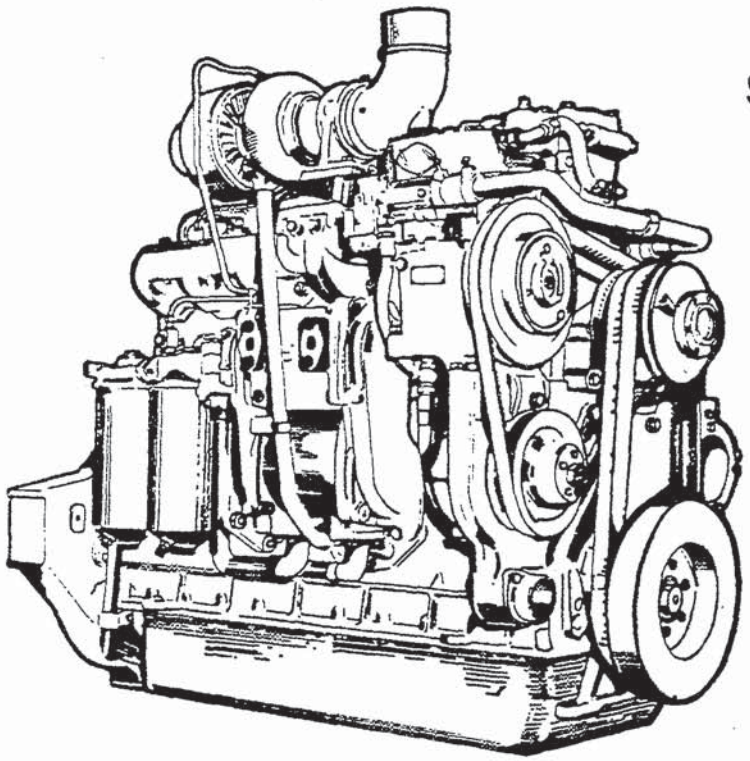
FIATALLIS®

2800
2800 MK1
2900
2900 MK1

ENGINES



service manual

Form 73110787 English
8-89

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason MOST ACCIDENTS CAN BE PREVENTED by recognizing the real cause and doing something about it before the accident occurs.

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

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

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

WARNING

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

CALIFORNIA

Proposition 65 Warning

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

2800, 2800 MK 1
2900, 2900 MK 1
ENGINES

service manual

FORM 73110787 English

(Replaces 70666040)

⚠ 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 MANUAL FORM 73110787
2800, 2800 MK1, 2900, 2900 MK1 ENGINES

(5-80)

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:
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or
Fiat-Allis M.M.T. S.p.A. - MAGAZZINO STAMPATI - Viale Torino, O STUPINIGI (Torino) - Italy

Write in the following changes:

Page 14-6 IMPORTANT - Last Sentence:

Petroleum lubricants MUST NOT be used. Use only ~~mineral or~~ vegetable oils, such as ~~castor oil,~~ Wesson or Liquid Crisco. *Not castor oil.*

Page 17-9 At the bottom of the page a

Capscrew	Turbocharger Compressor Housing to Bearing Housing	1/4-20 UNC-	UNC-2B	-	80-100 lb-in.	92-115 kg-cm
Nut	Turbocharger Impeller	5/16-24 N	-24 NF-2	-	80-100 lb-in.	92-115 kg-cm

Capscrew | Engine Mounting *68-70 lb.ft. 9.4-9.7 kgm*

NOTICE These changes are included in this copy

Replace the following pages:

1-3	Revised	19-1	Revised
1-4	No change	19-2	Revised

Reason: Update service tools.

SUBJECT INDEX

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, over hangs, timber, demolitions, fire, high walls, drop off, back fills, rough terrain, ditches, ridges, excavations, heavy traffic, crowded parking, crowded maintenance and closed areas. Use extreme care when in areas such as these.

An operator must know the machine's capabilities. When working on slopes or near drop offs 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 hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Controls also may be inadvertently moved causing accidental machine or equipment movement.

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 shut down 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.

SAFETY RULES

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.

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* the machine before mounting. Sound horn. Obey flag man, 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 load ability 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 draw bars, 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 OPERATOR'S COMPARTMENT 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 lowered 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 element 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.

SAFETY RULES

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 a 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 break over 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 drop offs, in congested areas or on ice or slippery surfaces.

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

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 hill side proceed slowly. Never turn sharply up hill or down hill.

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

In steep down hill operation, do not allow engine to over speed. Select proper gear before starting down grade.

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 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 over head guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.

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

Avoid operating equipment too close to an over hang or high wall either above or below the machine. Be on the look out for caving edges, falling objects and slides. Beware of concealment by brush and under growth 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 of approaching traffic.

Move the machine away from pits, trenches, overhangs and over head 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.

SAFETY RULES

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 multi purpose 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 Manual. 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.*

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, fingers, or hands 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, feet, fingers, 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.

SAFETY RULES

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 card board 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 Manual 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 make shift 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 hand holds 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.

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.

SAFETY RULES

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 power steering 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 safety towed. Never lift loads in excess of capacity.

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

Know and understand the job site traffic flow patterns.

Keep the machine in the same gear going down hill as used for going up hill.

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 towing 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 overpressurization 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.

Fiatallis is not responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by Fiatallis for use in maintaining and/or repairing products manufactured or merchandized by Fiatallis.

In any case, no warranty of any kind is made or shall be imposed with respect to products manufactured or merchandized by Fiatallis when failures are caused by the use of parts and/or components not approved by Fiatallis.

SECTION 1 — DESCRIPTION AND SPECIFICATIONS

TOPIC 1 — DESCRIPTION

A. GENERAL

The engine models covered in this manual are six cylinder, vertical-in-line, four cycle, water cooled, overhead valve, compression-ignition type diesel engines. Model 2800 MKI engines are naturally aspirated and Model 2900 engines are equipped with a turbocharger.

1. ALL MODELS

The fuel system consists of a fuel filter, differential needle-type fuel injection nozzle holder assemblies, and a fuel injection pump with fuel transfer pump and governor. The system cleans, prepares, and delivers accurately metered quantities of fuel under high pressure, through fuel injection nozzles, into the cylinders at a definite timing in relation to the engine firing cycle. The fuel is ignited by heat generated by compression of the air in the cylinders.

A combustion chamber is located in the head of each piston and the fuel injection nozzles are mounted in the cylinder head. The orifices in the tip of the nozzle are drilled at a slight angle so that the fuel is sprayed directly into the combustion chamber. The shape of the combustion chamber and the angle of fuel injection, causes extreme turbulence of the air within the cylinders and results in the fuel and air being thoroughly mixed for complete combustion.

Proper lubrication is assured by a gear type oil pump driven by an integral gear on the camshaft. Oil is pumped under 30 - 55 psi (207 - 379 kN/m^2) pressure from the main oil gallery to the crankshaft, connecting rods, idler gear, and rocker arm assembly. All other internal moving parts are lubricated by splash, spray, or oil in suspension.

Engine cooling is accomplished by coolant, forced through the engine cooling and radiator system by a centrifugal type water pump. The water pump is belt driven.

2. MODEL 2900

A turbocharger is used to obtain greater power output over that of the naturally aspirated model engine by increasing the supply of air to the cylinders. The turbocharger is essentially a rugged, yet highly efficient exhaust driven blower.

The turbocharger responds to engine load demands by reacting to the flow of expanding exhaust gases and supplying a correlated volume of air to the engine cylinders. During a heavy load/lugging operation, the increased flow of exhaust gases turns the turbine wheel faster, causing the compressor impeller to turn faster to supply more air to the intake manifold. Conversely, when engine load is light, and the radial flow of gases within the turbine decreases, the turbocharger compressor reduces air supply to the intake manifold.

B. PRINCIPLES OF OPERATION

In a four cycle diesel engine, a power stroke is made by each piston for every two complete revolutions of the crankshaft. The sequence of the strokes is as follows: Intake, compression, power, and exhaust.

1. INTAKE STROKE

As the piston moves downward on the first, or intake stroke, air enters the cylinder through the air intake

manifold, and the intake valve which starts to open a few degrees before the piston reaches top dead center. The intake charge consists of air only, with no fuel mixture.

2. COMPRESSION STROKE

Shortly after the piston starts to move upward on the second, or compression stroke, the intake valve closes. The air is compressed in the cylinder and compression of the air raises the temperature in the cylinder to approximately 1000°F. (537°C.). At the proper moment during the compression stroke, a metered quantity of fuel is injected into the combustion chamber under extremely high pressure. The finely atomized fuel is ignited by heat of the compressed air and starts to burn immediately.

3. POWER STROKE

Expansion of the burning gases forces the piston downward on its third, or power stroke. Near the bottom of the power stroke, the exhaust valve starts to open.

4. EXHAUST STROKE

As the piston moves upward on the fourth, or exhaust stroke, the exhaust valve is open and burned gases are forced out of the cylinder by the upward travel of the piston. A few degrees before the piston reaches top dead center, the intake valve starts to open to admit a fresh charge of air to the cylinder. A few degrees after top dead center, the exhaust valve completely closes and the cycle is repeated.

TOPIC 2 — SPECIFICATIONS

A. ENGINE DATA AND CHARACTERISTICS

Number of Cylinders 6
Bore . . . . . 3.875" (98.42mm)
Stroke . . . . . 4.250" (107.95mm)
Total Displacement . . . . . 301 cu. in. (4933cm^3)
Crankshaft Rotation (Viewed from Fan End) . . . . . Clockwise
Number of Main Bearings 7
Compression Ratio (Nominal) 16.25:1
Compression Pressure (Minimum) at Sea Level 600 rpm hot . . . . . 500 psi (35.15 kg/cm^2)
Firing Order 1-5-3-6-2-4
Minimum Stabilized Water Temperature . . . . . 180° F. (82° C.)
Maximum Permissible Exhaust Restriction
Model 2900 . . . . . 2 in. (0.069 kg/cm^2)
Model 2800 MKI . . . . . 3 in. (0.103 kg/cm^2)

B. FUEL INJECTION

Nozzle Holder Assembly Mfr. . . . Allis-Chalmers
Fuel Injection Pump Mfr. . . . . Roosa Master
Nozzle Type . . Spring Loaded, Four Hole Orifices
Opening Pressure
Model 2900 . . . . . 3100-3150 psi (21373-21718 kN/m^2)
Model 2800 MKI . . . . . 3450-3500 psi (23787-24131 kN/m^2)
Orifice Size
Model 2900 . . . . . 0.0126" (0.32mm)
Model 2800 MKI . . . . . 0.0106" (0.27mm)
Fuel Pump Timing to Engine, static
Model 2900 . . . . . 20°
Model 2800 MKI . . . . . 18°
Fuel Oil Filter
Model 2900 . . Combination, Primary and Secondary
Model 2800 MKI . Common Base, Filter and Water Separator
Fuel Injection Pump Speed (Ratio to Crankshaft) 0.5:1

C. VALVE DATA AND TIMING

1. Valve Lash Adjustment:
   Intake Valve Clearance . . .015" (0.381mm) Hot
   Exhaust Valve Clearance . .015" (0.381mm) Hot
2. Valve Timing:
   Exhaust Valve (with .0195"-0.495mm tappet clearance):
   Opens BBDC . . . . . 56°
   Closes ATDC . . . . . 16°
   Duration . . . . . 252°

   Intake Valve (with .0195"-0.495mm - tappet clearance):
   Opens BTDC . . . . . 20°
   Closes ABDC . . . . . 48°
   Duration . . . . . 248°
   Overlap . . . . . 36°

IMPORTANT: Tappets must be set with .0195" (0.495mm) clearance to obtain proper valve opening and closing in degrees tabulated for the camshaft. Do not confuse this setting with valve lash adjustment data.

D. LUBRICATION

Type--Full Pressure

Lubricating Oil Filter--Full Flow

Oil Pump Speed (Ratio to Crankshaft--0.5: 1

Lubricating Oil Specifications: Use oils meeting or exceeding one of the following specifications:

(1) API Service CD

(2) MIL-L-45199B

(3) MIL-L-2104C

NOTE: Synthetic or partially synthetic oils, and multi-viscosity oils meeting one of the above specifications are approved for usage.

TEMPERATURE		VISCOSITY (St. Weight)
°C	°F	
35 up	95 up	SAE 40
0 to 35	32 to 95	SAE 30
-18 to 0	0 to 32	SAE 20-20W
-23 to -18	-20 to 0	

E. ENGINE SPEEDS

TEMPERATURE		MULTI-VISCOSITY (SAE)
°C	°F	
35 up	95 up	15W-40
0 to 35	32 to 95	10W-30 or 15W-40
-18 to 0	0 to 32	10W-30 or 15W-40
-23 to -18	-20 to 0	10W-30

Below -28°C(-20°F), a means of warming the engine and batteries is recommended to obtain satisfactory starting and to prevent damage to the engine.

NOTE: For severe machinery applications we strongly recommend the oil selected to have a minimum sulfated ash content of 1.5%.

For specified high and low idle engine speeds, refer to the Operation and Maintenance Instruction Manual furnished with the unit.

SECTION 2 - COOLING SYSTEM

TOPIC 1 - GENERAL

The engine cooling system includes the water pump, radiator, water inlet piping, thermostat, thermostat housing, engine oil cooler (Model 2900 only), hoses, engine coolant temperature gauge, and cooling fan. Coolant flows through water passages in the cylinder block and cylinder head to maintain correct engine operating temperatures.

A double acting valve is provided in the radiator filler cap for relieving air pressure due to heat expansion and allowing atmospheric pressure to enter when cooling contraction occurs.

The water pump draws coolant from the bottom of the radiator and circulates it thru the water passages in the cylinder block and cylinder head. The coolant is discharged from the cylinder head through the thermostat housing and radiator inlet hose into the upper part of the radiator. As the coolant passes from the top to the bottom of the radiator, the coolant dissipates its heat to the atmosphere by air pushed thru the radiator core by the cooling fan.

TOPIC 2 - RADIATOR

⚠ DANGER

Fluid under pressure. Do not remove radiator cap until pressure has been relieved as coolant may boil over and cause personal injury.

A. GENERAL

The radiator is a one piece welded assembly and is properly positioned on the radiator support in relation to the cooling fan. A shroud is provided in back of the core and surrounding the cooling fan to assure full air flow through the radiator core. The transmission oil cooler is an integral part of the radiator and is located in the lower section on early units.

B. RADIATOR REMOVAL AND INSTALLATION

1. Drain the cooling system; refer to "Operation and Maintenance Instruction Manual" for detailed information.
2. Loosen hose clamps attaching the radiator inlet and outlet hoses to the radiator and remove hoses from radiator.
3. Disconnect transmission cooling lines from the bottom of the radiator.
4. Remove fan guard, radiator grill, and fuel tank filler tube. Cover fuel tank opening to prevent entrance of dirt.

⚠ WARNING

Wear safety glasses with side shields or goggles when using compressed air for cleaning to reduce the danger of personal injury from flying particles Limit the pressure to 30 psi (2.1 kg/cm^2) according to OSHA requirements.

5. Remove nuts, lockwashers, and washers securing the radiator to the radiator support and remove the radiator.
6. Install radiator by direct reversal of removal procedure. Fill radiator to the proper level and check transmission oil level.

C. RADIATOR INSPECTION AND REPAIR

1. Thoroughly clean exterior of radiator removing all foreign material from between cooling core tubes and fins. Be careful not to bend the fins. Straighten any fins that are bent.
2. Inspect radiator for clogging or leakage. Test radiator under water with approximately 5 lbs. (0.351 kg/cm^2) of air pressure. Note the source of the air bubbles and solder any leaks. Be sure to wash off the acid after soldering as the acid will eat into the tubes if not washed off. The radiator should be repaired only by qualified personnel.
3. Inspect the hoses for deterioration or damage. Replace if necessary.

TOPIC 3 - FAN, FAN BELT, FAN SPACER, AND FAN PULLEY

⚠ WARNING

WARNING Do not check or adjust belts when engine is running. Be especially alert around a pusher fan.

Illustrations and procedures shown below depict the Model 2900 engine. Model 2800 MKI engines use a pair of matched V type belts, requiring 2-sheaved pulleys.

A. GENERAL

The engine is equipped with a pusher type fan. The fan pushes air thru the radiator and the engine coolant is cooled as it circulates from the top to the bottom of the radiator core. The fan, fan spacer, and pulley are bolted to the pulley hub which is pressed on the water pump shaft. The fan and water pump are driven from the crankshaft pulley by either a single V type belt or a pair of matched V type belts that also drive the alternator.

B. FAN BELT ADJUSTMENT

The fan belt is properly adjusted when it can be pressed inward by hand .25" (6.35mm) to .50" (12.7mm) at a point half way between alternator and crankshaft pulleys.

Refer to Fig. 1 and proceed as follows to adjust belt:

1. Loosen but do not remove adjusting bracket capscrew (1) and capscrew attaching supporting bracket (4) to alternator.
2. Move alternator in or out to obtain specified tension and tighten capscrews securely.

C. FAN BELT REMOVAL, INSPECTION, AND INSTALLATION

1. Remove the fan guard and loosen capscrew securing alternator to adjusting brace; push alternator in so that fan belt can be removed from alternator pulley. Slip fan belt from crankshaft pulley then over fan blades, and remove the belt.
2. Inspect fan belt for excessive slickness, oilsoak, wear, tears, cracks, and overstretching. Replace if necessary.

IMPORTANT: MODEL 2800 MKI. Even though only one belt may need replacement because of damage or excessive wear, it is imperative that both belts be replaced to obtain satisfactory belt life. After replacement, approximately 24 hours operating time is required to properly seat a new pair of belts. Readjust the belts after this period.

3. Install fan belt by a direct reversal of the removal procedure and adjust the belt; refer to "FAN BELT ADJUSTMENT" in this section.

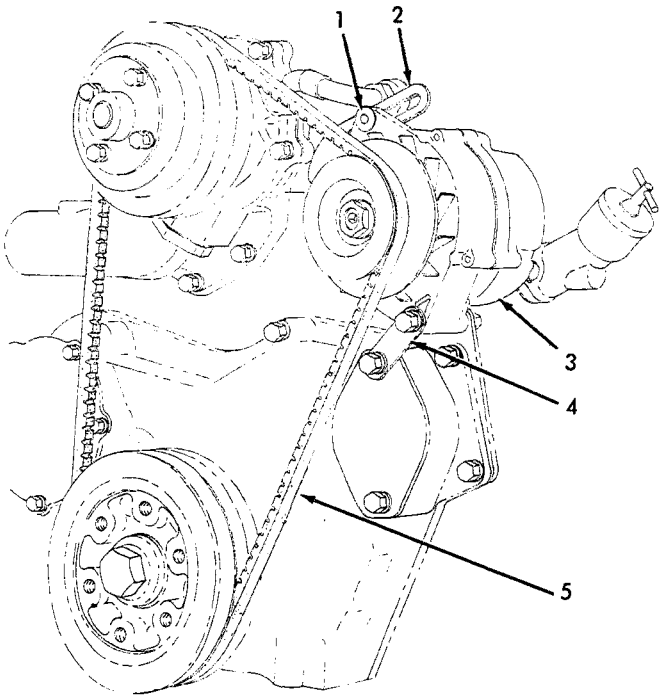

FIG. 1 FAN BELT ADJUSTMENT LOCATION (MODEL 2900 SHOWN) (T-74681)

1. Adjusting bracket capscrew
2. Adjusting bracket
3. Alternator
4. Alternator supporting bracket
5. Belt

D. FAN, FAN SPACER, AND FAN PULLEY REMOVAL, INSPECTION, AND INSTALLATION

Fan blades seldom require service. However, bent blades are conducive to inefficient cooling and will affect the balance of the fan causing water pump bearing damage. In case of damage, the fan should be removed and the blades restored to their original contour (check by comparing with a new or undamaged fan) or replace with a new fan. For removal of the fan, fan spacer, and fan pulley, proceed as follows:

1. Remove capscrews and lockwashers securing fan and fan spacer to pulley hub; remove fan and fan spacer.

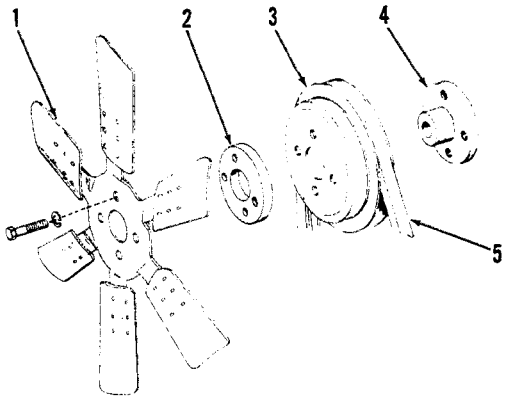

FIG. 2 FAN AND FAN PULLEY PARTS (T-54408)

1. Fan
2. Fan spacer
3. Pulley
4. Pulley hub
5. Belt

2. Loosen capscrew securing alternator to adjusting brace and push alternator in far enough so the belt can be removed from the fan pulley.

3. Slip the belt off the fan pulley and remove the pulley from the water pump hub.

4. Inspect fan for cracks, loose rivets, or bent blades. Repair or replace if necessary.

5. Inspect fan spacer and fan pulley for wear or damage. Replace if necessary.

6. Position fan pulley on water pump hub; position belt in fan pulley groove.

7. Install fan spacer and fan, securing with capscrews and lockwashers. Tighten capscrews to a torque of 30 to 35 lbs. ft. (4.14 - 4.83 kg – m).

8. Adjust fan belt; refer to "FAN BELT ADJUSTMENT" in this section.

TOPIC 4 - THERMOSTAT

⚠ WARNING

Observe all start up and shut down procedures ⚠ WARNINGS listed in the Operation and Maintenance Instruction Manual.

A. GENERAL

The thermostat, located in housing on left side of engine, limits circulation of coolant to engine circulation system only until engine reaches normal operating temperature. Thermostat then maintains correct operating temperature by circulating some coolant through radiator.

If engine overheats or does not reach and maintain normal operating temperature, thermostat should be removed and tested as a possible cause of trouble.

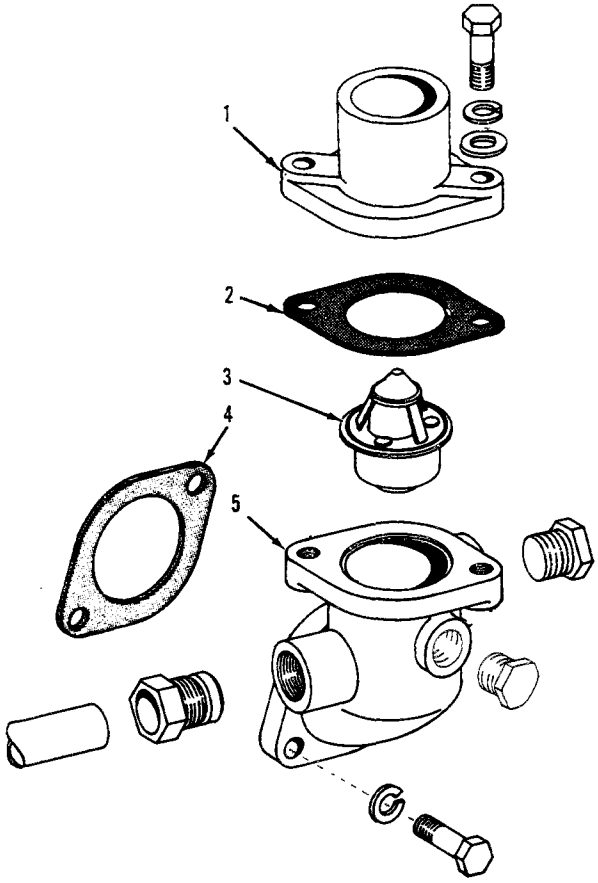

FIG. 3 THERMOSTAT HOUSING PARTS (MODEL 2900 SHOWN) (T-74684)

1. Water outlet flange
2. Gasket
3. Thermostat
4. Gasket
5. Thermostat housing

B. THERMOSTAT REMOVAL, TESTING, AND INSTALLATION

1. THERMOSTAT REMOVAL (Fig. 3)

   a. Drain cooling system.

   b. Remove two capscrews securing water outlet flange to thermostat housing and remove gasket and flange.

   c. Remove thermostat; clean and inspect housing and examine gasket. If leakage between thermostat housing and block is evident, remove housing and replace gasket (4).

2. THERMOSTAT TESTING

   a. Suspend thermostat in a pan of clean water so that the thermostat is completely immersed.

   b. Gradually heat the water and use an accurate thermometer to check the temperature of the water.

NOTE: Stir water during this procedure so that heat is evenly distributed in the volume of water.

   c. Observe the thermostat as temperature of the water reaches 180°F. If thermostat is functioning properly, thermostat should begin to open at 180°F. and be fully open at 195°F. plus or minus 5°.

NOTE: The thermostat is not adjustable and if it does not open or close within the above limits, it must be replaced.

3. THERMOSTAT INSTALLATION (Fig. 3)

   a. Place gasket in position and install thermostat.

   b. Place water outlet flange and gasket in position on thermostat housing and secure with capscrews and lockwashers.

   c. Fill cooling system.

TOPIC 5 - ENGINE OIL COOLER - MODEL 2900 ONLY

A. GENERAL

The engine oil cooler, Fig. 4, located on the right side of the engine, consists of a bundle of corrosion resistant cooling tubes, a baffle, and a shell. The water pump circulates coolant through the tubes and the engine oil pressure pump circulates oil through the shell around the outside of the tubes, controlling oil temperature.

The cooling tubes dissipate heat from the oil to the coolant. If proper lubricating oil maintenance procedure is followed, the oil cooler will function efficiently. However, if the oil in the engine is not changed at recommended intervals, impurities will be deposited in the cooler that will eventually restrict the flow of oil around tubes of the cooling core. Restriction of oil flow through the cooler is usually indicated by a drop in oil pressure because of the oil overheating. If this occurs, the oil cooler must be cleaned or replaced with a new one.

IMPORTANT: It is absolutely necessary that the oil cooler be kept clean for proper oil cooling.

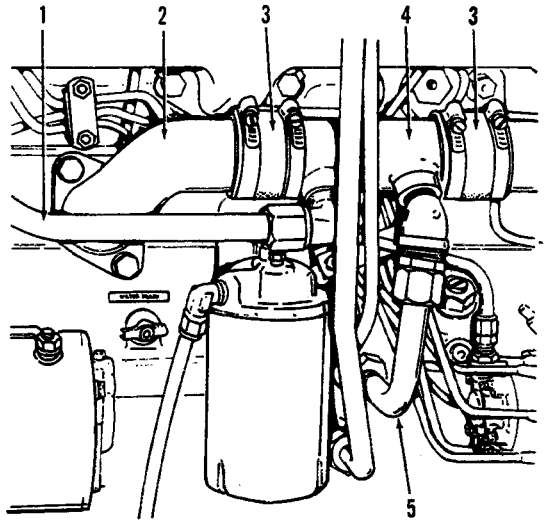

FIG. 4 ENGINE OIL COOLER (T-53676)

1. Oil cooler oil inlet tube
2. Coolant outlet elbow
3. Hose and hose heat shield
4. Oil cooler
5. Oil cooler oil outlet tube

B. ENGINE OIL COOLER REMOVAL AND INSTALLATION

1. Drain cooling system.
2. Remove oil inlet tube from cylinder block and cooler.
3. Remove oil outlet tube from cooler and cylinder block.
4. Loosen hose clamp at front of cooler.
5. Remove capscrew and lockwasher from coolant outlet elbow.
6. With a twisting motion, force oil cooler outlet elbow and cooler to rear of engine, freeing cooler from front hose connector.
7. Loosen hose clamp at rear of cooler and remove from elbow.
8. After inspecting and cleaning, install oil cooler in reverse order of removal. Use a new coolant outlet elbow-to-block gasket. Inspect hoses and hose heat shields and replace if necessary.

C. OIL COOLER CLEANING

To function efficiently the oil cooler tank and core must be kept as clean as possible. Scale and sludge deposits reduce the cooling capacity of the oil cooler. Whenever an oil cooler is removed from the engine or if the efficiency of the cooler is impaired due to an accumulation of sludge or scale the oil cooler should be cleaned.

In many repair shops and service departments, caustic compounds are used to clean grease, dirt, paint, gasket remnants, etc., off parts. These compounds are very effective and very useful when used properly, but can cause considerable damage to certain materials.

Materials such as aluminum, rubber, fiber, sintered bronze and bonding agents are particularly sensitive to all highly concentrated caustic cleaners. There are many of these cleaning compounds on the market, under various trade names, but the majority of them are based on the same active agent - sodium hydroxide. Steam "jenny" compounds also generally contain this agent.

Some current oil coolers and radiators are being manufactured with aluminum fins. A few cleaning solutions have been found to react with aluminum to the extent of dissolving the metal.

We recommend that Trichlorethylene solvent or equivalent be used for both internal and external cleaning of oil coolers and radiators used in Allis-Chalmers units since there is no reaction between the aluminum and the solvent.

> **⚠ WARNING**
>
> Trichlorethylene solvent is toxic and very volatile. Use only in a well ventilated room or area. Do not inhale the fumes for any length of time. Extinguish all smoking materials and open flames.

In all cleaning operations care should be taken in the selection of cleaning materials. When any doubt exists as to whether or not caustic compounds would damage the materials to be cleaned, the use of such compounds should be avoided.

D. OIL COOLER TESTING

1. Using an improvised seal, such as a metal plate and rubber gasket, seal either the fluid inlet or outlet opening in the oil cooler tank and attach an air pressure hose to the other opening.

2. Submerge the oil cooler in water heated to approximately 180° F. (82° C) and allow sufficient time for oil cooler to warm up, then test for leaks using air under pressure of 100 psi (7.031 kg/cm2), or as near that pressure as possible.

3. Air bubbles observed at either open end of the oil cooler indicate that a cooling core tube may have a puncture or be defective in another way. If cooling core is faulty, the oil cooler must be replaced. If repair of oil cooler tank is necessary, the repair should be made by a reputable radiator repair shop.

TOPIC 6 - WATER PUMP

> **⚠ WARNING**
>
> Never use gasoline, solvent or other flammable fluids to clean parts.

A. GENERAL

A centrifugal type water pump is provided for circulating coolant through the engine and radiator. The water pump is mounted on the front of the cylinder block and is belt driven from the crankshaft pulley. Coolant is drawn through the inlet opening by the pump impeller and forced through the outlet opening located in the back side of the volute and into the cylinder block. When the engine is equipped with an oil cooler, the coolant is forced through the outlet of the volute into and through the oil cooler and then into the cylinder block. Also, a portion of the coolant is forced through the volute into the cylinder block. O-rings and/or gaskets are used to assure leak proof connections.

The water pump shaft and bearing assembly is sealed and does not require lubrication. A water slinger on the impeller end of the shaft slings any coolant which might seep past the seal assembly out the cored opening in the pump body, thus preventing coolant from coming in contact with the shaft bearing. The shaft and bearing assembly is secured in the pump body by a press fit and a retaining snap ring. The seal between the impeller and pump body is spring loaded and is pressed into the pump body forming a leakproof seal. The carbon sealing surface is bonded to the seal assembly and contacts a ceramic seal insert bonded to the pump impeller. The ceramic seal insert bonded to the impeller cannot be serviced separately. If it is damaged, a new impeller must be installed in the pump.

A pulley hub, pressed on the front end of the water pump shaft and bearing assembly, is the mounting member for the pulley and fan.

B. WATER PUMP REMOVAL

1. Drain cooling system; remove fan guard.

2. Loosen capscrews securing fan, spacer, and pulley to water pump hub.

3. Loosen capscrew securing alternator at slotted end of brace. Push alternator forward to relieve tension on the belt and remove the drive belt.

4. Remove the loosened capscrews, lockwashers, fan, fan spacer, and pulley from water pump hub.

5. Remove hose clamp and bypass hose from water pump.

6. Remove capscrews, and lockwashers that secure water inlet pipe to water pump. Remove water inlet pipe and gasket from water pump.

7. Remove capscrews, washers, and lockwashers that secure the water pump to the volute and remove water pump and O-ring or gasket from the volute.

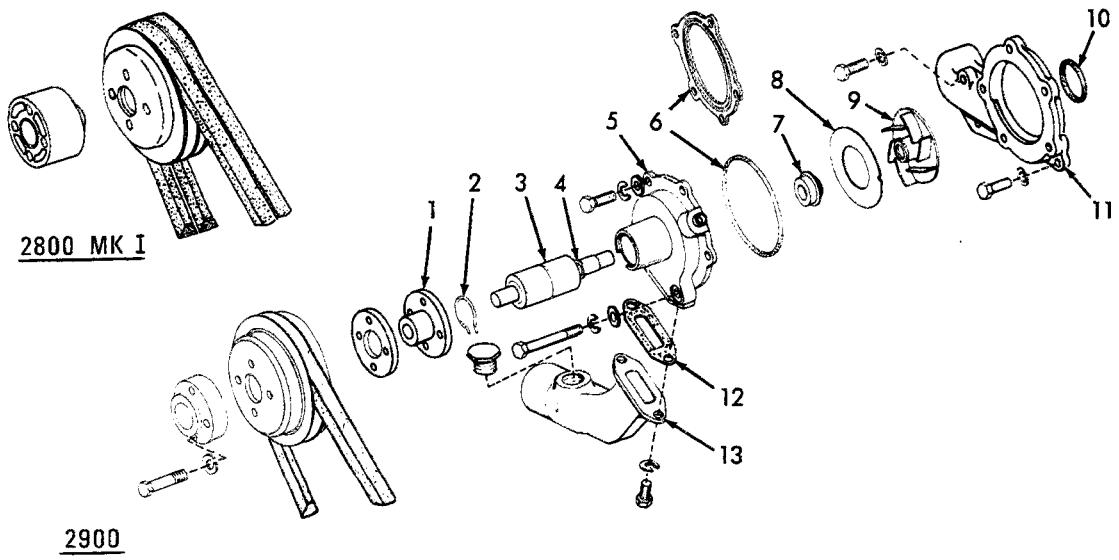

FIG. 5 WATER PUMP PARTS
(T-80060)

1. Pulley hub
2. Snap ring
3. Shaft assembly (includes bearing)
4. Slinger (Model 2900 only)
5. Pump body
6. O-ring (First Type Model 2900 only)
6. Gasket (Second Type Model 2900 and Model 2800 MKI)
7. Seal
8. Body plate (Model 2900 only)
9. Impeller
10. O-ring
11. Volute
12. Inlet pipe gasket
13. Inlet pipe

NOTE: If water pump only is being repaired or replaced, allow water pump volute to remain on the cylinder block.

8. Remove capscrews and lockwashers that secure the volute to the cylinder block and remove volute and O-ring from the block.

C. WATER PUMP DISASSEMBLY, INSPECTION AND ASSEMBLY

1. DISASSEMBLY

With the water pump removed from the engine, disassemble it in the following manner:

a. Place water pump assembly in position on a press and remove the pulley hub, Fig. 6.

b. Remove bearing retaining snap ring from pulley hub end of the pump body.

c. Place water pump assembly in position on a press, impeller end up, Fig. 7. Make certain the pump rests on back of pump body and not on the water inlet or the drain hole. Press end of shaft until shaft and bearing assembly is out of the pump body. Remove impeller and body plate (Model 2900 only) from the pump body and drive out seal assembly, Fig. 5 (7).

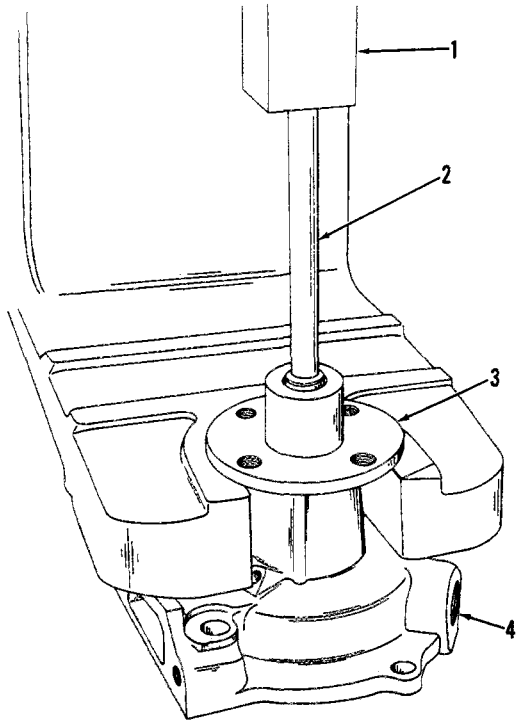

FIG. 6 REMOVING WATER PUMP PULLEY HUB
(T-51197)

1. Press ram
2. Rod
3. Pulley hub
4. Water pump

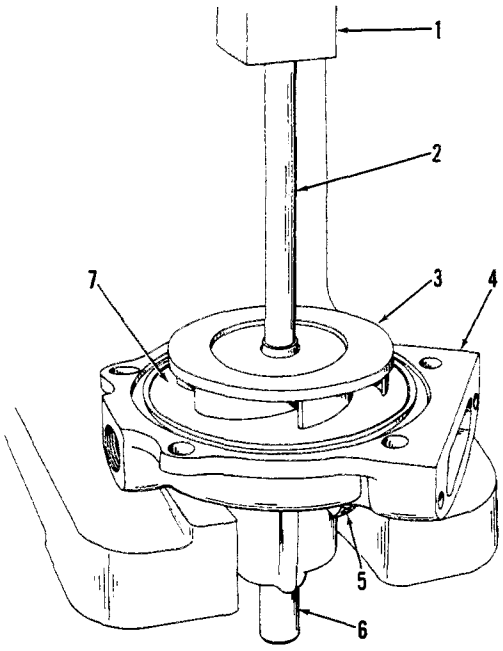

FIG. 7 REMOVING IMPELLER, SHAFT, AND BEARING ASSEMBLY (T-51192)

1. Press ram
2. Rod
3. Impeller
4. Water pump body
5. Drain hole
6. Shaft
7. Body plate (Model 2900 only)

2. WATER PUMP INSPECTION

Repair to the water pump consists of replacement of worn or damaged parts.

a. Check condition of shaft and bearing assembly by rotating the bearing. If the bearing is binding, running dry from lack of lubricant, or feels rough, the shaft and bearing assembly must be replaced. If the slinger is damaged, it must be replaced.

IMPORTANT: Do not clean shaft and bearing assembly in cleaning solvent.

b. Check condition of the ceramic seal insert bonded to the impeller. If it is rough, cracked, or chipped, replace the impeller.

c. Thoroughly clean pump body with a non-flammable, nontoxic commercial solvent.

d. Check condition of bearing bore in the body. Replace pump body if cracks are evident.

e. Replace the water pump seal assembly.

3. WATER PUMP ASSEMBLY

The water pump is assembled by reversing the disassembly procedure. See Fig. 5 for relative parts location.

a. Position pump body on press, impeller end up. Apply Number 3 Permatex or equivalent to that portion of the seal assembly which is pressed into the pump body. Position seal assembly in the pump body. Place seal installer tool on the seal and press seal into pump body, as shown in Fig. 8, making certain the carbon sealing surface is not damaged.

IMPORTANT: Face of seal assembly must be free of oil, grease, and fingerprints before seal assembly is installed.

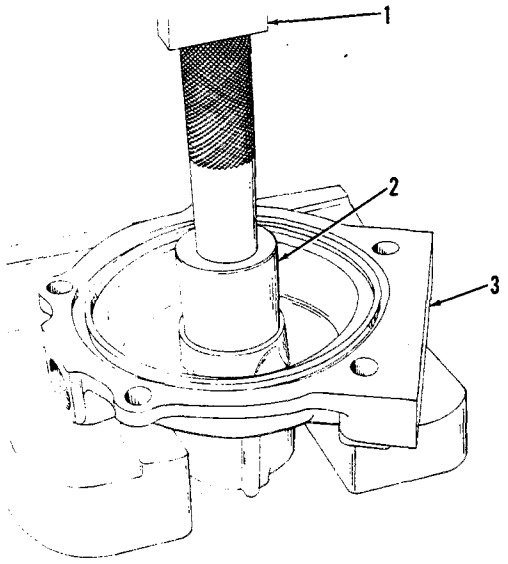

FIG. 8 INSTALLING SEAL ASSEMBLY (T-51202)

1. Press ram
2. Seal installer tool
3. Water pump body

b. Model 2900 only. Refer to Fig. 9; position slinger 1.94" (49.27mm) from the end of the shaft before installing shaft in the pump body.

c. Position pump body on the press, bearing bore up. Start shaft and bearing assembly into bore, slinger end of shaft down. Press shaft until bearing seats on shoulder in the pump body. Press on OUTER race to prevent damage to bearing.

d. Install bearing retaining snap ring.

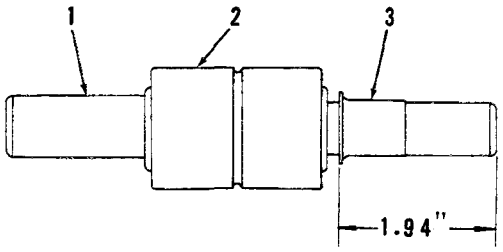

FIG. 9 SHAFT, BEARING AND SLINGER ASSEMBLY (T-74691)

1. Shaft
2. Bearing
3. Slinger (Model 2900 only)

e. Model 2900 only. Install body plate.

f. Position pump on press with pulley hub end of shaft firmly supported on the press base plate. Position impeller on upper end of shaft. Use a collar between the impeller and the press ram; press impeller on shaft to attain 0.015" (0.381 mm) maximum feeler gauge clearance between impeller and body plate as shown in Fig. 10.

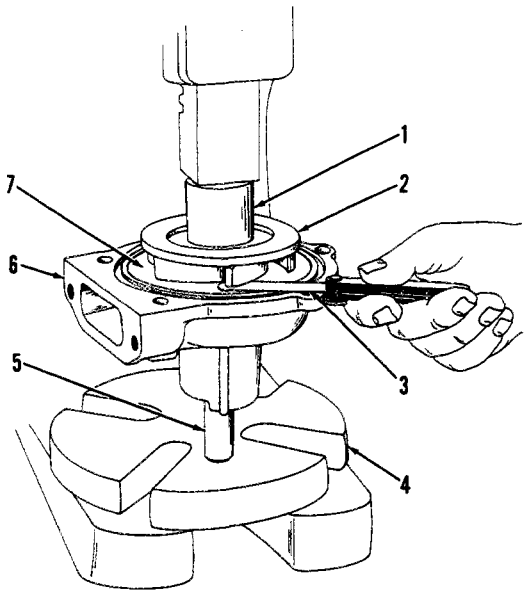

FIG. 10 CHECKING IMPELLER CLEARANCE (T-51189)

1. Collar
2. Impeller
3. Feeler gauge
4. Press base plate
5. Shaft
6. Water pump body
7. Body plate (Model 2900 only)

IMPORTANT: Seal face of impeller must be free of oil, grease, and fingerprints before installing impeller.

g. With pump in press as shown in Fig. 11, use collar (6) to clear shaft and press hub (5) on shaft to obtain the specified 4" (+ or - .010") (101 + or - 0.254mm), between bottom of pump body and fan side of pulley hub.

h. Rotate pulley hub and check for proper pump operation (a slight drag caused by mating surfaces of the seal and impeller is normal).

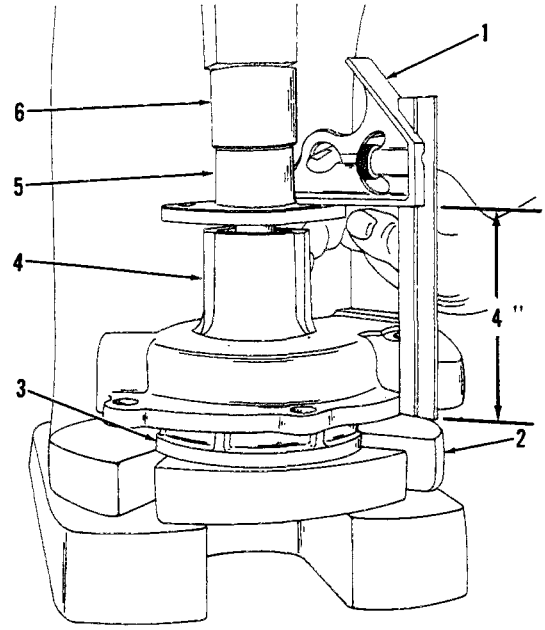

FIG. 11 INSTALLING PULLEY HUB (T-74692)

1. Square
2. Press base plate
3. Impeller
4. Water pump body
5. Pulley hub
6. Collar

D. WATER PUMP INSTALLATION

1. Apply a small amount of grease to the O-ring groove in the water pump volute. Install a new O-ring in the groove and install volute to cylinder block securely with capscrews and lockwashers. Tighten capscrews to a torque of 28 to 33 lbs. ft. (3.87-4.56 kg-m).

2. Model 2900 only. Apply a small amount of grease to the O-ring groove in the water pump body. Install a new O-ring in the groove.

3. Model 2800 MKI only. Install new gasket to the water pump body.

4. Install water pump to volute with capscrews, washers, and lockwashers. Torque capscrews to 28 to 33 lbs. ft. (3.87-4.56 kg-m).

5. Install new gasket on end of water inlet pipe. Install water inlet pipe to water pump with capscrews, and lockwashers. Torque capscrews to 28 to 33 lbs. ft. (3.87-4.56 kg-m).

6. Install bypass hose to water pump. Secure with hose clamp.

7. Install pulley, fan spacer, and fan to water pump pulley hub with capscrews and lockwashers. Torque capscrews to 30 to 35 lbs. ft. (4.14-4.83 kg-m).

8. Install drive belt or belts.

9. Adjust belt to proper tension and tighten alternator brace adjusting capscrew securely. Refer to "FAN BELT ADJUSTMENT" in this section. Fill cooling system.

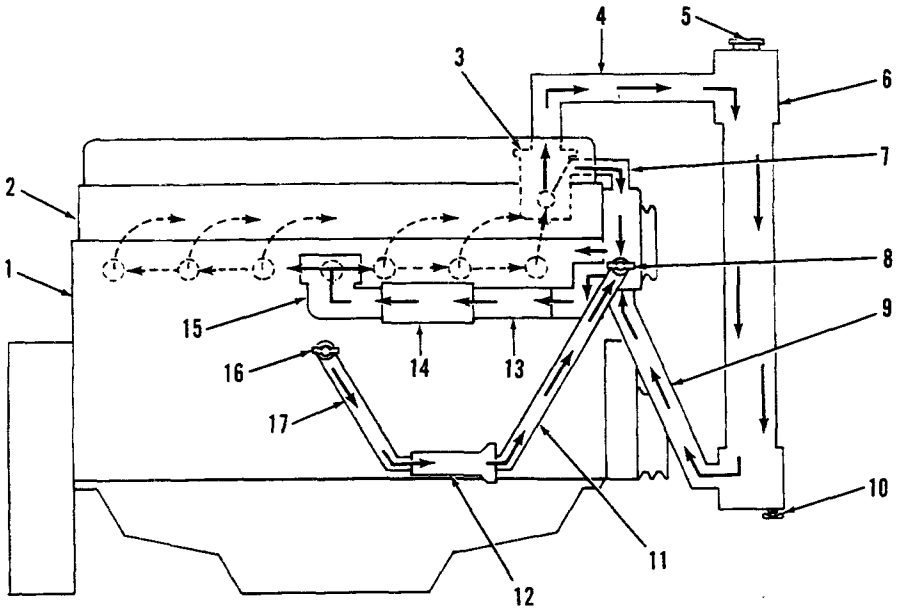

FIG. 12 Cooling System Schematic Diagram

1. Cylinder block
2. Cylinder head
3. Thermostat housing and thermostat
4. Radiator inlet hose
5. Pressure cap (7 psi)
6. Radiator
7. Bypass hose
8. Coolant filter shutoff valve
9. Radiator outlet hose
10. Drain cock
11. Coolant filter outlet hose
12. Coolant filter (optional equipment)
13. Water pipe (model 2900)
14. Oil cooler (model 2900)
15. Oil cooler outlet elbow (model 2900)
16. Coolant filter shutoff valve
17. Coolant filter inlet hose

SECTION 3 - ELECTRICAL SYSTEM

⚠ WARNING

Always disconnect the batteries before cleaning, repairing or servicing the machine.

TOPIC 1 - GENERAL

The electrical system includes the starter, alternator and regulator, ammeter, wiring, and batteries. It is a 12 volt system throughout.

A. CHARGING CIRCUIT

The basic units of the charging circuit are the battery, alternator, and voltage regulator. The battery is the storage plant for electrical energy and must be kept fully charged. Refer to Electrical Manual for battery testing information.

Electrical energy, drained from the battery, is replaced by the alternator. Too much alternator output will usually burn out the alternator or damage the battery. To prevent this, a regulator is connected into the circuit.

B. CRANKING CIRCUIT

The basic units of the cranking circuit are the battery starter, solenoid switch, and a remote control switch. The remote control switch completes the circuit between the batteries and solenoid switch. As current flows through the solenoid, the drive pinion of the starter is shifted into mesh with the flywheel ring gear, the main contacts in the solenoid close, connecting the battery directly to the starter which turns the engine. When the engine starts and the remote control switch is released, the solenoid contacts open and the drive pinion is automatically disengaged. Never operate the starter continuously for more than 30 seconds.

C. ACCESSORY CIRCUIT

The accessory circuit is composed entirely of current-consuming devices such as lights, horn, heaters, etc. In this circuit, good connections at junction points, fuses, switches, and circuit breakers, are important to prevent voltage losses which will reduce the efficiency of operation.

Manufacturers of the battery, starter, and alternator used on the unit are responsible for this equipment during the warranty period. Any claim for replacement or repair of any of these units must be presented to the manufacturer, not to Fiat-Allis. Suppliers of such equipment are represented by distributors or dealers in nearly all cities; they are authorized to make reasonable adjustments or replacements for their respective companies. Always give the serial number of the unit and the date the unit was delivered when presenting a claim of this nature.

TOPIC 3 - WIRING SYSTEM

Heavy cables connect the battery and starter. All cables are color coded for identification purposes. Inspect wiring frequently to detect any loose connections or frayed insulation; make sure all grommets and cable protecting boots are in good condition and properly installed. Tighten connections and wrap any frayed insulation with friction tape to prevent short circuits. Check all cable clips and make certain they are properly installed and secured.

WARNING

Always disconnect the batteries before cleaning, repairing or servicing the machine.

TOPIC 4 - ALTERNATOR

A. DESCRIPTION

1. MODEL 2900

The alternator is a continuous output, diode rectified unit, designed and constructed to provide extra long periods of reliable service with minimum maintenance. Two brushes carry current through two slip rings to the field coil of the rotor. The rotor is mounted on ball bearings at the drive end and on roller bearings at the slip ring end. A grease supply for each set of bearings eliminates need for periodic lubrication.

The stator windings are assembled inside a laminated core that forms part of the alternator frame. Mounted in the slip ring end frame are 6 rectifier diodes that are connected to the stator windings. These diodes replace the separately mounted rectifier that is used in other types of applications. They change AC voltage to a DC voltage that appears at the alternator BAT terminal.

IMPORTANT: Alternator ground polarity and battery ground polarity must be the same before making any connections. Instant damage to wiring and diodes will result if polarities are mismatched. Do not operate without a battery. Do not attempt to polarize alternator. Do not short across or ground alternator terminals. Never operate the alternator on an open circuit. Make absolutely certain all connections in the circuit are secure.

2. MODEL 2800 MKI

The alternator features a solid state regulator that is mounted inside the alternator slip ring end frame. All regulator components are enclosed into a solid mold, and this unit, along with the brush holder assembly, is attached to the slip ring end frame. The regulator voltage setting never needs adjustment, and no provision for adjustment is provided.

B. ALTERNATOR REMOVAL

1. Loosen capscrew attaching alternator to supporting bracket.