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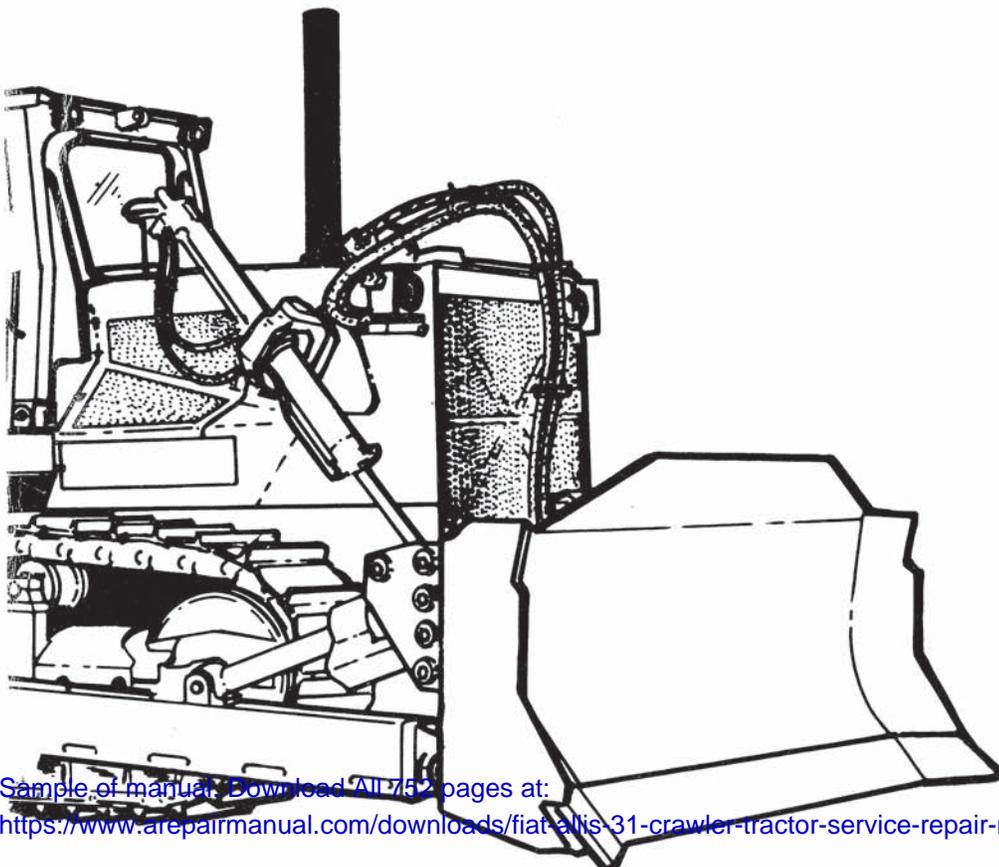


31

Service manual

TRANSMISSION

Form 73108460 English



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31

crawler tractor

service manual

TRANSMISSION

S/N 84M01001-UP

Form 73108460 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 instruction 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.

TABLE OF CONTENTS

TOPIC	TITLE	PAGE NO.
	Safety Rules - - - - -	1
1	General Description - - - - -	6
2	Lubricant Specifications, Capacity and Service - - - - -	14
3	Troubleshooting - - - - -	15
4	Pressure Checking - - - - -	18
5	Flow Checking - - - - -	26
6	Hydraulic System Components - - - - -	31
7	Input Clutch And Torque Converter - - - - -	43
8	Transmission - - - - -	60
9	Bevel Gear And Shaft - - - - -	97
10	Drive Shaft Universal Joint - - - - -	105
11	Fits And Tolerances - - - - -	107
12	Service Tools - - - - -	110
	Alphabetical Index - - - - -	112



SUPPLEMENT NO. 2
SERVICE MANUAL FORM 73108460
TRANSMISSION
31 CRAWLER TRACTORS

(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:
*Fiat-Allis Construction Machinery, Inc., Publications Services Dept.,
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or
*Fiat-Allis M.M.T. S.p.A. - MAGAZZINO STAMPATI - Viale Torino, 0
STUPINIGI (Torino) - Italy*

Replace the following like pages:

13	No change	75	Revised	93	Revised
14	Revised	76	Revised	94	Revised
29	Revised	77	Revised	95	Revised
30	No change	78	No change	96	Revised
43	No change	81	Revised	97	No change
44	Revised	82	Revised	98	Revised
45	Revised	83	Revised	99	No change
46	No change	84	Revised	100	Revised
57	Revised	85	Revised	101	Revised
58	No change	86	Revised	102	No change
61	Revised	87	Revised	107	No change
62	No change	88	Revised	108	Revised
71	No change	89	Revised	109	Revised
72	Revised	90	Revised	110	Revised
73	Revised	91	No change	111	Revised
74	Revised	92	Revised	112	No change

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SUPPLEMENT NO. 1
SERVICE MANUAL FORM 73108460

TRANSMISSION

31 CRAWLER TRACTORS

(10-77)

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Write in the following change:

Page 59 LEGEND FOR FIG. 7-37 Add: 70. Plug (orifice)
Page 106 10.2.2 ... torque retaining capscrew to
90 -- 100 lbs. ft. (12.4 -- 13.8 m-kg)

Replace the following like pages:

33 (No change)	71 (Revised)	107 (No change)
34 (Revised)	72 (No change)	108 (Revised)
51 (Revised)	83 (Revised)	109 (Revised)
52 (No change)	84 (No change)	110 (Revised)
57 (Revised)		
58 (Revised)		

Reason: show gasket arrangement between torque converter and pressure regulating valve; change installation procedure and torque on clutch carrier retaining nut.

NOTICE
These changes are
included in this copy

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 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.

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.

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

Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.

When pulling or towing through a cable or chain, do not start suddenly at full throttle. Take up slack carefully. Guard against kinking chains or cables. Inspect carefully for flaws before using. Do not pull through a kinked chain or cable due to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chain or cable.

Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain. **DO NOT PULL OR TOW UNLESS OPERATORS COMPARTMENTS OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.**

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

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

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

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.

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.

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.

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.

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 men-

SAFETY RULES

tioned 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.

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.

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) switch. Consult 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.**

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.

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.

SAFETY RULES

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.

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.

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.

Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

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

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

Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.

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

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

Remove sharp edges and burrs from reworked parts.

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

FOREWORD

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

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

Additional publications pertaining to this model and to all other Fiat-Allis products are available through Fiat-Allis dealers. Publications are generally available in several languages. Refer to Service Publications Index Form 70658800 for all such publications; the index is available free from Fiat-Allis.

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Illustrations show standard and optional items.

IMPORTANT

The information in this manual was current at the time of publication. It is our policy to constantly improve our product and to make available additional optional items. These changes may affect procedures outlined in this manual. If variances are observed, verify the information through your Dealer.

TOPIC 1 GENERAL DESCRIPTION AND OIL FLOW SCHEMATICS

1.1 MECHANICAL OPERATION

1.1.1

Input clutch and torque converter transmit engine power through drive shaft universal joint to transmission. Multiple plate clutch, located in front part of torque converter housing, is hydraulically controlled. Engine power is transmitted through input clutch to the torque converter rotating housing. Rotating housing drives impeller wheel; impeller wheel pumps oil through turbine wheel; turbine wheel drives torque converter output shaft to transmit power to transmission.

1.1.2

Between the torque converter housing and engine flywheel housing is a gear train to drive the dozer pump, transmission pump, and steering pump. Gear train is driven directly from engine through torque converter accessory drive gear.

1.1.3

Transmission is constant mesh type, with three speeds in both forward and reverse. Transmission has three clutch shafts, plus a countershaft and a bevel pinion (output) shaft; the three clutch shafts carry five clutches. Viewing transmission from front, the top (input) shaft carries forward and reverse clutches, lower right shaft carries the first and second range clutches, and the lower left shaft carries third range clutch. In center is the bevel pinion shaft; upper right shaft is the countershaft.

1.1.4

Transmission clutches are multiple plate, oil cooled and lubricated. The clutches are hydraulically engaged and spring released -- they require no adjustment. The clutches are all identical in design and operation; size of clutch drum gears vary to obtain different speed and power ratios.

1.1.5

A direction clutch and range clutch must both engage to move the tractor. Engagement of all the clutches is controlled by a single lever -- the transmission shift lever, Fig. 6-7. Front - to-rear movement of the transmission shift lever engages the range clutches; side-to-side movement engages the direction clutches. Engagement of the input clutch takes place automatically after engagement of the transmission direction clutch.

1.2 FUNCTION OF HYDRAULIC SYSTEM

1.2.1 TRANSMISSION OIL PUMP

1.2.1.1

Mounted on rear of gear housing just above the torque converter housing and driven from

engine flywheel through gear train within gear housing. Pump contains a single set of gears to draw oil from sump in transmission housing and charge the hydraulic system. Pump rotation is clockwise (viewed from drive shaft end); pump speed is .86 time engine speed. Refer to 5.1 for specified flow.

1.2.2 SHIFT INHIBITING PUMP

1.2.2.1

Attached to transmission bevel pinion shaft front bearing retainer, pump contains a single set of gears. Pump is driven by bevel pinion shaft -- therefore the tractor must be moving for pump to operate. Purpose of the pump is to create a pressure differential on ends of shift inhibiting valve shift inhibit piston which is controlled by travel speed of the tractor; this allows full speed directional shifts to be made (see oil flow description in 1.5). When tractor is moving, pump transfers main circuit oil from one end of shift inhibit piston to the other end; suction and pressure sides of the pump depend on direction of travel. Pump volume is limited by restriction on inlet side; relief valve on output side of pump prevent cavitation at high speeds.

1.2.3 PRESSURE REGULATING VALVE

1.2.3.1

Mounted on lower rear side of torque converter, valve contains components to regulate main pressure and torque converter/transmission lube pressure, and regulate oil flow to the input clutch.

1.2.3.2

Main pressure is regulated in the center section of pressure regulating valve. Oil in main circuit flows through a small passage in the regulator piston to both ends of the piston. Oil flow to the poppet end of the regulator piston flows through a small orifice in the poppet and is deadheaded at the end of the regulator piston. Pressure build up in the pocket forces the regulator piston open allowing oil in main circuit to bypass into torque converter circuit. Regulator piston is shown in its normal bypass position in Fig. 1-2. If oil is extremely cold or thick and will not flow through the orifice in the poppet, the poppet will be forced off its seat allowing a larger flow of oil to react on the end of the regulator piston. Regulator piston is forced all the way open, Fig. 1-1, to allow a portion of the bypass oil to return to sump. After oil warms to normal operating temperature, the poppet will close and the regulator piston will return to the position shown in Fig. 1-2. Oil flow to the spring end of the regulator piston flows through a small orifice, then through a passage to a pilot valve located at the opposite end of the regulator piston. Pressure reacting

General Description

on the end of the pilot piston compresses the main pressure regulating spring and dumps excess oil to sump. The main pressure regulating spring is shim adjusted; the adjustment is internal.

1.2.3.3

Torque converter/transmission lube pressure regulating valve is in the right side of pressure regulating valve (viewing the converter from the rear). Oil bypassed by regulator piston flows through the heat exchanger to the torque converter. Part of this oil lubes the input clutch and part of it returns to sump through the converter drain line; remainder of the oil returns to the transmission lube circuit through this valve. This valve does not actually regulate any pressure at low engine speeds, it merely directs oil flow from the converter to the transmission. Orifices in the plate beneath the lube header maintain pressure in the circuit; the valve opens only when the volume of oil in this circuit is too great to pass through the orifices. Excess oil is then dumped to sump through the torque converter. In a properly working system, valve will not open until engine speed exceeds 1600 rpm. Orifices in the plate beneath the lube header vary in size to satisfy the different lubrication requirements in the transmission clutches and bearings.

1.2.3.4

Input clutch control valve is in the left side of the pressure regulating valve. This valve does not regulate pressure, it merely controls the supply of main circuit oil to the input clutch. Main circuit oil is supplied to this valve at all times. In neutral, Fig. 1-1, the oil enters a drilled passage in the center of the valve piston to hold the piston in closed position. When the input clutch has been engaged, Fig. 1-2, oil from flow sensing piston in shaft inhibiting valve forces the piston open, allowing oil in main circuit to engage the clutch. Clutch will remain fully engaged as long as oil pressure is applied to the bottom of the control valve piston. When this pressure is no longer applied, main circuit oil in center of the piston will force the piston closed -- shutting off the main oil supply to the input clutch. Oil in clutch returns to sump through the dump valve in clutch carrier.

1.2.4 TRAVEL CONTROL VALVE

Mounted on upper right side of transmission, valve contains two plungers which direct oil to engage transmission clutches -- one for the direction clutches, the other the range clutches. Plungers are mechanically controlled by the operator and are held in position by detents. Mounted on top of this is a small housing containing two check balls; its only function is to prevent range apply oil in one circuit from transferring to another.

1.2.5 SHIFT INHIBITING VALVE

Mounted on upper right side of transmission, valve contains four principal components to regulate oil flows to other parts of the system; the components and their functions are:

1.2.5.1

DIRECTION CONTROL PISTON regulates signal oil flow to direction clutch shuttle valves. In neutral, Fig. 1-1, piston is centered in its bore, blocking this oil flow. When a direction shift has been made, Fig. 1-2, piston is forced off-center by oil from travel control valve. Signal oil (from main circuit) flows to the end of shuttle valve which controls main oil flow to desired direction clutch and the clutch is engaged (refer to 1.2.7 for description of the shuttle valve). As direction control piston is forced off-center, an internal oil passage leading to flow sensing piston is opened; incoming oil from travel control valve flows through this passage to the flow sensing piston. This oil is restricted to assure complete engagement of direction clutch before input clutch circuit is charged with oil.

1.2.5.2

FLOW SENSING PISTON regulates main circuit oil flow to end of piston in input clutch control section of pressure regulating valve, to the brake regulator valve and to the sensing valve located in the shift inhibiting valve top cover. In neutral, Fig. 1-1, flow sensing piston is held closed by spring tension to stop main circuit oil flow to these valves. When a direction shift has been made, Fig. 1-2, oil from travel control valve forces flow sensing piston open, allowing oil flow to these valves. Description of the input clutch control valve piston is given in 1.2.3.4; description of the sensing valve is given in 1.2.5.4; description of brake regulator valve is given in Steering Clutches and Brakes service manual.

1.2.5.3

SHIFT INHIBIT CENTER PISTON AND END PISTONS regulate main circuit oil flow to follower piston at each end of direction control piston. Movement of the pistons in the bore is dependent on the operation of shift inhibiting pump. In neutral, Fig. 1-1, or in PTO, the shift inhibiting pump does not operate because tractor is not moving. Pressures on each of the shift inhibit end pistons are the same and the restricted outlet to sump in the end pistons centers the pistons in the valve body, blocking main circuit flow to direction control piston follower pistons. When the tractor is moving, Fig. 1-2, shift inhibiting pump is operating, creating a pressure differential on ends of piston. This

General Description

pressure differential forces shift inhibit pistons off-center; main circuit oil flows through shift inhibit center piston to follower piston on depressed end of direction control piston. Function of this oil is described in 1.5.

1.2.5.4

SENSING VALVE located in the shift inhibiting valve top cover has no function on this tractor; oil flow to this valve is deadheaded at the valve piston.

1.2.6 DECELERATING AND SAFETY BRAKE VALVE

Refer to BRAKE REGULATOR VALVE in Steering Clutches and Brakes service manual for description and operation of this valve.

1.2.7 TRANSMISSION CLUTCH SHUTTLE VALVES

1.2.7.1

Shuttle valves -- one for each clutch -- are located in the valve bodies on front end of the transmission clutch shafts. Function of all the valves is the same. The valves regulate no pressure; they merely control the supply of main circuit oil to the transmission clutches. In neutral, Fig. 1-1, the shuttle valves are held closed by spring tension; main circuit oil deadheads against side of valve. When transmission clutches have been engaged, Fig. 1-2, oil from travel control valve (for range clutch) and shift inhibiting valve (for direction clutch) flows to end of shuttle valves. Shuttle valves are forced back, allowing oil in main circuit to engage the desired clutches. When either clutch has been disengaged, oil flow to the end of shuttle valve is stopped and spring tension returns shuttle valve to its closed position. Oil in transmission clutch is sumped through dump valve in the clutch; see 1.2.8.

1.2.8 TRANSMISSION CLUTCH DUMP VALVES

1.2.8.1

Dump valves -- one for each clutch -- are located in the clutch apply piston housing on clutch shafts.

1.2.8.2

Each valve serves as a metering device to control the pressure behind clutch apply piston while clutch is engaged and also serves as a quick dump port for the clutch apply oil after clutch has been disengaged.

1.2.8.3

To engage a clutch, oil from shuttle valve at clutch apply pressure enters between the dump valve spool and sleeve -- forcing the spool down. Oil flows around the spool and enters

the cavity behind clutch apply piston -- forcing the piston back to engage the clutch. Oil behind clutch apply piston also reacts against the bottom of the dump valve spool. Outward (upward) movement of the spool partially dumps the oil behind clutch apply piston to sump. This continuous metering action reduces pressure within the clutch piston housing to increase the life of the clutch parts and assure fast, smooth shifts.

1.2.8.4

When clutch is disengaged, oil supply from shuttle valve is stopped. Centrifugal force plus oil pressure on bottom of dump valve spool forces spool all the way up (out); oil behind clutch apply piston dumps directly to sump and clutch is spring released.

1.3 OIL FLOW DESCRIPTION - NEUTRAL

1.3.1

Oil in the main circuit deadheads in the travel control valve, shift inhibiting valve and transmission clutch shuttle valves; brakes are applied by spring pressure.

1.3.2

Oil by-passed by main relief valve charges the torque converter, and lubricates the input clutch and transmission clutches. Since the tractor is not moving, shift inhibiting pump is not turning. Pressure on shift inhibit end pistons are equal, centering the pistons in their bore.

1.4 OIL FLOW DESCRIPTION - SHIFT FROM NEUTRAL TO 3RD FORWARD

NOTE: To make the following text easier to understand, the ends of direction control piston in shift inhibiting valve will be referred to as right and left; right being the end which receives oil from forward outlet in travel control valve.

1.4.1

Range plunger in travel control valve aligns 3rd range outlet with incoming main flow; this flow opens 3rd range shuttle valve allowing 3rd range clutch to engage.

1.4.2

Direction plunger in travel control valve aligns forward outlet with incoming main flow; oil flows to right end of direction control piston in shift inhibiting valve. Direction control piston is forced off center; main circuit oil flows through the shift inhibiting valve to the end of forward clutch shuttle valve. Shuttle valve opens, allowing forward clutch to engage.

General Description

1.4.3

As direction control piston in shift inhibiting valve is forced off center, an internal oil passage leading to flow sensing piston is opened to oil from direction plunger in travel control valve. This oil forces flow sensing piston open and allows oil in main circuit to flow to end of input clutch control piston in pressure regulating valve, to the brake regulator valve and to sensing valve in shift inhibiting top cover.

NOTE: Restrictor in the internal oil passage delays oil flow to end of flow sensing piston to allow complete engagement of transmission direction clutch before oil enters input clutch circuit.

1.4.4

Oil flow to sensing valve in shift inhibiting valve top cover is deadheaded at the piston and has no function in this system. Oil flow to the brake regulator valve signals the brake system -- brakes are released. Oil flow to end of input clutch control piston in pressure regulating valve forces piston open -- oil in main circuit engages input clutch.

1.4.5

As soon as tractor starts moving, pressure differential created by rotation of the shift inhibiting pump forces shift inhibit pistons off-center; main circuit oil flows behind follower piston on right end of direction control piston. Function of this oil is described in the following paragraph.

1.5 OIL FLOW DESCRIPTION - SHIFT FROM 3RD FORWARD TO 3RD REVERSE

NOTE: The following sequence of events, from the time the operator moves the transmission shift lever to make the shift until the tractor actually reverses direction of travel, takes approximately 2.5 seconds; exact time is dependent on ground speed.

1.5.1

Third range clutch remains engaged because the range plunger in travel control valve is not moved.

1.5.2

Movement of direction plunger in travel control valve to reverse position sumps the oil on right end of direction control piston and supplies main pressure oil to the left end (left and right end of direction control piston are defined in NOTE under 1.4). Direction control piston does not move because of pressure behind right follower piston, but signal pressure to the flow sensing piston drops and the flow sensing piston is forced closed by spring pressure. This stops main flow to input clutch and brake regulator valve; input clutch disengages and brakes apply to slow the tractor.

1.5.3

Pressure behind right follower piston continues to hold direction control piston stationary as long as the pressure differential on ends of shift inhibit pistons is maintained. As tractor speed and shift inhibiting pump speed reduce, however, the pressure differential diminishes until pressures equalize at slightly less than 1 mph (1.6 km/h). When pressures equalize, shift inhibit pistons center in their bores sumping the oil behind right follower piston. Direction control piston is forced off-center by main circuit oil already on the left end. Reverse clutch engages, brakes are released, and input clutch engages in the same manner as when shifting from neutral to 3rd forward (1.4.3 and 1.4.4).

1.5.4

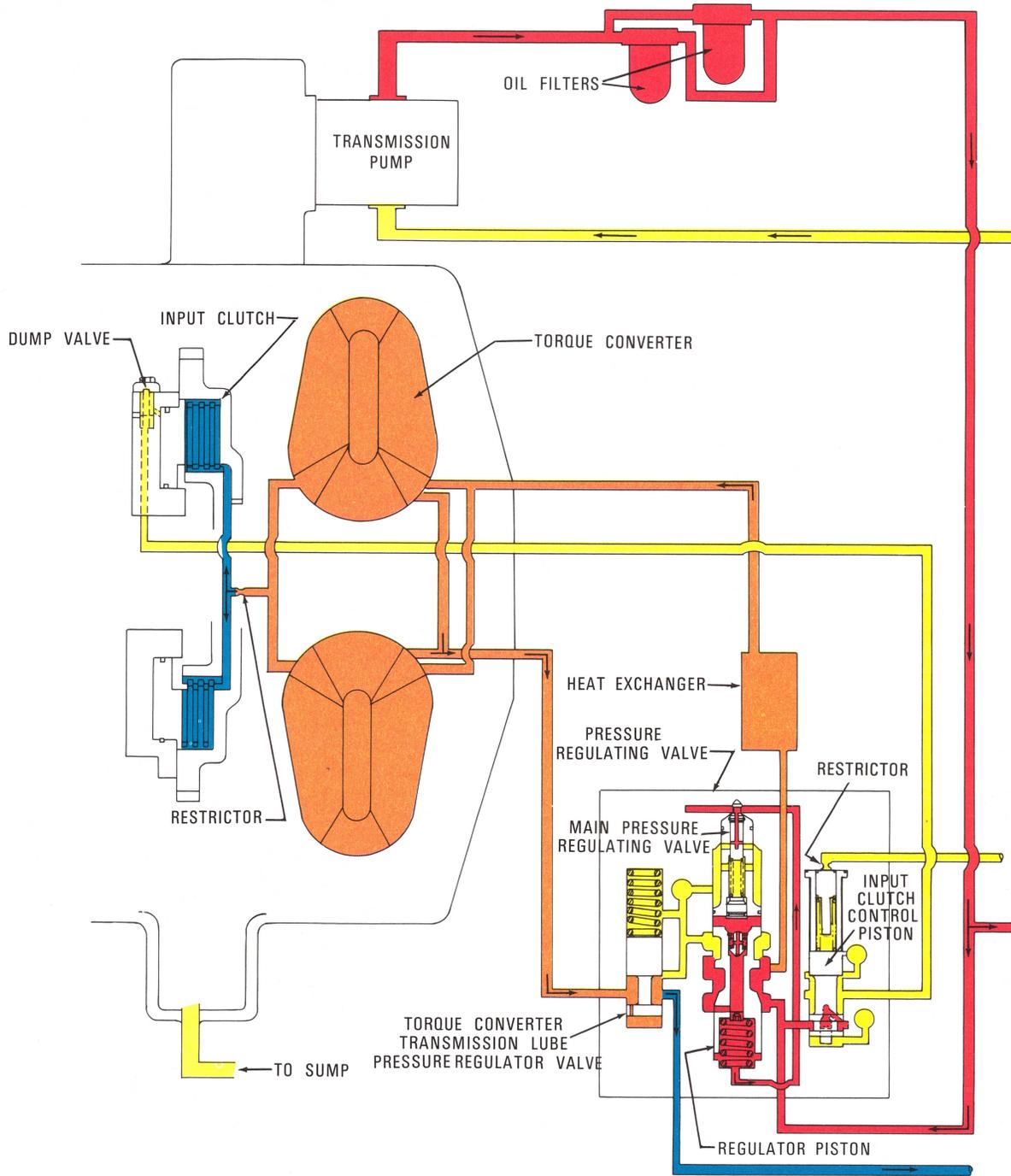
When tractor is operating in reverse, the shift inhibiting pump rotation is opposite that shown in Fig. 1-2. Shift inhibit pistons are forced to the right; main circuit oil flows behind left follower piston where it will function in the manner described in 1.5.3 when transmission is shifted out of reverse.

General Description

T-79700

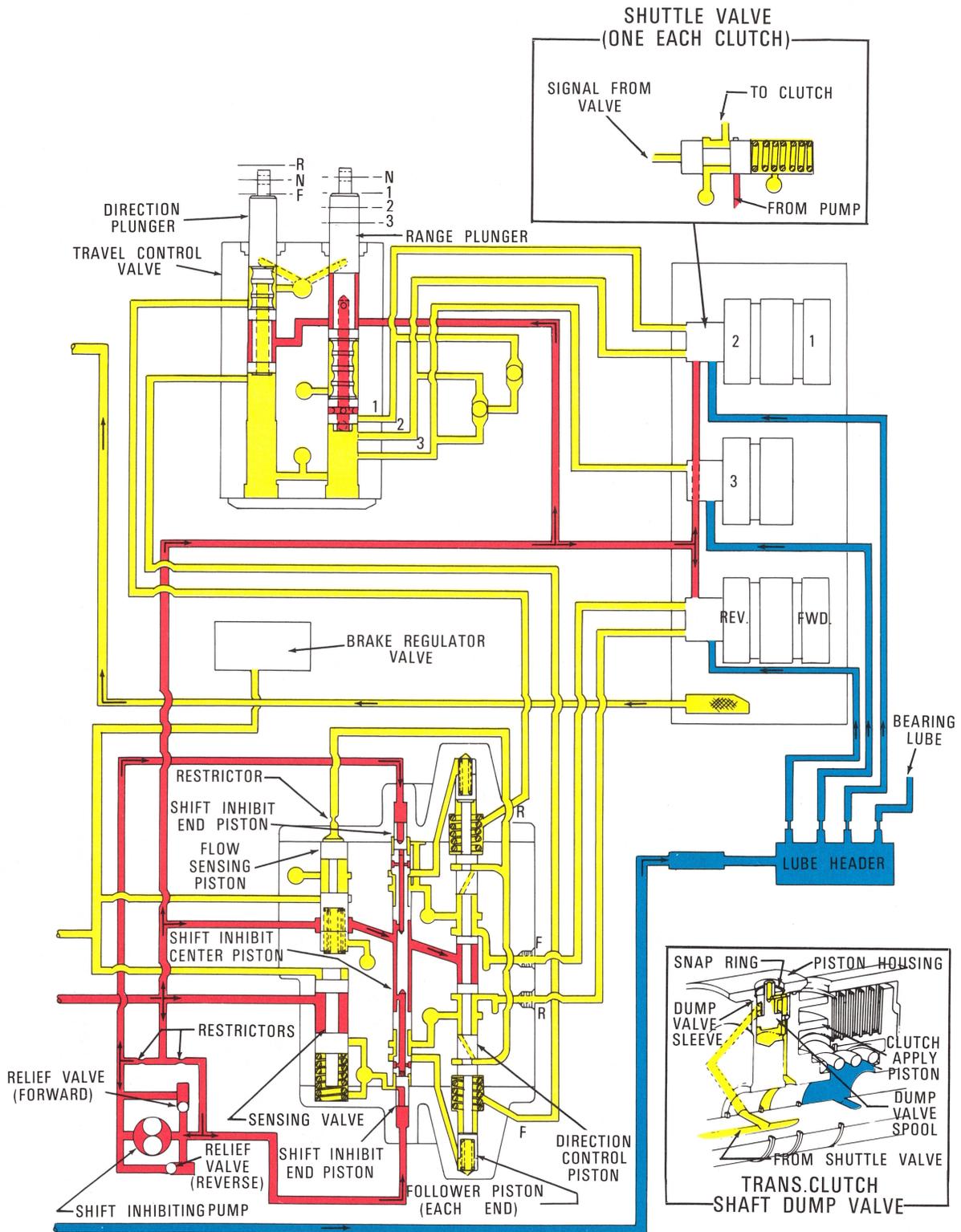
OIL CODE

- MAIN
- TORQUE CONVERTER
- LUBE
- SUMP, SUCTION, OR STATIC



Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

General Description



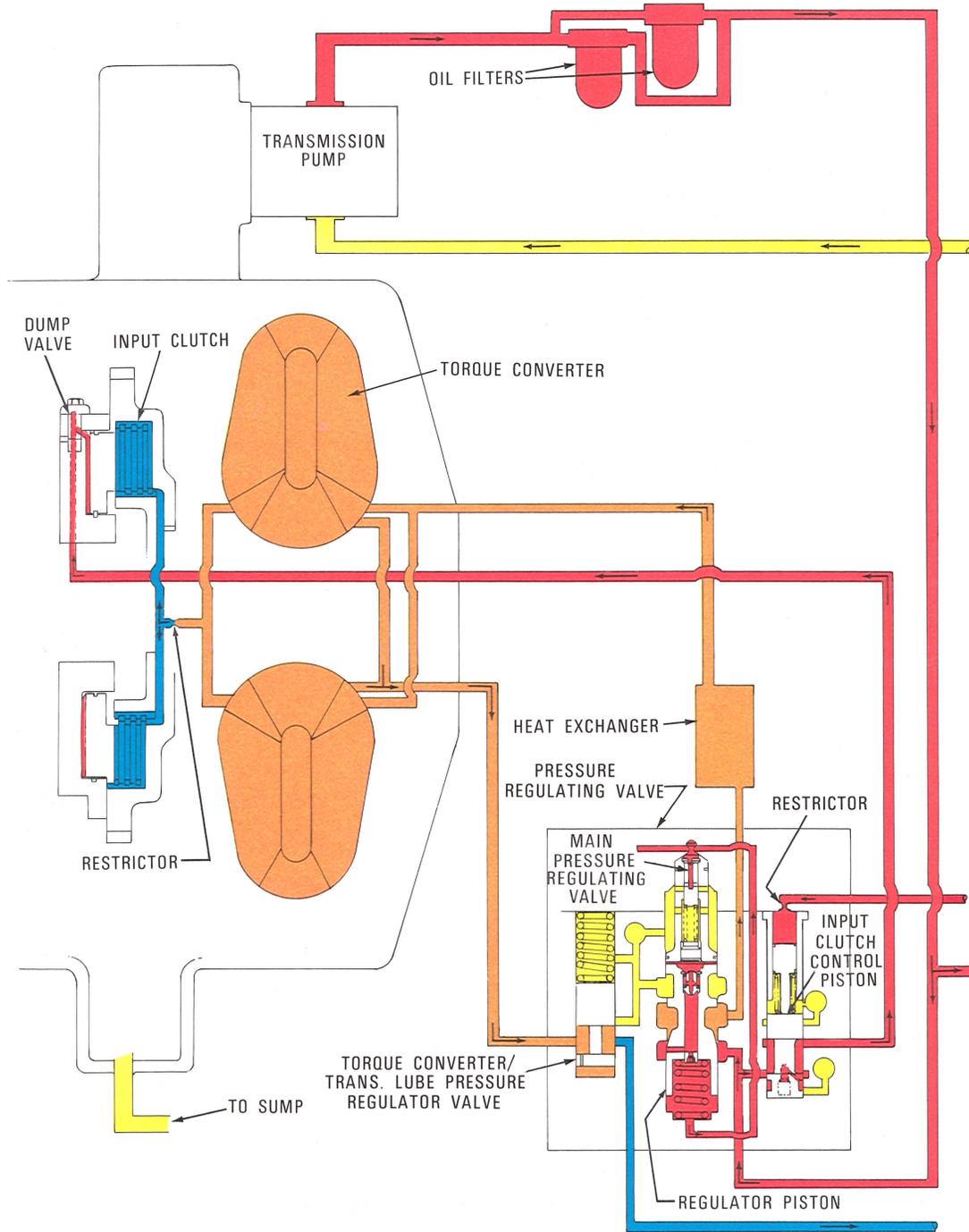
T-79701

FIG. 1-1 OIL FLOW SCHEMATIC - NEUTRAL

General Description

T-79702

- OIL CODE**
- MAIN
 - TORQUE CONVERTER
 - LUBE
 - SUMP, SUCTION, OR STATIC
- SHIFT INHIBIT SYSTEM**
- LOW PRESSURE
 - HIGH PRESSURE



Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

General Description

T-79703

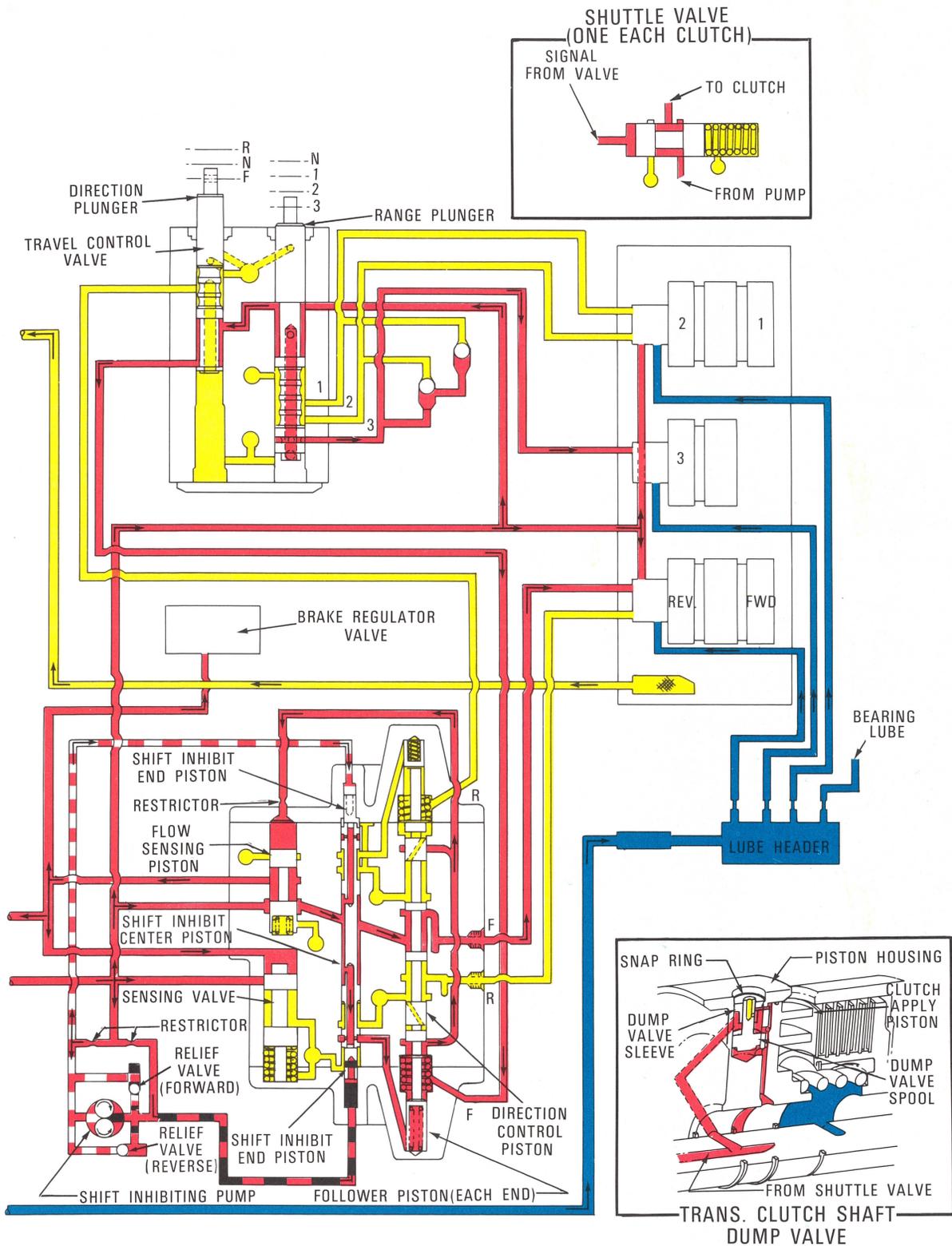


FIG. 1-2 OIL FLOW SCHEMATIC - 3RD. FORWARD

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

TOPIC 2 LUBRICANT SPECIFICATIONS, CAPACITY AND SERVICE

2.1 HYDRAULIC SYSTEM

Use oils meeting or exceeding one of the following specifications:

Preferred:

Engine Oil TO-2 Qualified, API Service CD.

Acceptable:

- (a) Type C-3 Transmission Fluid meeting TO-2 specifications.
- (b) MIL-L-2104C meeting TO-2 specification.

VISCOSITY:

TEMPERATURE	VISCOSITY
0°C (32°F) up	SAE 30
0°C (32°F) below	SAE 10

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

2.2 CAPACITY AND SERVICE

2.2.1

Capacity of the hydraulic system is 25 gallons (98.4 liters).

2.2.2

Service consists of changing oil, replacing filter elements, cleaning breather element and cleaning suction line filter.

Replace filter elements, clean suction line filter and install clean oil after making major repairs to any part of the system; replace filter elements again after first 50 hours of operation. Detailed service procedures and specified service intervals are given in the Operation and Maintenance Instruction Manual.

2.3 DRIVE SHAFT UNIVERSAL JOINT

2.3.1

Universal joint spiders are packed at the factory with "Shell" Alvania "B" grease. Spiders which are being reused must be packed with this grease or its equivalent.

2.3.2

Capacity of each spider assembly is 1.12 ounces (31.7 grams). This is approximately 11 shots from an average hand lubricating gun.

2.3.3

Spider assemblies are packed at assembly; no further service is required until rebuild.

TOPIC 3 TROUBLESHOOTING

IMPORTANT

Always make certain hydraulic system is filled to proper level with specified lubricant before troubleshooting.



WARNING

- Do not start the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
- Warn all people who may be servicing or working around your machine before starting engine.
- Never leave machine unattended with engine running.

TROUBLE	POSSIBLE CAUSE	REMEDY
Starter will not turn engine	<p>Transmission shift lever not in neutral-start position</p> <p>Neutral safety switch out of adjustment or broken</p> <p>All other possible causes and their remedies are listed in Engine Service Manual</p>	<p>Lock shift lever in neutral-start position with safety lock lever</p> <p>Adjust or replace neutral safety switch (paragraph 6.3.4)</p>
Tractor will not move	<p>Transmission linkage out of adjustment or broken</p> <p>Failure in hydraulic system</p> <p>Input clutch or transmission clutches failing to engage</p>	<p>Adjust and/or repair linkage (paragraph 6.3.4)</p> <p>Check all hydraulic system pressures in sequence given in PRESSURE CHECKING</p> <p>Move shift lever through all positions and observe drive shaft. If drive shaft turns, input clutch is engaging -- failure is in transmission. Check transmission clutch apply pressures and/or flows. If drive shaft does not turn, input clutch is not engaging; check input clutch apply pressure.</p>
Tractor seems low on power in all ranges	<p>Brakes adjusted too tight</p> <p>Brakes partially applied</p>	<p>Refer to Steering Clutches and Brakes service manual and adjust brakes</p> <p>Check brake signal pressure from shift inhibiting valve--check pressure at high idle with transmission in 3rd forward and steering clutches disengaged. Specified pressure is 125--200 psi (12.3--14.0 kg/cm²)</p> <p>If pressure is low refer to 4.5 and check main pressure</p> <p>If pressure is OK refer to Steering Clutches and Brakes service manual for further troubleshooting</p>

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

Troubleshooting

TROUBLE	POSSIBLE CAUSE	REMEDY
Tractor does not change direction after making a directional shift with transmission shift lever	Flow sensing piston in shift inhibiting valve is stuck open	Refer to 6.1 and make necessary repairs to shift inhibiting valve
Fast, hard shift when changing directions; tractor speed reduces but direction change is still accomplished above specified speed (see 1.5)	Shift inhibiting pump worn	Check pump pressure (paragraph 4.9)
Fast, hard shift when changing directions; tractor speed does not reduce at all before direction change is accomplished	Input clutch remaining engaged during shift cycle	Check shift inhibiting system pressures and make necessary corrections to raise pressure if low (refer to paragraph 4.9)
Delay when shifting into a range or direction.	Leak in clutch pack.	Check transmission clutch apply flow (5.3) and make necessary repairs.

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

TOPIC 4 PRESSURE CHECKING

Pressure Check Points	Pressure Being Checked	Specified Pressures		Trans. Position	Input Clutch Position	Engine Speed and Oil Temp.
		psi	kg/cm ²			
Fig. 4-3	Main	175-220	12, 3-15.4	Neutral	Neutral	Make all Pressure Checks At High Idle With Oil Temp. At 180°F. (82°C)
Fig. 4-3	*Trans. Clutch Apply	175-200	12, 3-14.0	Note #1	Engaged	
Fig. 4-3	*Input Clutch Apply	175-200	12.3-14.0	3rd. Fwd. and 3rd. Rev.	Engaged	
Fig. 4-3	*Converter	80-90	5.6-6.3	3rd. Forward	Engaged	
Fig. 4-3	*Trans. Clutch Lube	65-75	4, 5-5.2	Note #2	Engaged	
Fig. 4-3 & Fig. 4-4	Shift Inhibit	See 4.9 for specified pressures and pressure check procedures				

* Disengage steering clutches when checking pressure.

NOTE #1

NOTE #2

Engage all clutches; record pressure in each position.

Clutch being checked in neutral; opposing clutch on same shaft engaged (except third range)

T-75713

FIG. 4-1 HYDRAULIC SYSTEM PRESSURE SPECIFICATIONS

4.1 PRE-CHECK INFORMATION

⚠ WARNING

- ⚠ Do not start engine of this machine in closed area without proper ventilation to remove deadly exhaust gases.
- ⚠ Warn all people who may be servicing or working around your machine before starting engine.
- ⚠ Never leave machine unattended with with engine running.

4.1.1

If both gauges on cowl indicate some pressure, bring hydraulic oil to operating temperature before pressure checking by running engine for about 15 minutes with transmission shift lever in neutral.

4.1.2

If main pressure is O.K. (or after making repairs to obtain specified main pressure and original trouble still exists) check and record all pressures so comparisons can be made. The system pressures and flows can be recorded on the work sheet on page 25 .

4.1.3

Check system pressures after service work has been performed on any system component.

4.2 SPECIFICATIONS (See Fig. 4-1)

4.3 PRESSURE CHECK POINTS

4.3.1

Pressure gauge connection points for all the hydraulic system pressures are located in a panel under an access panel at the base of the

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

Pressure Checking

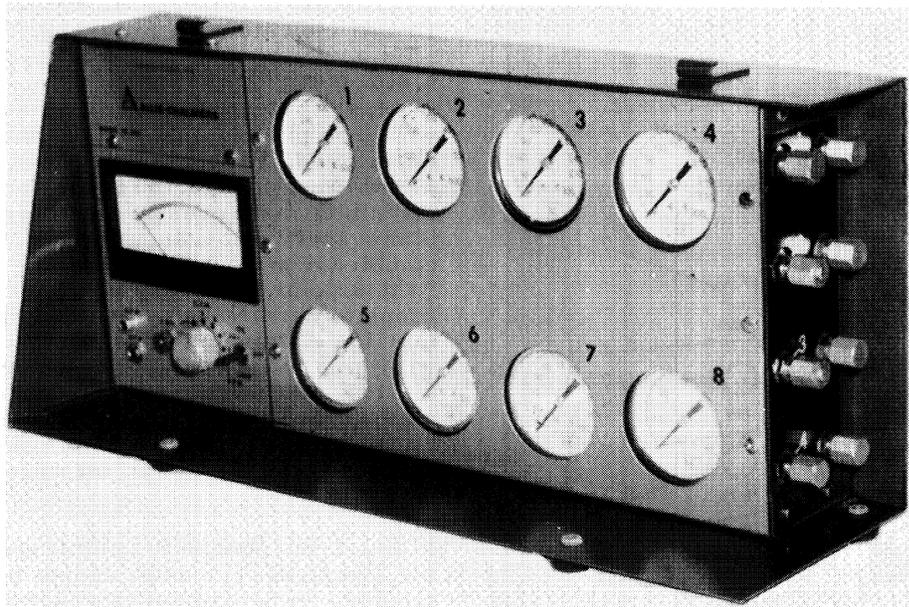


FIG. 4-2 *TRANSMISSION TEST KIT (TG-100)

T-75485

*Refer to SERVICE TOOLS

cowl, Fig. 4-3. All the pressure check connections can be made at the same time with the check points grouped in this manner. The pressure gauge connected to each point should have capacity high enough to check the desired pressure, but not so high that the exact pressure is difficult to read.

4.3.2

It is suggested that the test kit shown in Fig. 4-2, be used to check the system pressures and flows. The kit contains eight pressure gauges of various capacity, a flow meter, and tachometer. Oil lines and fittings furnished with the kit connect to the check fittings. The gauges are numbered 1 thru 8; connect gauges to check points as shown in Fig. 4-3. Notice that gauge #1 is switched to check input clutch apply pressure after checking main pressure. An additional gauge, with a capacity of 300 psi (21.09 kg/cm²), can be used here if desired. If gauge #8 in transmission test kit being used has only a 60 psi (4.22 kg/cm²) capacity, gauge #7 can be switched to check transmission clutch lube pressure after checking converter pressure. An additional gauge, with a capacity of 100 psi (7.03 kg/cm²), can be used here if desired.

NOTE: A complete description of the test kit and instructions for its use are contained in Test Data Manual for Power Shift Transmission.

4.3.3

Shift inhibit pump pressures can be checked at

the same time by using two additional gauges with 300 psi (21.09 kg/cm²) capacity.

NOTE: To make the following procedure easier to understand the gauge connected to point marked INH. FWD. on test panel will be referred to as #9 and gauge connected to point marked INH. REV. as #10.

4.4 PRESSURE CHECK PROCEDURES

4.4.1

The method for checking each pressure is given in Fig. 4-1. One procedure not given is the direction shift. Although the same pressure readings will result from individual pressure checks, the sequence of pressure changes when a direction shift is made may give the mechanic a little better understanding of the hydraulic system.

4.4.2

A direction shift can be simulated by moving transmission shift lever to 3rd forward with engine at high idle and steering clutches disengaged. Remain in this position long enough to note pressures; then quickly move shift lever to 3rd reverse. Observe pressures while the shift is being made and after the shift has been completed.

NOTE: The simulated shift will take longer to complete than an actual shift because the unit is not moving. The following sequence of events will take place in a properly operating system.

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

Pressure Checking

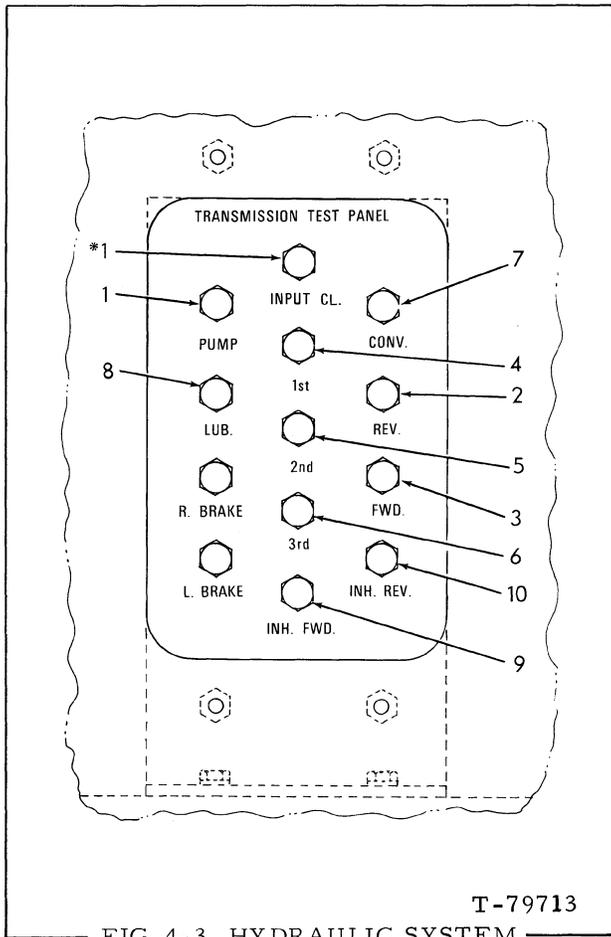


FIG. 4-3 HYDRAULIC SYSTEM
PRESSURE CHECK POINTS

1. Main pressure (gauge #1)
- *1. Input clutch apply (use gauge #1 after checking main pressure or use additional gauge with capacity of 300 psi (21.09 kg/cm²))
2. Reverse clutch apply (gauge #2)
3. Forward clutch apply (gauge #3)
4. 1st range clutch apply (gauge #4)
5. 2nd range clutch apply (gauge #5)
6. 3rd range clutch apply (gauge #6)
7. Converter (gauge #7)
8. Transmission lube (gauge #8) (use gauge #7 after checking converter pressure, if gauge #8 does not have a 100 psi (7.03 kg/cm²) capacity or use an additional gauge with a 100 psi (7.03 kg/cm²) capacity.
9. Inhibit forward (gauge #9)
10. Inhibit reverse (gauge #10)

4.4.2.1

Assuming the gauges are connected as shown in Fig. 4-3, the following pressures will be observed before the shift is made: input clutch apply on #1*, transmission clutch apply on #3 and #6, converter on #7, transmission lube on

#7* and main pressure on #9. Gauge 2, 4, 5 and 10 will indicate zero pressure.

4.4.2.2

When shift to 3rd reverse is made, gauge #1* will drop to zero, indicating that clutch has disengaged. Pressure on gauges #3, #6 and #7* will not change. Pressure on gauge #9 will remain at main pressure until speed of bevel pinion shaft is low enough for the shift to be completed without damage to the transmission. At this point, pressure on gauge #9 and #3 drops to zero; gauge #2 will jump to transmission clutch apply pressure, then gauge #1* will jump to input clutch apply pressure, indicating that first the transmission reverse clutch, then the input clutch have engaged. Gauge #10 will indicate main pressure while gauge #9 will remain at zero pressure.

4.4.2.3

If any of the events are out of sequence, or if the specified pressures cannot be obtained, the trouble can be located by checking the individual pressure.

4.5 MAIN PRESSURE

4.5.1

Refer to Fig. 4-1 for specified pressure and pressure check procedure.

4.5.2

Pressure check results:

4.5.2.1

No pressure. Pump drive train damaged. Remove pump and inspect pump driving shaft in torque converter housing; check pump for damaged drive shaft.

4.5.2.2

Low and erratic pressure. Suction line screen clogged; remove pressure pump suction tube from front of transmission and clean screen.

NOTE: If suction line screen is clogged, replace the filter elements. Cut the old elements open and inspect them for foreign material indicating a failure in its early stage.

4.5.2.3

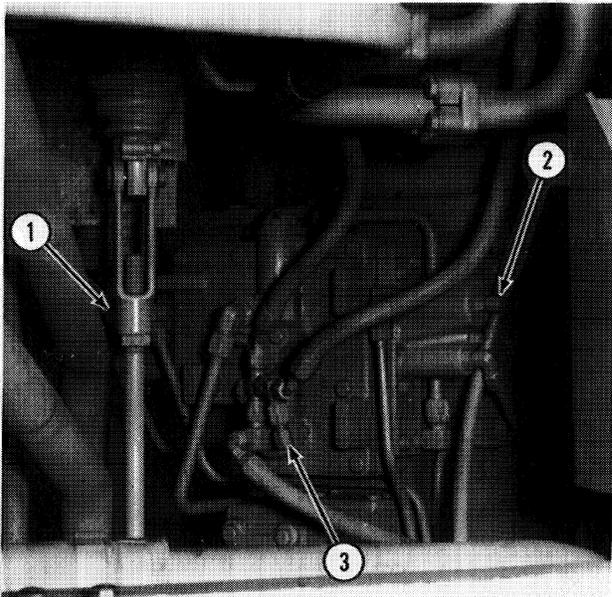
Low pressure. Main relief valve setting too low. Remove cover, 6-5 (37) from pressure regulating valve and remove pilot valve. Remove plug (16), shims (18) and spring (19) from valve body (23). Check spring tension (11.2.1) reinstall spring if within specifications and add shims (18) to raise pressure.

4.5.2.4

Low pressure; transmission clutch lube pressure also low. Worn pump; flow check pump (5.2). If pump flow is O.K., regulator piston in pressure regulating valve may be stuck

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

Pressure Checking



T-79714

FIG. 4-4 SHIFT INHIBITING VALVE
INSTALLED

1. Pressure check point (Reverse follower piston)
2. Pressure check point (Forward follower piston)
3. Pressure check point (Brake signal and input clutch apply. Added)

open, dumping too much oil to sump. This will be accompanied by a rise in torque converter oil temperature. Refer to 6.2 for repair procedure.

4.6 INPUT CLUTCH APPLY PRESSURE

4.6.1

Refer to Fig. 4-1 for specified pressure and pressure check procedure.

4.6.2

Pressure check results:

4.6.2.1

No pressure in either direction; main pressure O.K. Install a tee, Fig. 4-4 (3) on top of shift inhibiting valve and connect a pressure gauge to the tee; shift transmission to 3rd forward and 3rd reverse. If main pressure is indicated on pressure gauge the trouble will be in the pressure regulating valve; remove it (6.2), and check for a failure in the input clutch control section. If no pressure is indicated on the pressure gauge the trouble has to be in the shift inhibiting valve. Refer to 6.1 to remove valve and make necessary repairs.

4.6.2.2

No pressure in one direction; pressure O.K. in opposite direction. Direction control piston in shift inhibiting valve failing to move in one direction. Check shift inhibit system pressure (4.9) to determine if the inhibit system is at fault. If inhibit system pressures are O.K., disassemble shift inhibiting valve and make necessary repairs.

4.6.2.3

Low pressure; main pressure O.K. Leakage to sump across sealing rings on clutch apply piston (Pressure at the apply piston will actually be too low to keep clutch fully engaged; clutch will slip, causing the tractor to be low on power). See 5.1 for specified flow and 5.4.3 for maximum allowable flow.

4.6.2.4

Clutch apply pressure O.K., but clutch will not engage. Failure in clutch. Remove clutch and make necessary repairs; refer to INPUT CLUTCH AND TORQUE CONVERTER.

4.7 TRANSMISSION CLUTCH APPLY PRESSURE AND TRANSMISSION CLUTCH LUBE PRESSURE

4.7.1

Refer to Fig. 4-1 for specified pressures and pressure check procedure.

NOTE: If the test kit, Fig. 4-2 is not used, at least two gauges must be used so the lube pressure may be recorded while checking apply pressure in each of the clutches.

4.7.2

Pressure check results:

4.7.2.1

Low lube pressure; all other pressures in system low or O.K., but on low side of specifications. Worn pump; flow check pump (5.2).

4.7.2.2

Low lube pressure; torque converter pressure also low but pump flow is O.K. oil build-up in torque converter and engine flywheel housings because of clogged return line between flywheel housing and transmission sump. (If this is the cause the torque converter temperature will also be slightly higher than normal). Remove and clean return line. If no oil build-up is evident, the cause may be low engine rpm; set engine to specified high idle speed. If rpm is O.K., but pressures are still low, remove plug, Fig. 6-5 (6) and spring (5) from pressure regulating valve. Check spring tension (11.2.2) replace spring if weak. If spring is O.K., reinstall it with one additional shim (4), and repeat pressure check. If pressures are still low, excessive leakage in the system is robbing

Pressure Checking

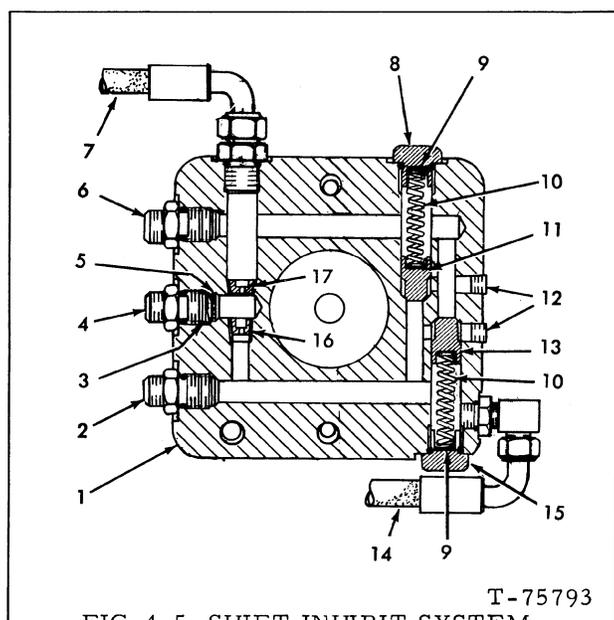


FIG. 4-5 SHIFT INHIBIT SYSTEM
RELIEF VALVES AND RESTRICTORS

1. Bevel pinion shaft front bearing retainer
2. Outlet to forward end of shift inhibit piston
3. Spring
4. Main circuit oil inlet
5. Screen
6. Outlet to reverse end of shift inhibit piston
7. Hose to test panel (Inh. Rev.)
8. Plug
9. Pressure adjusting shims
10. Relief valve spring
11. Relief valve (on pressure side of pump in forward)
12. Pipe plugs
13. Relief valve (on pressure side of pump in reverse)
14. Hose to test panel (Inh. Fwd.)
15. Plug
16. Drilled pipe plug (on suction side of pump in reverse)
17. Drilled pipe plug (on suction side of pump in forward)

this circuit of oil; check transmission clutch apply flow (5.3), torque converter in flow (5.4) and transmission lube flow (5.5). Remove the shim which was added behind spring, Fig. 6-5 (5) in pressure regulating valve.

4.7.2.3

Apply pressure O.K. in each range clutch, but some apply pressure also noted in range clutches which are disengaged. Leaks around range control spool or check balls in travel control valve. Disassemble valve and make repairs (6.3).

4.7.2.4

Apply pressure O.K. in all range clutches, but no apply pressure in either direction clutch or in the input clutch. Direction control piston in shift inhibiting valve stuck in neutral position; disassemble valve and make necessary repairs (6.1).

NOTE: If direction control piston is stuck in one end of its bore, the transmission direction clutch apply pressure and input clutch apply pressure will be O.K. in one direction but zero in the opposite direction. Direction pressure will also be present in neutral position.

4.7.2.5

Apply pressure low in one clutch only. Failure in affected clutch. Remove transmission and make necessary repairs.

4.7.2.6

Lube pressure high; transmission clutch apply flow in neutral (5.3) also high. Blown gasket between shuttle valve body and its cap.

NOTE: Specific gasket cannot be determined by testing. Remove all three caps so all the gaskets can be inspected.

4.7.2.7

Lube pressure high; torque converter pressure (4.8) and transmission lube flow (5.5) also high. Failure in torque converter/transmission lube section of pressure regulating valve. Make necessary repairs (6.2).

4.8 TORQUE CONVERTER PRESSURE

4.8.1

Refer to Fig. 4-1 for specified pressure and pressure check procedure.

4.8.2

Pressure check results:

4.8.2.1

Low pressure; see 4.7.2.1 and 4.7.2.2 for possible causes and remedial actions.

4.8.2.2

High pressure; transmission lube pressure (4.7) and flow (5.5) high. Failure in torque converter/transmission lube section of pressure regulating valve. Make necessary repairs (6.2).

4.9 SHIFT INHIBIT SYSTEM PRESSURE

NOTE: Oils in hydraulic system must be at normal operating temperature when pressures are checked.

Pressure Checking

4.9.1 SHIFT INHIBIT PUMP PRESSURE

4.9.1.1

Connect pressure gauges of 300 psi (21.09 kg/cm²) capacity to test panel at points 9 and 10, Fig. 4-3. Run engine at high idle with transmission in neutral. Pressure on gauges must be the same within 5 psi (0.35 kg/cm²).

NOTE: Specified pressure is 80 -- 120 psi (5.6 -- 8.4 kg/cm²). Disengage steering clutches and shift transmission to 3rd forward. Pressure on gauge (9) must be 80 -- 100 psi (5.6 -- 7.0 kg/cm²) higher than pressure on gauge (10). Shift transmission to 3rd reverse -- after shift is completed pressure on gauge (10) must be 80 -- 100 psi (5.6 -- 7.0 kg/cm²) higher than pressure on gauge (9).

NOTE: High pressure should be 180 -- 200 psi (12.6 -- 14.0 kg/cm²).

4.9.1.2

If no pressure differential is detected in both engaged positions, check for a clogged screen, Fig. 4-5 (5), an inoperative shift inhibiting pump or inoperative relief valves, Fig. 4-5 (11) (13).

4.9.1.3

Pressure differential is controlled by the relief valves, Fig. 4-5 (11) (13). Both valves are shim adjusted -- add shims to increase pressure differential. Each shim will change pressure differential approximately 5 psi (0.35 kg/cm²).

4.9.1.4

If shimming does not change the pressure differential, first remove any shims which were added. Check condition of orifices in plugs, Fig. 4-5 (16) (17); if orifices are O.K. disassemble the shift inhibiting valve (6.1) and check condition of the shift inhibit pistons, Fig. 6-2 (14) (19). Be sure the orifice in side of end pistons (14) is not clogged.

4.9.2 FOLLOWER PISTON PRESSURE

4.9.2.1

Connect pressure gauges of 300 psi (21.09 kg/cm²) capacity to the connectors, Fig. 4-5 (1) (2). Run engine at high idle; with transmission in neutral, there should be no pressure at either gauge. Disengage steering clutches and shift transmission to 3rd forward. Gauge at point (2) should indicate no pressure; gauge at (1) should indicate main pressure (see Fig. 4-1 for main pressure specification). Shift to 3rd reverse -- after shift is completed gauge at (2) should indicate main pressure while gauge at (1) should indicate no pressure.

4.9.2.2

If one or both of the pressures in the ends of shift inhibiting valve is low, or if there is pressure at either end with transmission in neutral, the cause has to be in the shift inhibiting valve or shift inhibit relief valves, Fig. 4-5 (11) (13). Check relief valves for freedom of movement and make certain they are seating properly, if this does not correct the problem remove shift inhibiting valve (6.1); check movement of pistons, Fig. 6-2 (14) (19) in bore and/or check for clogged oil passages in valve body.

PRESSURE (PSI) SHIFT LEVER POSITION	MAIN	CONV.	LUBE	INPUT CLUTCH	FWD	REV	1ST	2ND	3RD	SHIFT INHIBIT SYSTEM			
										FWD. AT VALVE Fig. 4-4(2)	REV. AT VALVE Fig. 4-4(1)	FWD. AT PANEL Fig. 4-3(9)	REV. AT PANEL Fig. 4-3(10)
NEUTRAL	175- 220	80-90	65-75							0	0	80-120	80-120
PTO	175- 220	80-90	65-75	175- 200	175- 200					175- 200	0	180-200	80-120
*1 FWD.	175- 220	80-90	65-75	175- 200	175- 200		175- 200			175- 200	0	180-200	Note 1
*2 FWD.	175- 220	80-90	65-75	175- 200	175- 200		175- 200			175- 200	0	180-200	Note 1
*3 FWD.	175- 220	80-90	65-75	175- 200	175- 200		175- 200		175- 200	175- 200	0	180-200	Note 1
*1 REV.	175- 220	80-90	65-75	175- 200	175- 200	175- 200	175- 200			0	175-200	Note 2	180-200
*2 REV.	175- 220	80-90	65-75	175- 200	175- 200	175- 200	175- 200			0	175-200	Note 2	180-200
*3 REV.	175- 220	80-90	65-75	175- 200	175- 200	175- 200	175- 200		175- 200	0	175-200	Note 2	180-200

NOTES:

- 80-100 psi less than gauge #9
- 80-100 psi less than gauge #10

1 psi = 0.07 kg/cm²
1 gpm = 3.78 lit/min

* Disengage steering clutches when checking pressure and/or flow.

SHIFT LEVER POSITION	RPM	NEUT	1ST	2ND	3RD	* 1ST FWD	* 2ND FWD	* 3RD FWD	* 1ST REV	* 2ND REV	* 3RD REV
TRANSMISSION PUMP	1450	43-47									
	High Idle	62-68									
TRANSMISSION CLUTCH APPLY	High Idle	1.5-2	4-6	4-6	4-6			5-7			5-7
	1450 High Idle							1.5-2			1.5-2
TORQUE CONVERTER IN	1450 High Idle							32-37			32-37
	1450 High Idle							52-57			52-57
TRANSMISSION LUBE	1450 High Idle					20-25	20-25	20-25	20-25	20-25	20-25
	High Idle					36-40	36-40	36-40	36-40	36-40	36-40

SPECIFIED PRESSURES AND FLOWS

Study SAFETY RULES, pages I thru III, thoroughly for the protection of personal and machine safety.

PRESSURE (PSI) SHIFT LEVER POSITION	MAIN	CONV.	LUBE	INPUT CLUTCH	FWD	REV	1ST	2ND	3RD	SHIFT INHIBIT SYSTEM				
										FWD. AT VALVE Fig. 4-4(2)	REV. AT VALVE Fig. 4-4(1)	FWD. AT PANEL Fig. 4-3(9)	REV. AT PANEL Fig. 4-3(10)	
NEUTRAL														
PTO														
*1 FWD.														
*2 FWD.														
*3 FWD.														
*1 REV.														
*2 REV.														
*3 REV.														

SHIFT LEVER POSITION	RPM	NEUT	1ST	2ND	3RD	*1ST FWD	*2ND FWD	*3RD FWD	*1ST REV	*2ND REV	*3RD REV
TRANSMISSION PUMP	1450 High Idle										
TRANSMISSION CLUTCH APPLY	High Idle										
INPUT CLUTCH APPLY	High Idle										
TORQUE CONVERTER IN	1450 High Idle										
TRANSMISSION LUBE	1450 High Idle										

1 psi = 0.07 kg / cm²
 1 gpm = 3.78 lit/min

* Disengage steering clutches
 when checking pressure and/or
 flow.