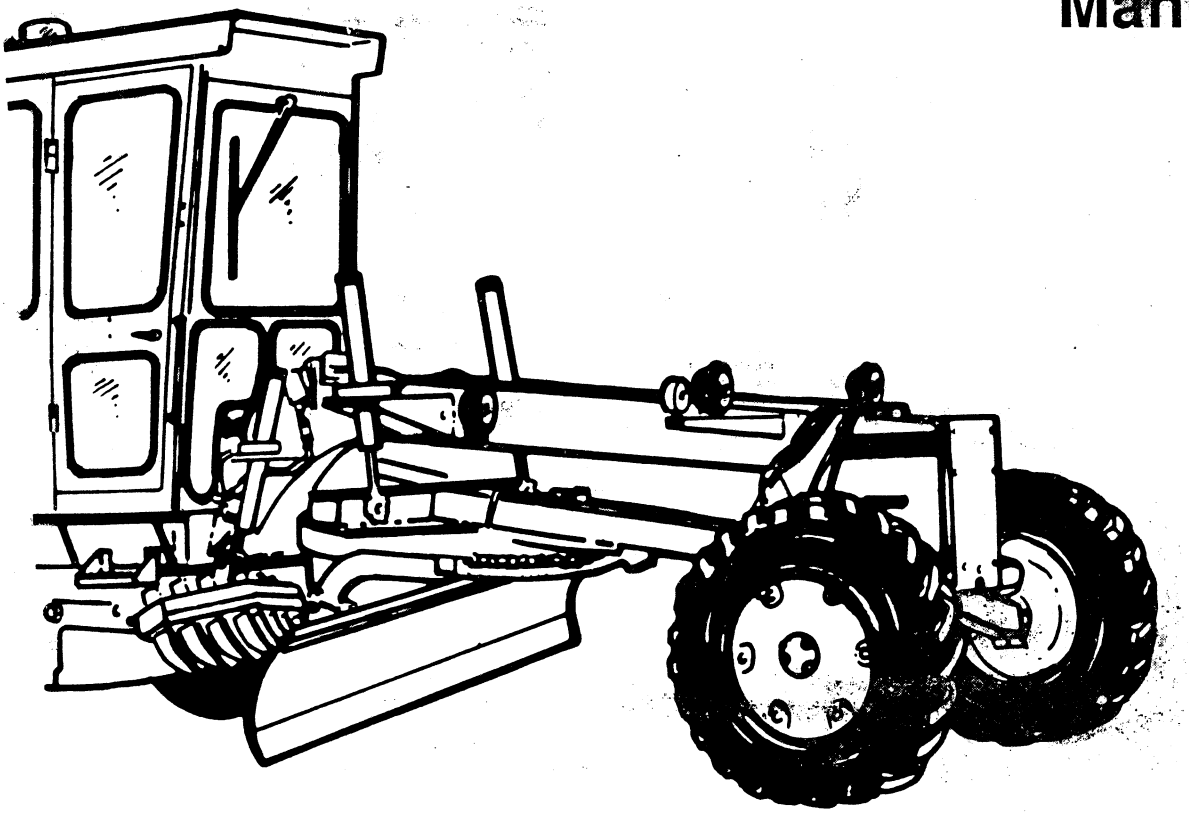
FIATALLIS

65-B

motor grader

Service Specifications Manual



Form 73119389 English
1/87

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.

65-B

motor grader

Service Specifications Manual

S/N 62S 02401 - up

FORM 73119389 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.

FIAT-ALLIS

SUPPLEMENT NO. 1
SERVICE SPECIFICATION MANUAL
FORM 73119389
65-B GRADER

(7-79)

ATTENTION: Insert this sheet in the front of publication as record of receipt. Replace or add pages in the publication according to instructions below.

Additional copies of this supplement are available. Please direct your request to:
Fiat-Allis Construction Machinery, Inc., Publications Services Dept., 3000 South 6th Street, Springfield, Illinois 62710 U.S.A.
or
Fiat-Allis M.M.T. S.p.A. - MAGAZZINO STAMPATI - Viale Torino, O STUPINIGI (Torino) - Italy

---

Write in the following changes:

NOTICE
THESE CHANGES ARE INCLUDED IN THIS COPY

Page 2

Engine Oil Pressure ---------------------- at High Idle ~~40-55~~ 3.8-5.5 bar (55-80 psi)

1.3 WEIGHTS

Page 3

Cylinder
3048 mm (10') Moldboard (Hyd. shift)
8.25 20 - 6 ply, Tube-type Tires

Page 4

2.3.1 SCHEMATIC EXPLANATION (Fig. 1)

There are essentially approx. two hydraulic circuits
circuit. Oil to the implement circuit flows f
From the pump, oil flows to and around the
sections; note that (for instance) if any three
each will receive 1/3 of the total oil volume

Page 5

Maximum volume, each pump -------------- 35.2 L/min. at 110.3 bar at (9.3 gpm at 1600 psi at 2000
Volume ~~while steering~~ to implement circuit ---------------- 60.18 L/min. (15.9 gpm)
~~Volume while not steering ---------------- 69.6 L/min. (18.4 gpm)~~
Volume to steering ~~only~~ circuit ---------- 10.2 L/min. (2.7 gpm)

Centering Springs — Replace when free height is less than ~~.559~~ 5.59 mm (.22")

Any product change described in this publication is part of the continuing effort of Fiat-Allis 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 Fiat-Allis or its affiliates.

SUPPLEMENT NO. 1 (Continued)

Page 19

IMPORTANT: Clutch pressures must be equal within ~~3.45~~ .345 bar (5 psi); if not, repair clutch pack.

Page 26

(b) Adjust hub bearings, Fig. 11 (1) with shims (2) so that shaft rotation requires ~~27 — 34 da~~ 2.7 - 3.4 Nm (28 — 40 kgm(~~175 — 250 lbs. ft.~~ 24-35 lbs. in) rolling torque. Initially, total shim pack should be placed on bevel gear side.

(c) After installing pinion (12) and bearing set (11) into pinion housing, record dimensions "A", "B", "C".

(d) Install spacer (7); from above dimensions, make up shim pack (6) and install it. Torque nut (8) ~~24~~ — 34 da N m (25- 35 kgm)(175 -- 250 lbs. ft.). Rolling torque of pinion must be 2.7-3.4 N m (28 - 40 kg cm) (24 - 35 lbs. in.); if necessary, adjust shim pack . Each .025 mm (.001") shim equals ~~344~~ 1.7 Nm (17.3 kgm ~~XX~~ cm)(15 lbs. in.) rolling torque. Stake nut after rolling

Page 27

2.10.1 FRONT AXLE

~~Wheel~~ Rim clamp retaining nut torque -

Wheel ~~Spindle~~ retaining nut; while rotating wheel, tighten to -

Then loosen nut and re-torque to -

NOTICE THESE CHANGES ARE INCLUDED IN THIS COPY

Page 28

2. Radius rod torque	~~54.2 — 67.8~~ 32.5 - 35.3	~~55 — 69~~ 33 - 36	~~400 — 500~~ 240 - 260
3. Steering ball (drag link to swing freely with no socket end play	4.7 — 5.3	4.8 — 5.4	35 — 39
4. Steering knuckle torque (after shimming plate to obtain .13 mm -- .30 mm (.005 -- .012") loose fit -- knuckle-to-axle	4.7 — 5.3	4.8 — 5.4	35 — 39
5. Steering arm torque	24.4 — 31.2	25 — 32	180 — 230
6. Clearance between rear of axle and rear frame bracket - 0.0			

2.10.2 STEERING ASSEMBLY NOTES

(a) Use washers and shims, Fig. 15 (5)(6) to obtain .005" — .010" (.127 — .254 mm) shaft end play.

(b) When assembling unit line up position marks on components (2)(4)~~(6)~~ (8).

Replace the following like pages:

9 (Revised)
10 (Revised)
23 (Revised)
24 (No Change)

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. Aways 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 (30 psi) 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.

Replace seat belts every two years on open canopy units and every three years on machines with cabs or at change of ownership.

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.

Do not rush. Walk, do not run.

Know and use the hand signals used on particular jobs and know who has the responsibility for signaling.

Face the access system when climbing up and down.

Apply the parking device and place the transmission in neutral before starting the machine.

Do not bypass the starter safety switch. Repair the starter safety controls if they malfunction.

Fasten seat belt before operating.

Steering should be checked to both right and left. Brakes should be tested against engine power. Clutch and transmission controls should be moved through or to neutral positions to assure disengagement. Operate all controls to insure proper operation. If any malfunctions are found, park machine, shut off engine, report and repair before using machine.

If the powersteering or the engine ceases operating, stop the machine motion as quickly as possible. Lower equipment, set parking device and keep machine securely parked until the malfunction is corrected or the machine can be safely towed. Never lift loads in excess of capacity.

Should the machine become stuck or frozen to the ground, back out to avoid rollover.

Know and understand the job site traffice flow patterns.

Keep the machine in the same gear going downhill as used for going uphill.

When roading a machine, know and use the signaling devices required on the machine. Provide an escort for roading where required.

Always use the recommended transport devices when roading the machine.

Do not attempt repairs unless proper training has been provided.

Use extreme caution when removing radiator caps, drain plugs, grease fittings or pressure taps. Park the machine and let it cool down before opening a pressurized compartment.

Release all pressure before working on systems which have an accumulator.

When necessary to tow the machine, do not exceed the recommended towing speed. be sure the towing machine has sufficient braking capacity to stop the towed load. If the towed machine cannot be braked, a tow bar must be used or two twoing machines must be used - one in front pulling and one in the rear to retard. Avoid towing over long distances.

Observe proper maintenance and repair of all pivot pins, hydraulic cylinders, hoses, snap rings and main attaching bolts.

Always keep the brakes and steering systems in good operating condition.

Replace all missing, illegible or damaged safety signs. Keep all safety signs clean.

Do not fill the fuel tank to capacity. Allow room for expansion.

Wipe up spilled fuel immediately.

Always tighten the fuel tank cap securely. Should the fuel cap be lost, replace it only with the original manufacturers approved cap. Use of a non-approved cap may result in over-pressurization of the tank.

Never drive the machine near open fires.

Use the correct fuel grade for the operating season.

FOREWORD

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

Many equipment owners employ the Dealer 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.

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 items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

TABLE OF CONTENTS

TOPIC 1 GENERAL MACHINE DATA

1.1 MODEL AND U.S.A. FEDERAL SPECIFICATIONS

1.1.1 Model	65-B Motor Grader
1.1.2 U.S.A. Federal Specifications	00-G-630D, Type I, Size I

1.2 ENGINE

Make	Fiat
Model	8065.04.089
Type	4 Cycle
No. Cylinders	6
Bore	103 mm (4.05")
Stroke	110 mm (4.33")
Displacement	5.5 litre (335.5 in^3)
Firing Order	1-5-3-6-2-4
RPM:	
High Idle	2360
Low Idle	800/850
Full Load	2200
Fan and Water Pump	3037
Lubrication	Full Pressure
Fuel Injection Pump	Fiat (Bosch Lic.)
Bosch Number	PES6A80B410: L4/203
Fuel Injection Nozzles	Fiat or Bosch, CAV, OMAP
Injection Pressure	2255 ± 4.9 bar (3271 ± 71 psi)
Engine Timing	25° BTDC
Engine Oil Pressure	at High Idle- 3.8-5.5 bar (55-80 psi)

1.3 WEIGHTS

**Operating Weight	6190 kg (13 650 lbs.) w/scarifier 6038 kg (13 315 lbs.) w/out scarifier
Blade Pressure	2970 kg (6550 lbs.) w/scarifier

**Includes lubricants, hydraulic fluid, full fuel tank (no operator)

1.4 DIMENSIONS

Length	6.07 m (19'11")
Width	1.94 m (6'4.5")
Height:	
Top of Cab, Canopy	2.77 m (9'1.1")
Turning Radius (min.)	7.86 m (25'9.5")
Wheel Base	4.37 m (14'4")

1.5 POWER TRAIN AND SPEEDS

Transmission	
Make	Clark
Type	Power Shift
Model	18000
Torque Converter	
Make	Clark
Type	3 element, single stage
Model	12.2 integral
Torque Ratio at Stall	2.852 : 1
Torque Ratio at 2200 rpm	1.019 : 1

(Continued)

1.5 (Continued)

Tandems and Brakes	
Drive	Double Reduction
Chain Pitch	38.1 mm (1.50")
Center Distance	1113.28 mm (43.83")
Brakes	Dual (safety) System with Declutch
Number	4
Diameter	355.6 mm (14.0")
Total Lining Area	1574.3 cm^2 (244 in^2)
Speeds (Forward and Reverse) Standard Tires	
Low 1st	3.4 km/hr (2.1 mph)
Low 2nd	7.4 km/hr (4.6 mph)
Low 3rd	16.7 km/hr (10.4 mph)
High 1st	6.6 km/hr (4.1 mph)
High 2nd	14.3 km/hr (8.9 mph)
High 3rd	31.7 km/hr (19.7 mph)

1.6 STANDARD EQUIPMENT

Diesel Engine
Torque Converter
Power Shift Transmission w/Declutch
Hydraulic Controls
Hydrostatic Power Steering
4 Wheel Hydraulic Brakes w/Dual Master Cylinder
3048 mm (10') Moldboard(Hyd. shift)
8.25 20 - 6 ply, Tube-type Tires
Dry Air Cleaner w/Safety Element
24 Volt Electrical System
45 Amp. Alternator
Full Flow Engine Oil Filters
Full Flow Hydraulic System Filter
One - Stop and Tail Light
Accelerator/Decelerator
Horn
Back-up Alarm
ROPS Canopy
Seat Belts
Instrument Gauges:
- Engine Temperature
- Engine Oil Pressure
- Transmission Oil Pressure
- Transmission Oil Temperature
- Voltmeter
- Hourmeter

Control Lever Lock
Rear Step and Handles

1.7 SPECIAL EQUIPMENT

Scarifier
Cab Enclosure w/Safety, Tinted Glass (Includes front wiper and inside rear-view mirror)
Air Cleaner Extension
Air Cleaner Service Indicator
Rotating Beacon
Cab Heater
- Heater
- Pressurizer
- Dome Light
- Rear Wiper
- Inside Mirror

Defroster Fan
Gauge, Fuel Pressure
Indicator Lights
- Declutch Signal
- Engine Temperature
- Engine Oil Pressure
- Transmission Oil Pressure
- Transmission Oil Temperature
- Alternator

Head Lights
Working Lights
Outside Mirrors
Moldboard Extensions
3.66 m (12') Moldboard
Ratchet Park Brake Lever

8.25 x 20 - 10 ply Tires
15.00 x 19.5 - 8 ply Tires
Turn Signals
Vandalism
Hood Side Plates
Front Wheel Lean Anchor
Slow Moving Machine Emblem
Cold Weather Start System (ether)

TOPIC 2 SERVICE SPECIFICATIONS

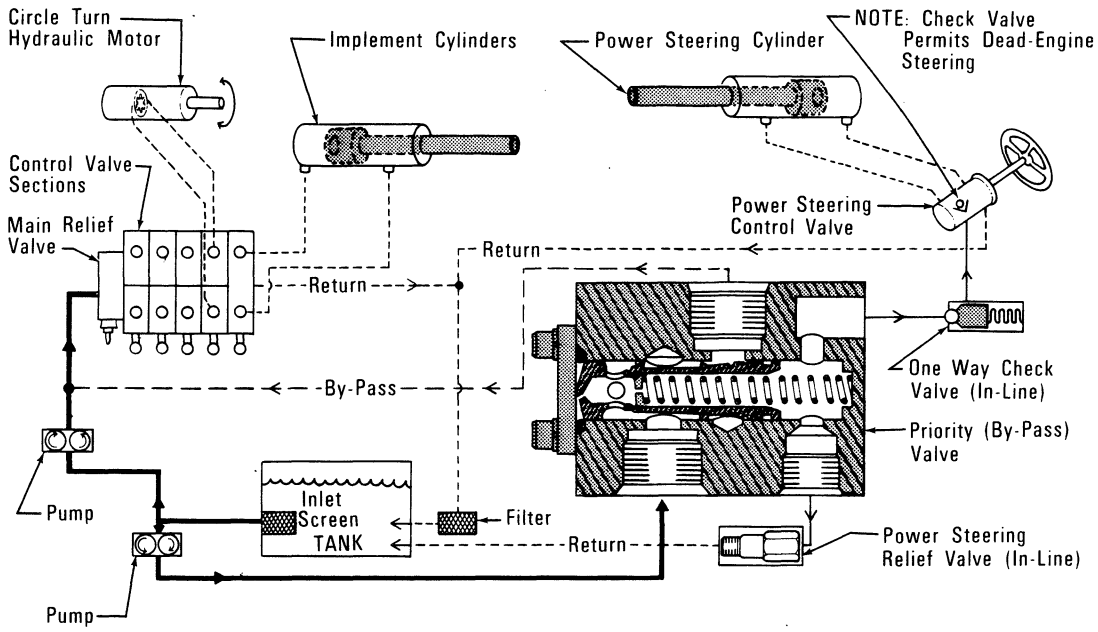
2.1 SERIAL NUMBER LOCATIONS

Grader - Right side of frame, immediately below operator's compartment.
Engine - Right side of engine -- just below and to the rear of alternator -- stamped on block.
Fuel Injection Pump - Right side of pump (note that pump "part" number is significant to calibration information.
Transmission and Torque Converter - Lower left front of drop housing.

2.2 VOLUMETRIC CAPACITIES

Hydraulic System	41.6 L (11.0 gals.)
Fuel Tank	113.6 L (30.0 gals.)
Cooling System	19.9 L (5.25 gals.)
Crankcase	12.3 L (3.25 gals.)
Transmission and Torque Converter	19.9 L (5.25 gals.)
Real Axle	5.7 L (1.5 gal.)
Tandem Case (each)	14.2 L (3.75 gals.)

2.3 HYDRAULIC SYSTEM



T-81734

FIG. 1 HYDRAULIC SYSTEM SCHEMATIC

2.3.1 SCHEMATIC EXPLANATION (Fig. 1)

There are essentially two hydraulic circuits; the implement circuit and the power steering circuit. Oil to the implement circuit flows from tank, through the screen, to the pump (upper). From the pump, oil flows to and around the main relief valve and to each of the control valve sections; note that (for instance) if any three implement controls are activated simultaneously, **each will receive approx. 1/3 of the total oil volume, thus, each implement will function** at 1/3 speed (but up to full system pressure -- pressure is only affected by restriction). If the implement cylinders (or circle turn motor) cannot move, due to load or at the end of travel, pressure builds to the setting of the main relief valve, which will constantly relieve, maintaining pressure at the pre-adjusted pressure setting. Relieved oil, as well as return oil from the implement circuits, flows through the return line, through the full flow return filter and then to tank.

IMPORTANT: Notice that an additional 25 L (6.6 gal.) of oil, from the power steering, constantly flows to the implement circuit to prevent an implement circuit void.

In the power steering circuit, tank oil flows through the screen, to the pump, then to the priority (by-pass) valve. Within the valve, 10.2 L (2.7 gal.) of oil will flow through the orifice disc, Fig. 1 (in front of spring) through the one-way check valve to the power steering control valve; the balance of flow, being pressurized because of the orifice restriction, moves the inner valve over and bypasses to the implement circuit.

The power steering control valve has two functions: the first function is to direct the oil to the desired end of hydraulic cylinder for turning. The other function is to permit dead engine steering; this is accomplished by a star gear and ring (inside the control valve) which rotate when the steering wheel is turned. Functioning as a pump, the star gear forces the trapped oil in the system (trapped by the check valve) to the desired end of hydraulic cylinder for turning. Note that very good "dead-engine" steering control is possible with this system.

The power steering relief valve functions only if the engine is running and the steering cylinder has traveled to its full stroke and the steering wheel is held in the full turn position.

2.3.2 SPECIFICATIONS

Hydraulic System Type	Closed, parallel
Control Valves (Husco)	Sectional
Pumps (Warner-Motive)	2 (Gear Type)
Maximum volume, each pump	35.2 L/min. at 110.3 bar at 2000 rpm (9.3 gpm at 1600 psi at 2000 rpm)
Volume to implement circuit	60.18 L/min. (15.9 gpm)
Volume to steering circuit	10.2 L/min. (2.7 gpm)
Priority Flow Divider (Waterman)	10.2 L/min. (2.7 gpm) Flow rate
Main Relief Valve	99.98 bar (1450 psi)
Power Steering Relief Valve	79.3 ± 3.4 bar (1150 ± 50 psi)
Oil Type	SAE 10W
Steering Cylinder Repair Kit	#73112076
Lift Cylinder Repair Kit	#73112075
Inlet Screen	Metal, washable
Filter	Replaceable #74027979

2.3.3 TOLERANCES

Hydraulic Pumps (implement and steering	Components not serviced separately -- check output -- if insufficient, replace pump (see paragraph 2.3.2).
Implement Control Valves	Housing and plunger not serviced separately.
Main Relief Valve	Adjustable -- pilot operated type, therefore, very sensitive.
Steering Control Valve Gerotor Set (Internal pump)	Replace star and ring when star teeth-to-ring clearance exceeds .127 mm (.005").
Centering Springs	**Replace when free weight is less than 5.59mm (.22").**
Spool and Sleeve	Maximum allowable clearance between spool and sleeve is .127 mm (.005").
Sleeve and bore	Maximum allowable clearance between sleeve and housing bore is .0203 mm (.0008").
Cross Pin	Replace if O.D. is less than 6.344 mm (.2498")
Circle Turn Hydraulic Motor	
Body and shaft	Maximum allowable clearance between shaft and body is .05 mm (.002")
Gerotor Set	Maximum allowable clearance between star and ring is .127 mm (.005").

2.4 ELECTRICAL SYSTEM

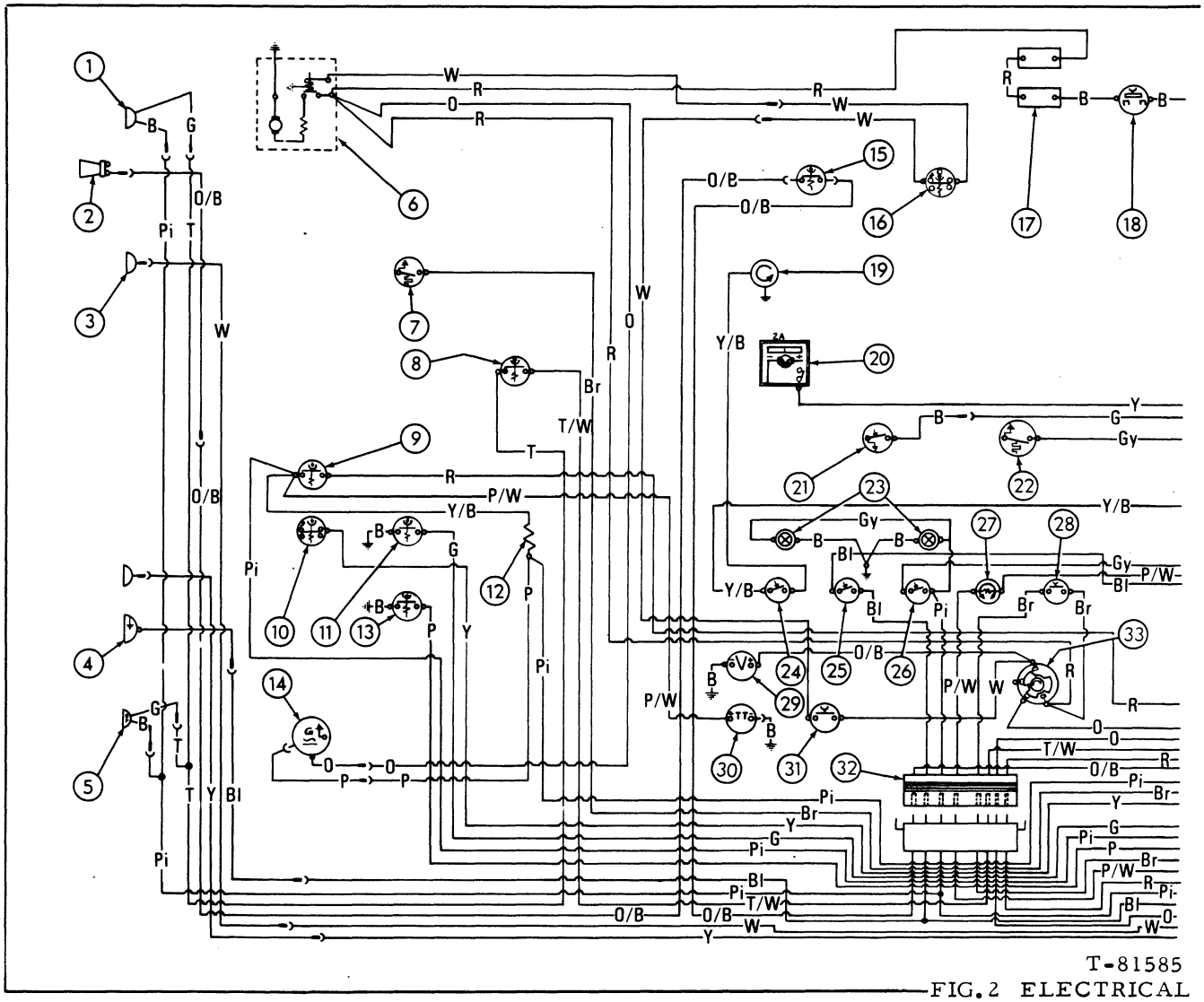
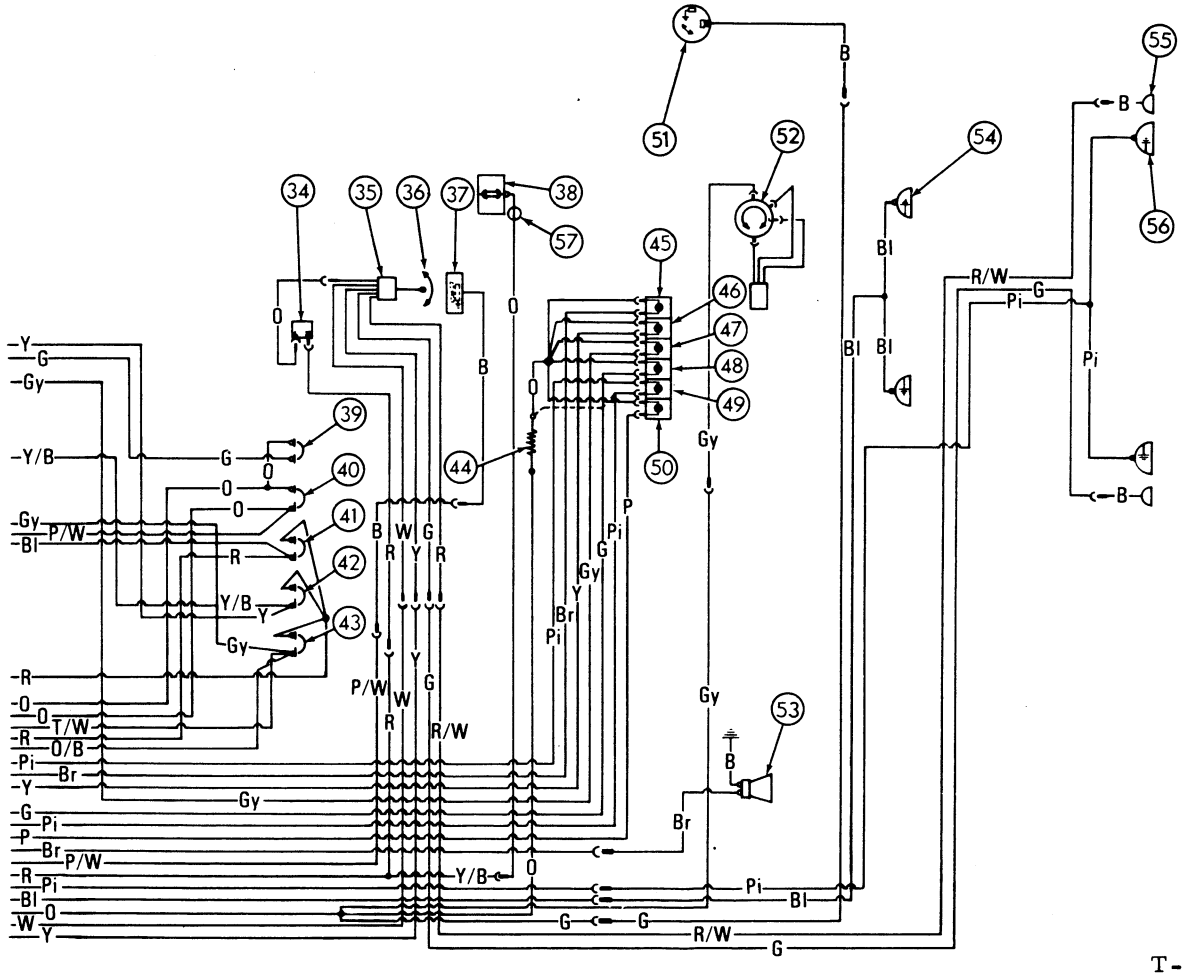


FIG. 2 ELECTRICAL

*Special Equipment
△To Indicator Lights

1. Tail and stop light
2. Reverse alarm
*3. Turn signal, rear
*4. Flood light, rear
*5. Tail and stop light
6. Cranking motor
△*7. Engine water temperature, switch
8. Stop light pressure switch
9. Hour meter pressure switch
△*10. Engine oil pressure switch
△*11. Transmission oil pressure switch
12. Resistor
13. De-clutch pressure switch
14. Alternator
15. Reverse alarm pressure switch
16. Neutral start switch
17. Batteries
18. Master switch
*19. Revolving light
*20. Rear window wiper switch
*21. Dome light
△*22. Transmission oil temperature switch
*23. Dash lights
*24. Revolving light switch
*25. Flood light switch
*26. Dash, head, tail, light switch
*27. Heater switch
28. Horn switch
29. Voltmeter
30. Hour meter
31. Cranking motor switch
32. Wire connector
33. Ignition switch
*34. Flasher
*35. Turn signal switch
*36. Turn signal lever
*37. Heater
*38. Cab pressurizer
*39. Circuit breaker
*40. Circuit breaker



SYSTEM SCHEMATIC

*41. Circuit breaker
*42. Circuit breaker
*43. Circuit breaker
*44. Resistor
*45. Indicator light, engine temperature
46. Indicator light, engine oil pressure
47. Indicator light, transmission oil temperature
48. Indicator light, transmission oil pressure
49. Indicator light, alternator
50. Indicator light, de-clutch
*51. Defroster fan switch
*52. Front window wiper switch
53. Horn
*54. Front flood light
*55. Front turn signals
*56. Headlights
*57. 20 amp. fuse (See item 38)

Electrical Wiring Color Coding

Code	Color
B	Black
G	Green
O	Orange
P	Purple
R	Red
T	Tan
W	White
Y	Yellow
Bl	Blue
Br	Brown
Gy	Grey
Pi	Pink
Bl/B	Blue and Black
G/W	Green and White
LBl	Light Blue
Pi/Gy	Pink and Grey
*G/W	Green with White Tracer (*)
*W/Gy	White with Grey Tracer

Service Specifications

2.4.1 GENERAL

Electrical System	24 Volts
Batteries	2 -- 12 Volt (series)
Size	30H
Amp. Hour Capacity (20 Hr. Rato)	95
Ground	Negative
Alternator	
Make	Delco - Remy
Model Number	1117645
Output	45 Amp.
Cranking Motor	
Make	Marelli
Model	MT 676 -- 24V, SAE 3 Flange

2.5 ENGINE AND FUEL INJECTION PUMP

2.5.1 ENGINE FITS AND TOLERANCES

	mm	SIZE inch (nominal)
CYLINDER HEAD AND BLOCK		
Cylinder Sleeves: semi-finished(std. O.D.)	107.020 - 107.050	4.213 - 4.214
honing required to	103.000 - 103.018	4.0550 - 4.0557
available oversize	.2	.0078
Cylinder head gasket: note that "top" is marked "ALTO" (Refer to Fig. 3)		
CRANKSHAFT		
Diameter of standard size main bearing journals	76.187 - 76.200	2.9995 - 3.0000
0.254 mm (0.010 in)	75.933 - 75.946	2.9895 - 2.9900
Journal undersize 0.508 mm (0.020 in)	75.679 - 75.692	2.9795 - 2.9800
0.762 mm (0.030 in)	75.425 - 75.438	2.9695 - 2.9700
1.016 mm (0.040 in)	75.171 - 75.184	2.9595 - 2.9600
Thickness of standard size main bearings	2.165 - 2.172	.0852 - .0855
0.254 mm (0.010 in)	2.292 - 2.299	.0902 - .0905
Bearing undersizes 0,508 mm (0.020 in)	2.419 - 2.426	.0952 - .0955
0.762 mm (0.030 in)	2.546 - 2.553	.1002 - .1005
1.016 mm (0.040 in)	2.673 - 2.680	.1052 - .1055
Running clearance of main bearing journals	.043 - .090	.0017 - .0035
Thickness of standard size thrust washers (bearing flanges)	3.378 - 3.429	.133 - .135
Thickness of 0.127 mm (0.005 in) oversize thrust washers	3.505 - 3.556	.138 - .140
End play of crankshaft	.082 - .334	.0032 - .013
Install oversize thrust/washers if end play exceeds	.40	.0157
Diameter of standard size connecting rod bearing journals	58.730 - 58.743	2.3121 - 2.3126
.102 mm (0.102 in)	58.628 - 58.641	2.3082 - 2.3087
0.254 mm (0.010 in)	58.476 - 58.489	2.3021 - 2.3026
Journal undersizes 0.508 mm (0.020 in)	58.222 - 58.235	2.2920 - 2.2926
0.762 mm (0.030 in)	57.968 - 57.981	2.2822 - 2.2827
1.016 mm (0.040 in)	57.714 - 57.727	2.2721 - 2.2726
Thickness of standard size connecting rod bearings	1.805 - 1.815	.071 - .0714
.102 mm (0.004 in)	1.856 - 1.866	.073 - .0734
0.254 mm (0.010 in)	1.932 - 1.942	.076 - .0764
Bearing undersizes 0.508 mm (0.020 in)	2.059 - 2.069	.081 - .0814
0.762 mm (0.030 in)	2.186 - 2.196	.086 - .0864
1.016 mm (0.040 in)	2.313 - 2.323	.091 - .0914
Running clearance	.021 - 0.058	.0008 - .0023
PISTONS		
Diameter of standard size pistons measured at a point 50 mm (1.968 in) from the base of the skirt at 90° to pin.	102.865 - 102.877	4.0498 - 4.0527
Piston-liner clearance	.123 - .153	.0048 - .0060
Oversize pistons:		
0.2 mm (0.008 in)	103.865 - 103.077	4.0578 - 4.0607
0.4 mm (0.016 in)	103.265 - 103.277	4.0658 - 4.0687
0.6 mm (0.024 in)	103.465 - 103.477	4.0738 - 4.0767
0.8 mm (0.032 in)	103.665 - 103.667	4.0818 - 4.0847

IMPORTANT: Replaced pistons must weigh within 10 grams (.35 oz) of original pistons (Weight -- Peso -- see stamping on piston).

2.5.1 (Continued)

	SIZE	
PISTON RINGS	mm	inch (nominal)
End gap of piston rings (Fitted in cylinders)		
Top ring	.35 - .55	.014 - .021
2nd ring	.30 - .50	.012 - .019
3rd ring	.30 - .45	.012 - .018
Oversize piston rings:		
.1mm (.004")		
.2mm (.008")		
.4mm (.016")		
.6mm (.024")		
.8mm (.031")		
PISTON PINS		
Standard size	33.983 - 33.990	1.3379 - 1.3381
Oversize	.2	.0078
Oversize	.5	.0196
Pin bushing size (I.D.)	34.005 - 34.012	1.3387 - 1.3390
TIMING GEARS		
Idler gear bushing (ream after installation)	32.050 - 32.075	1.261 - 1.262
VALVE OPERATING MECHANISM		
Camshaft journal O.D.		
Front	51.470 - 51.500	2.0263 - 2.0275
Intermediate	50.970 - 51.000	1.0066 - 1.0078
Intermediate	50.470 - 50.500	1.987 - 1.988
Rear	49.970 - 50.000	1.967 - 1.968
Camshaft bearing I.D.		
Front	51.580 - 51.630	2.0307 - 2.0326
Intermediate	51.080 - 51.130	1.011 - 1.0129
Intermediate	50.580 - 50.630	1.9913 - 1.9933
Rear	50.080 - 50.130	1.9716 - 1.9736
Valves, exhaust, seat angle, 45° 30' $\pm$ 7'		
Seat face width	1.3 ± 0.2	.051 ± .0078
Valves, intake, seat angle, $45^{\circ} \pm 0^{\circ}$ 5'		
Seat face width	1.3 ± 0.2	.051 ± .0078
Valve guides available oversize	.2	.0078
Valve lifters available oversize	.1	.0039
Valve lifters available oversize	.2	.0078
Valve lifters available oversize	.3	.0118
FAN BELTS		
Belts are matched -- comparable to Gates #HC-38		
Tension (use gauge) -- new belts	22.7 - 28.5 kg	50 - 63 lbs.
Tension (use gauge) -- used belts	18.1 - 22.7 kg	40 - 50 lbs.
COOLING SYSTEM		
Thermostat	79 - 94° C	174 - 201° F
OIL PUMP		
Upper shaft O.D. -- at cover end	14.003 - 14.014	.5512 - .5517
Upper shaft O.D. -- at body end	17.989 - 18.000	.7082 - .7086
Lower shaft O.D.	14.989 - 15.000	.5901 - .5905
Upper shaft bushing I.D.	18.016 - 18.059	.7092 - .7109
Lower shaft bushing I.D.	14.697 - 14.874	.5786 - .5855
HYDRAULIC PUMP DRIVE		
Bushing I.D. in front and rear supports	37.050 - 37.075	1.4586 - 1.4596