sup>2</sup> (2500 psi)
FLUID TYPE -----	Viscor #1467 (SAE) or Fiat CFB or Bosch 0L61V11
Temperature -----	38 <sup>o</sup> ± 41 <sup>o</sup> C (100 <sup>o</sup> - 105 <sup>o</sup> F)
Gallery Pressure -----	1.5 ± .3 kg/cm <sup>2</sup> (22 ± 4 psi)
<b>HIGH PRESSURE TEST TUBING</b>	
I. D. -----	2 mm
O. D. -----	6 mm
Length -----	600 mm
<b>MANIFOLD PRESSURE COMPENSATOR (MPC)(Aneroid)</b>	
Pressure -----	1.2-1.8 kg/cm <sup>2</sup> (17-26 psi)

FLOW TIMING (PHASING) -----	60 <sup>o</sup>
Plunger lift at port closing -----	2.2 ± 0.5 mm (from bottom dead center)

<b>FR10 PUMP CALIBRATION WITH GOVERNOR</b>					
Throttle Lever Position	Speed (rpm)	Rack Position (mm)	CC at 1000 Strokes (each element)	CC at 1000 Strokes (Total)	Boost Pressure kg/cm <sup>2</sup> (psi)
Min.	415-425	8.5-9.5	9-11	---	---
Max.	1190-1200	11.5-11.7	59.5-61.5	360-366	0
Max.	795-805	---	---	363-369	0
Max.***	1190-1200	11.8-12.0	63-65	381-387	0.9-1.0 (13-14.5)
Max.*	795-805	---	---	387-393	0.9-1.0 (13-14.5)
Max.	≡ 1320	---	0	---	---
Max.**	200	---	≡ 110	---	---

<b>FR12 PUMP CALIBRATION WITH GOVERNOR</b>					
Throttle Lever Position	Speed (rpm)	Rack Position (mm)	CC at 1000 Strokes (each element)	CC at 1000 Strokes (Total)	Boost Pressure kg/cm <sup>2</sup> (psi)
Min.	415-425	8.5-9.5	9-11	---	---
Max.	1190-1200	11.6-11.8	60.5-62.5	366-372	0
Max.	795-805	---	---	390-396	0
Max.***	1190-1200	12.6-12.8	69.5-71.5	420-426	0.9-1.0 (13-14.5)
Max.*	795-805	---	---	453-459	0.9-1.0 (13-14.5)
Max.	≡ 1320	---	0	---	---
Max.**	200	---	≡ 110	---	---

\*Manifold Pressure Compensator (MPC) must be pressurized for this test. MPC may be slightly adjusted to achieve specified total CC at 1000 strokes.  
 \*\*Overfuel solenoid activated (rack stop non-functional)  
 \*\*\*GOVERNOR CUT-IN - 1200-1210  
 ADJUST HIGH IDLE AFTER PUMP IS INSTALLED ON MACHINE

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

## GENERAL MACHINE DATA

### 1.2.2 FAN

Type ----- Pusher  
Diameter ----- 609.6mm (24.0 in.)  
Number of Blades ----- 8

### 1.2.3 COOLING

Type ----- Steel bolted tank and  
brass tube fin core  
Fins ----- 3.2mm (0.125") spacing  
Core Frontal Area ----- 5012.6cm<sup>2</sup> (776.9 in.<sup>2</sup>)  
System Pressure ----- 41.4-55.2 kPa(0.42-0.56 kg/cm<sup>2</sup>)  
(6-8 psi)

### 1.2.4 AIR CLEANER

Type ----- Dry (two stage) with safety  
element, treated to prevent  
carbon buildup.  
Diameter ----- 254mm (10.0 in.)

## 1.3 POWER TRAIN

### 1.3.1 TORQUE CONVERTER

Type ----- Single Turbine  
Cooling ----- Engine mounted, oil-to-coolant  
heat exchanger

### 1.3.2 TRANSMISSION

Type ----- Electro/Hydraulic Power Shift  
Mounting ----- Direct  
Speeds ----- 4 forward; 3 reverse  
Gear Ratios:  
1st Forward/reverse ----- 4.531-5.9  
2nd Forward/reverse ----- 2.304  
3rd Forward/Reverse ----- 0.964  
4th Forward ----- 0.617

### 1.3.3 TRANSMISSION PUMP

Type ----- Positive displacement, gear type  
Gear Ratio ----- 1:1  
Volume @ filter inlet  
port, @ 1000 engine rpm ----- 25 L/min. (6.6 gpm)  
Filtration ----- Full flow with built-in by-pass  
relief valve

---

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





## GENERAL MACHINE DATA

### 1.6.6 MAIN PRIORITY VALVE

Type ----- Spool  
Function ----- Flow Divider  
Relief Setting (Steering) at Full Throttle ---  $\frac{\text{bar}}{145}$   $\frac{\text{psi}}{2100}$

### 1.6.7 SECONDARY PRIORITY VALVE

Type ----- Spool  
Function ----- Flow Divider  
Relief Valve ----- None

### 1.6.8 CROSSOVER RELIEF VALVE

Type ----- Direct Operated  
Shock Relief Pressure ----- 19995<sub>2</sub>5-21995.1 kPa (203.9-224.3  
kg/cm<sup>2</sup>) (2900-3190 psi)

### 1.6.9 IMPLEMENT RESPONSE TIME (at 2410 engine RPM) (Empty bucket)

Lift ----- 6.2 seconds  
Dump ----- 2.4 seconds  
Lower ----- 4.4 seconds

## 1.7 ELECTRICAL

1.7.1 OPERATING VOLTAGE ----- 24 volt

1.7.2 BATTERIES ----- 2 - 12 volt (series)

Size ----- 30H-95  
Ampere Hour Capacity ----- 95 (20 hr. rate)

1.7.3 GROUND ----- Negative

### 1.7.4 ALTERNATOR (with integral voltage regulator)

Make ----- Delco-Remy  
Type ----- Brushless  
Output ----- 45 amp at 1960 engine rpm

### 1.7.5 STARTER

Make ----- Delco-Remy  
Rating ----- 550 amps  
Type ----- 24 volt

## GENERAL MACHINE DATA

### 1.8 CAPACITIES (Approximate)

	L	gal
Fuel Tank	172.0	45.5
Cooling System	33.0	8.75
Engine Crankcase (includes filters)	15.0	4.0
Transmission	17.0	4.5
Axle Differential and Planetary Hub (each)	30.0	8.0
Hydraulic System	109.0	28.8
Brake Booster Reservoirs FR10 - 1	1.6	.4
FR12 - 2 (Each)	1.6	.4

### 1.9 AXLE WEIGHTS

NOTE: SAE operating weight with standard, general purpose bucket (empty) at carry position, full fuel tank, and STD. boom (without counterweights).

	FR10	FR12
Tires -----	15.5 x 25 XRA	17.5 x 25-12 PR-L2
Bucket capacity (rated) -----	1.72m <sup>3</sup> (2.25 cu.yd.)	1.9m <sup>3</sup> (2.5 cu.yd.)
Bucket width -----	2433mm (95.8 in.)	2433mm (95.8 in.)
Front axle -----	4850 kg (10692 lb.)	5048 kg (11129 lb.)
Rear axle -----	5063 kg (11162 lb.)	5526 kg (12182 lb.)
Operating weight -----	9620 kg (21208 lb.)	10910 kg (24070 lb.)

### 1.10 PERFORMANCE DATA

NOTE: All performance data and specifications are based on a standard unit equipped with tires as noted:

	FR10	FR12
Tires -----	15.5 x 25 XRA	17.5 x 25-12 PR-L2
Rated capacity -----	1.72m <sup>3</sup> (2.25 cu.yd.)	1.9m <sup>3</sup> (2.5 cu.yd.)
Struck capacity -----	1.43m <sup>3</sup> (1.87 cu.yd.)	1.53m <sup>3</sup> (2.0 cu.yd.)
Bucket width -----	2433mm (95.8 in.)	2433mm (95.8 in.)
Hinge pin height -----	3401mm (133.9 in.)	3443mm (135.6 in.)
Dump height at 45° -----	2586mm (101.8)	2592mm (102.0 in.)
Reach at 45° -----	889mm (35 in.)	927mm (36.5 in.)
Reach at 45° at 2134mm (7ft.) -----	1422mm (56 in.)	1422mm (56.0 in.)
Overall length (bucket on ground) -----	6369mm (251 in.)	6443mm (253.6 in.)
Overall height (bucket raised) -----	4546mm (179 in.)	4563mm (179.6 in.)
Clearance Circle (bucket at carry) -----	10158mm (400 in.)	10200mm (401.5 in.)
Bucket weight -----	929 kg (2048 lbs.)	934 kg (2060 lbs.)
Tipping Load		
@ 0° -----	7120 kg (15700 lbs.)	8300 kg (18300 lbs.)
@ 35° -----	6355 kg (14010 lbs.)	7370 kg (16250 lbs.)
@ 40° -----	6130 kg (13520 lbs.)	7100 kg (15650 lbs.)
@ 45° -----	5860 kg (12980 lbs.)	6800 kg (15000 lbs.)
Operating Weight -----	9620 kg (21208 lbs.)	10918 kg (24070 lbs.)
Breakout force -----	9278 kg (20454 lbs.)	9004 kg (19850 lbs.)

## GENERAL MACHINE DATA

### 1.11 OVERALL DIMENSIONS

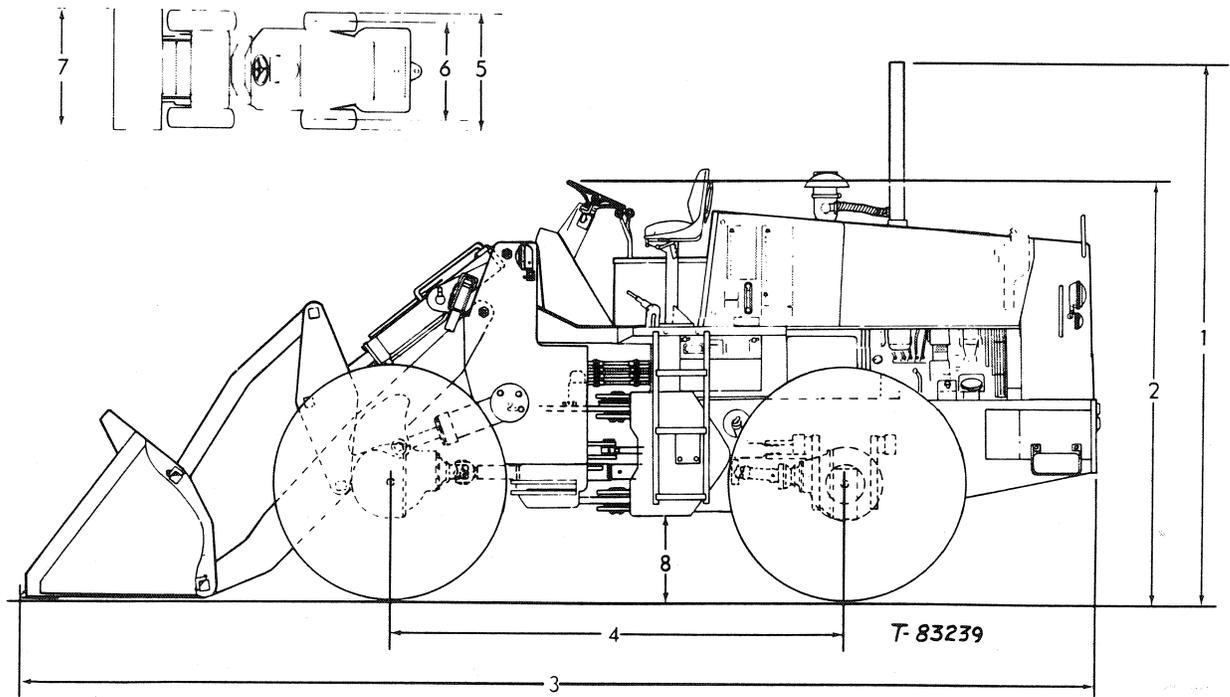


FIG.1 LOADER DIMENSIONS

	FR10		FR12	
	mm	inches	mm	inches
1. Height with stack	3225	127.0	3275	128.9
2. Height to steering wheel	2504	98.6	2546	100.2
3. Overall length (with bucket on ground)	6406	252.2	6443	253.7
4. Distance between axles	2794	110.0	2794	110.0
5. Overall width	2347	92.4	2383	93.8
6. Width (centerline of tires)	1905	75.0	1892	74.5
7. Width with bucket	2433	95.8	2433	95.8
8. Minimum clearance	358	14.1	398	15.7

### 1.12 SHIPPING WEIGHT

w/o counterweights, minimum fuel level

(FR10) 9460 kg (20858 lbs.)

(FR12) 10759 kg (23720 lbs.)

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

## TOPIC 2 LUBRICATION SPECIFICATIONS

### FUEL

The fuel to be used must meet the American Society for Testing and Material (ASTM) grade No. 2-D type T-T specifications for diesel fuel. The sulphur content must not exceed 1/2 of 1%. If sulphur content exceeds 1/2 of 1%, oil change intervals must be closer in order to compensate for the excessive sulphur.

### SYMBOL EO - ENGINE CRANKCASE

The following information is relative to engines used in Fiatallis machines.

1. The primary criterion for selecting an oil viscosity is the lowest ambient temperature at start-up. Change to a lower viscosity oil when the temperature reaches the lower end of the ranges as shown on the charts.

°C	°F
-10 and above	14 and above
-25 to 20	-13 to 68
Below -25	Below -13

#### ALTERNATE

10 and above	50 and above
0 to 35	32 to 95
-10 to 10	14 to 50
-25 to 0	-13 to 32

2. For maximum engine protection, use only the engine oil filters as specified in the parts catalog for the engine in your machine.
3. Use only oil which conforms to API classification CD, or MIL-L-2104C Specification
4. Sulfated ash content should not exceed 1.85%.
5. Synthetic oils may be used provided they meet the specified API service categories or MIL specifications, and viscosity grades.
6. Multi-viscosity oils are recommended. In the event that the recommended multi-viscosity oil is not available, single viscosity oil conforming to the charts may be substituted. Mixing grades of oils is not recommended.

### SAE VISCOSITY GRADE

15W-40  
10W-30  
Arctic

40  
30  
20, 20W or 20W-20  
10W

NOTE: Below  $-28^{\circ}\text{C}$  ( $-20^{\circ}\text{F}$ ), a means of warming the engine and batteries is recommended to obtain satisfactory starting and prevent damage to the engine and starter.

## LUBRICATION SPECIFICATIONS

### SYMBOL TF - TORQUE CONVERTER AND TRANSMISSION

Use oils meeting or exceeding one of the following specifications:

1. Type C-3 transmission fluid (oil)
2. Engine oil to TO-2 qualified meeting type C-3 specifications

AMBIENT TEMPERATURE	VISCOSITY
Above 0°C (32°F)	SAE 10W or 30
Below 0°C (32°F)	SAE 10W

If temperature is below -23°C (-10°F) auxiliary preheat will be required to raise the temperature in the sump and external circuits to at least -23°C (-10°F).

#### NOTE:

Wheel Loader transmission clutch facing material is not compatible with TO-2 qualified oils, unless the TO-2 oil meets the C-3 specifications.

### SYMBOL MGO - AXLES AND DIFFERENTIALS

Use gear lubricant meeting or exceeding one of the following specifications:

1. MIL-L-2105C (GL-5)  
Viscosity: SAE 80W/90EP year around.
2. MIL-L-2105B (GL-4)

AMBIENT TEMPERATURE	VISCOSITY
Above 0°C (32°F)	SAE 90 EP
Below 0°C (32°F)	SAE 80 EP

### SYMBOL TF - IMPLEMENT HYDRAULIC AND POWER STEERING SYSTEM

Use oils meeting or exceeding one of the following specifications:

1. Type C-3 transmission fluid (oil)
2. Engine oil TO-2 qualified
3. MIL-L-2104C
4. MIL-L-46152

TEMPERATURE	VISCOSITY
Above 38°C (100°F)	SAE 10W or SAE 30
Below 38°C (100°F)	SAE 10W

#### SYMBOL PGL PRESSURE GUN LUBRICANT

Use N.L.G.I. #2 Lithium soap base grease

#### WATER PUMP BEARINGS

Use a good grade of MIL-G-3545. DO NOT use a grease which contains a sodium or soap type thickener.

#### HYDRAULIC BRAKES

Use a good grade of heavy duty hydraulic brake fluid meeting SAE Standard J1703.

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

## TOPIC 3 ENGINE RELATED SPECIFICATIONS

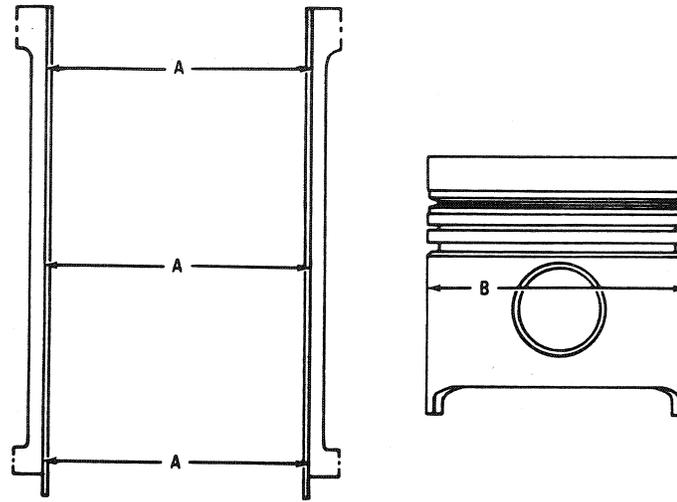


FIG.3-1 CYLINDER SLEEVE AND PISTON

T-81426

### 3.1 CYLINDER SLEEVE AND PISTON

	<u>mm</u>	<u>inches</u>
A.*Cylinder sleeve I.D.	103.00-103.02	4.055-4.056
B. Piston O.D. measured 50mm (1.97 in.) above skirt, Fig.3-1	102.81-102.82	4.047-4.048

**\*SERVICE NOTE:**

Cylinder sleeve I.D. to be measured with an internal dial indicator at top, center and bottom as illustrated in Fig.3-1. A variation of 0.15mm (0.006 in.) between any two dimensions should be considered cause for reboring. Sleeves can be rebored to a maximum I.D. of 103.82mm (4.087 in.).

ENGINE

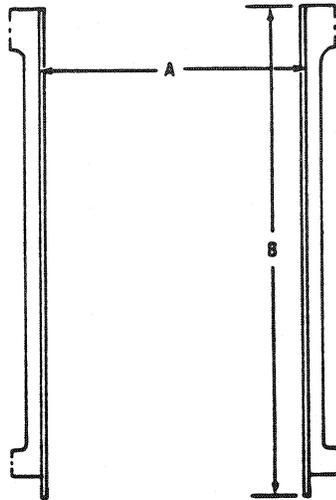


FIG.3-2 ENGINE BLOCK AND CYLINDER SLEEVE

T-81427

3.2 ENGINE BLOCK BORE AND CYLINDER SLEEVE

	<u>mm</u>	<u>inches</u>
*A. Engine block bore I.D.	106.89-106.94	4.208-4.210
Cylinder sleeve O.D.	107.02-107.05	4.213-4.214
B. Cylinder sleeve length	187.05	7.36

\*SERVICE NOTES:

1. Lubricate the walls of the cylinder block holes with light mineral oil and press the sleeve into engine block until sleeve is flush with the top of engine block.
2. The force required to install a sleeve should be 1500 kg (3307 lb.) when 70-90mm (2.76-3.55 in.) of sleeve is installed. This force should increase to 3600-6500 kg (7940-14330 lb.) when sleeve is 10mm (0.394 in.) from being seated. If these required forces are not met the sleeve must be withdrawn and replaced.

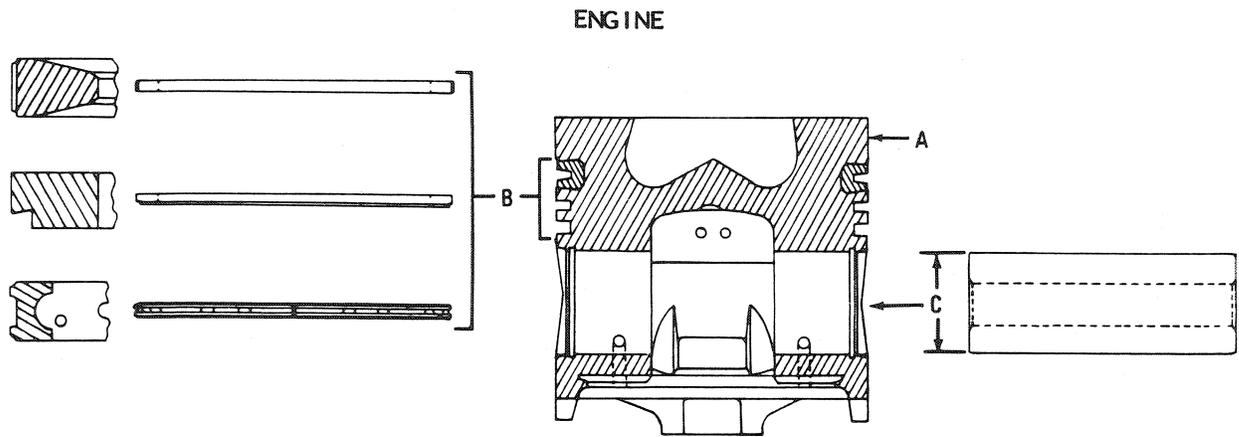


FIG.3-3 PISTON, RINGS, AND PIN

T-81428

### 3.3 PISTON, PISTON RINGS, AND PISTON PIN

	<u>mm</u>	<u>inches</u>
A. Piston weight -		
Oversize -		
B. Piston Ring Groove Width:		
Top groove (tapered sides)		
Center groove	2.55-2.57	0.100-0.101
Bottom groove	4.03-4.05	0.159-0.160
Piston Ring Thickness:		
Top ring (tapered)	3.00	0.118
Center ring	2.48-2.49	0.097-0.098
Bottom ring	3.98-3.99	0.156-0.157
Ring Clearance in Piston:		
Top ring - Cannot be checked due to bevel design		
Center ring	0.06-0.09	0.002-0.004
Bottom ring	0.04-0.07	0.0015-0.003
Fitted Ring Gap in Sleeve:		
Top ring	0.40-0.65	0.016-0.026
Center ring	0.30-0.50	0.011-0.019
Bottom ring	0.30-0.45	0.011-0.017
C. Piston pin bore I.D. in piston	34.00	1.338
Piston pin O.D.	33.99	1.338

**SERVICE NOTES:**

1. Oversize pistons and piston rings available in:

<u>mm</u>	<u>inches</u>	<u>mm</u>	<u>inches</u>
0.1	0.004	0.6	0.024
0.2	0.008	0.8	0.032
0.4	0.016		

2. Oversize piston pin available in:

<u>mm</u>	<u>inches</u>
0.2	0.008
0.5	0.020

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

ENGINE

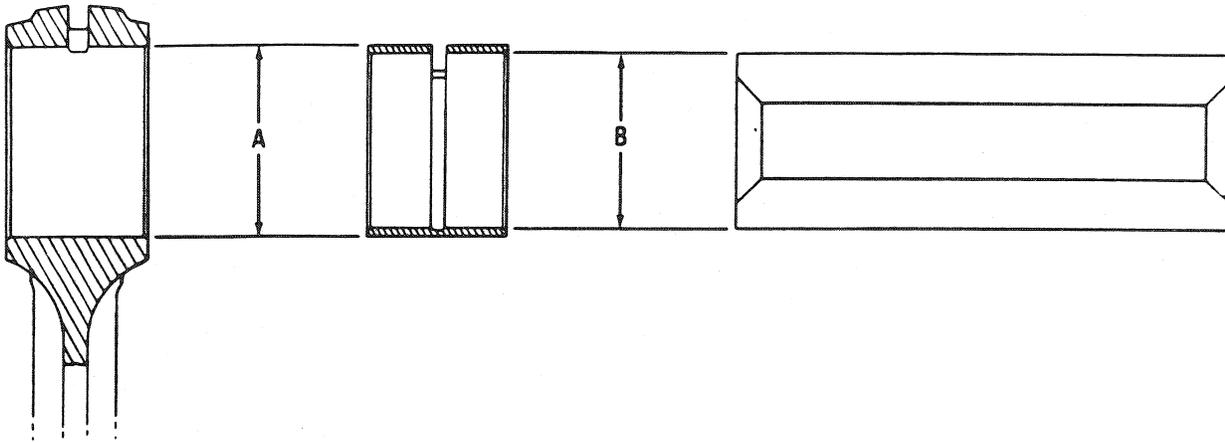


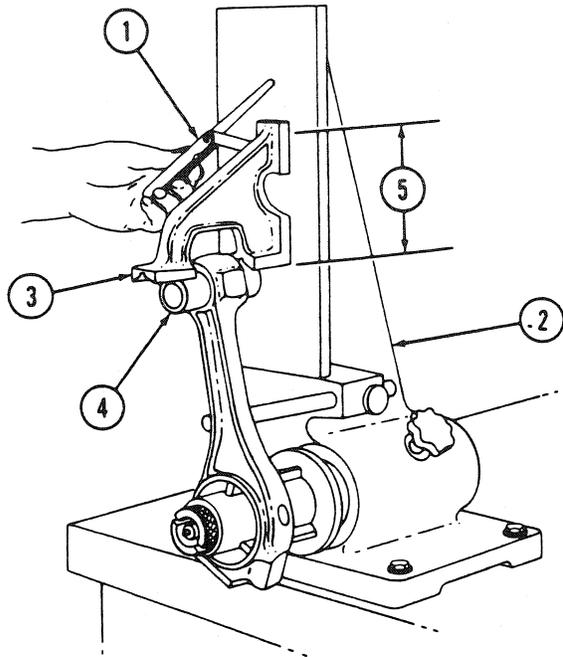
FIG.3-4 CONNECTING ROD, ROD BUSHING, PISTON PIN

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3.4 CONNECTING ROD, ROD BUSHING, AND PISTON PIN

	<u>mm</u>	<u>inches</u>
A. Connecting rod bushing bore I.D.	37.84-37.88	1.490-1.491
Connecting rod bushing O.D.	37.98-38.02	1.495-1.497
B. Connecting rod bushing, fitted I.D. (after reaming)	34.00	1.339
Piston pin O.D.	33.98	1.338
Piston pin available in 0.2mm (0.008 in.) and 0.5mm (0.020 in.) oversize.		

ENGINE



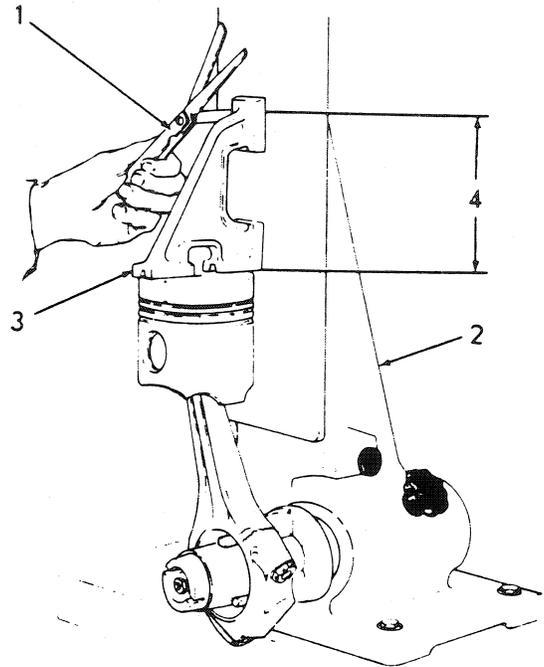
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FIG.3-5 CHECKING CONNECTING ROD PARALLELISM (Typical Fixture)

1. Feeler gauge - 0.025mm (0.001")
2. Fixture
3. Square
4. Piston
5. Approximately 125mm (4.92")

3.5 CONNECTING ROD PARALLELISM

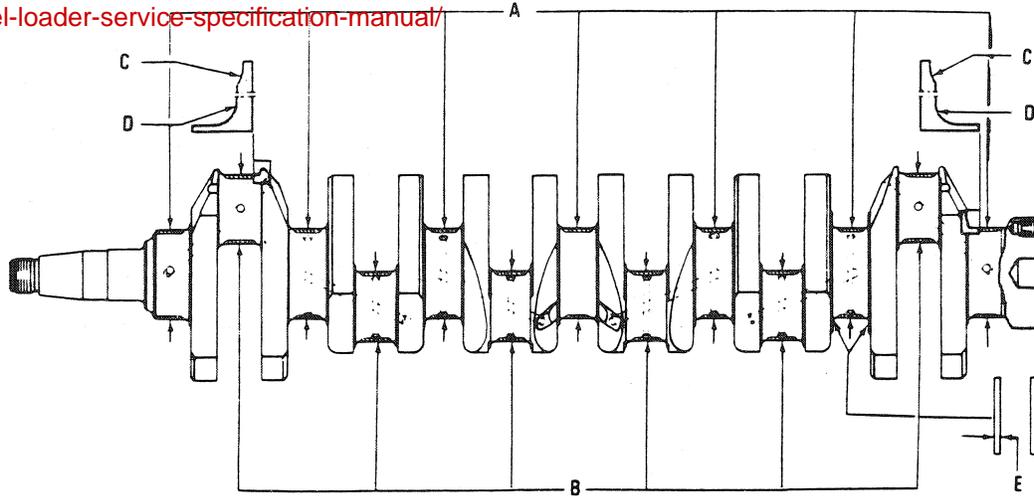
- A. Connecting rod pin and bearing bore must be parallel within 0.025mm (0.001") measured 125mm (4.92") from pin.



T-81958

FIG.3-6 CHECKING CONNECTING ROD PARALLELISM, PISTON INSTALLED (Typical Fixture)

1. Feeler gauge - 0.025mm (0.001")
2. Fixture
3. Square
4. Approximately 125mm (4.92")



T-81961

### 3.6 CRANKSHAFT MAIN BEARINGS AND CONNECTING ROD JOURNALS

	<u>mm</u>	<u>inches</u>
A. Main bearing housing bore I.D.	80.59-80.61	3.1727-3.1736
Crankshaft main journal O.D.	76.19-76.20	2.9996-2.9999
*Main bearing thickness	2.163-2.172	0.0851-0.0855
Journal to bearing clearance	0.042-0.094	0.0016-0.0037

**\*SERVICE NOTE:**

Undersize bearings available in 0.10, 0.25, 0.51, 0.76, 1.02mm (0.004, 0.010, 0.020, 0.030, 0.040 in.)

B. Connecting rod bearing bore I.D.	62.41-62.42	2.4588-2.4593
Crankshaft connecting rod journal O.D.	58.73-58.74	2.3122-2.3125
*Connecting rod bearing thickness	1.805-1.815	0.0710-0.0714
Journal to bearing clearance	0.035-0.080	0.0013-0.0031

**\*SERVICE NOTE:**

Oversize bearings available in 0.10, 0.25, 0.51, 0.76, 1.02mm (0.004, 0.010, 0.020, 0.030, 0.040 in.)

C. Crankshaft Fillet Radius:	5.0	0.197
D. Crankshaft Fillet Radius:	3.0-3.5	0.118-0.138
E. #6 Main Journal Width	32.000-32.100	1.2598-1.2637
*Standard thrust washer thickness	3.38-3.43	0.133-0.135
Crankshaft end play	0.08-0.33	0.003-0.013

**\*SERVICE NOTE:**

1. Oversize thrust washer available: 3.50-3.55    0.1378-0.1398
2. Install oversized thrust washer if end play exceeds: 0.40            0.016