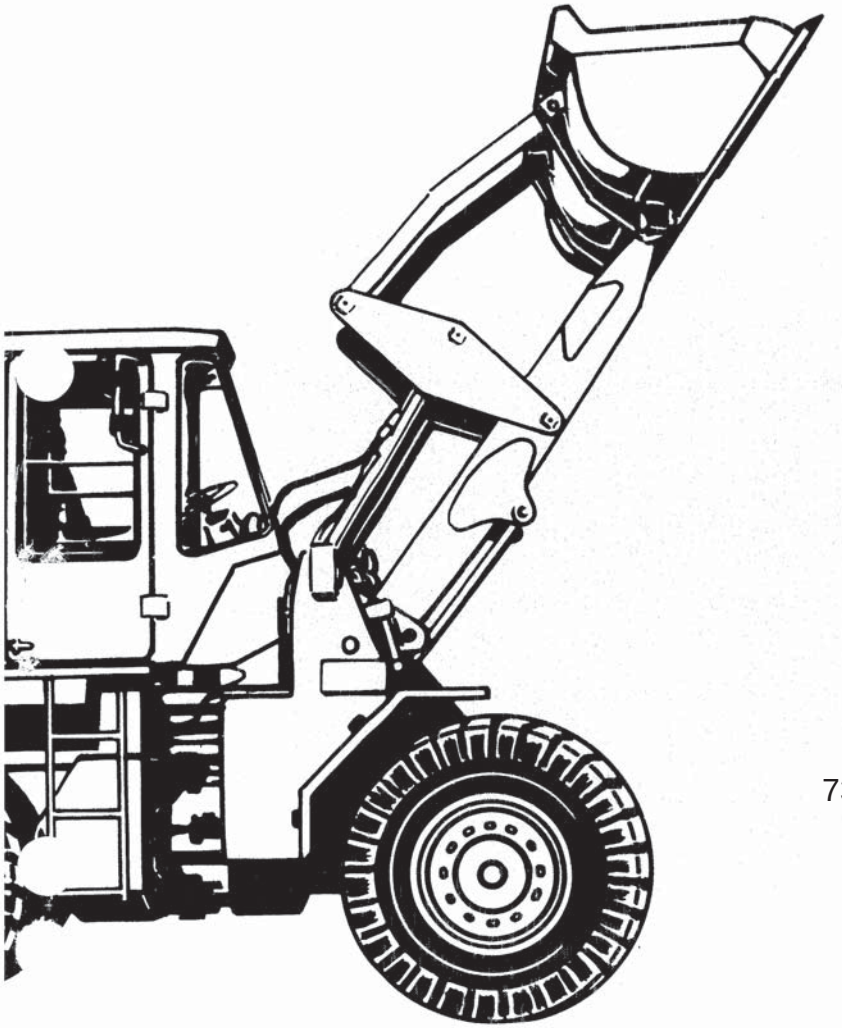
Product: Fiatallis FR10/FR12 Transmission Wheel Loader Service Manual
Full Download: https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/

FIATALLIS

FR10
FR12

TRANSMISSION



Service manual

73142482

Sample of manual. Download All 112 pages at:
https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/

Product: Fiatallis FR10/FR12 Transmission Wheel Loader Service Manual
Full Download: https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/

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 many 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.

Sample of manual. Download All 112 pages at:
https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/

FR10, FR12

wheel loader

service manual

TRANSMISSION

Form 73142482 English

⚠ WARNING

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

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

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

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

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

TABLE OF CONTENTS

TABLE OF CONTENTS

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 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.

No machine should ever be used as a work platform or scaffolding. Other unorthodox uses (such as pushing freight cars, trucks or other machinery) should be avoided.

Always be aware of presence of people in the work site. Load trucks from the driver's side if possible.

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

Never use the bucket as a man lift.

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.

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.

When machine is equipped with hydraulic brakes, be sure brake fluid is maintained at level specified in 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.

Water accumulates in air systems due to changes in atmospheric conditions. Check for and drain water if required according to the Operation and Maintenance Instruction Manual recommendations.

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.

Be sure tires are properly inflated to the manufacturer's specified pressure. Inspect for damage periodically.

Use care if you must transport (haul) a fully inflated tire.

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 and 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.

Check instruments at start up and frequently during operation. If brake pressure gauge indicates pressure below low limit shut machine down at once.

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.

Check condition of tie rod ends and other steering linkage at the beginning of each shift.

Inspect wheel fasteners and/or rim lugs for looseness before each shift. Tighten if required according to Operation and Maintenance Instruction Manual.

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.

Stop at appropriate intervals to inspect the machine and allow tires to cool. Air pressure will rise during operation . DO NOT REDUCE THE PRESSURE. Excess speed or dragging brakes can cause tires to heat up. Reduce travel speed, not tire pressure. Check brakes.

If tire has been run flat, allow to cool before parking in a closed area.

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.

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.

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

Pass only when absolutely necessary. Be alert to dangerous ground and visibility conditions and other machines in the area before attempting to pass. Be alert for the possibility of hidden personnel.

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.

Avoid operating equipment too close to an overhang or high wall 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.

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.

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.

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.

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.

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.

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.

Handle only loads which are safely arranged. Beware of overhanging material or objects.

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

Do not swing loads over exposed people. Avoid swinging loads towards the downhill side of slopes. Dump on the uphill side if at all possible.

Start and stop carefully when transporting a loaded bucket. Do not start with full loads without first reducing engine speed.

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

SAFETY RULES

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 attachments by means of the machine's hydraulic system 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.

Lock articulation with frame lock for servicing or transporting this machine. Be sure frame lock has been stored in carry position after completion of work.

Use the lift arm support whenever it is necessary to work under a raised linkage. Instruction for its use and storage are provided in the Operation and Maintenance Instruction Manual. Do not substitute any other devices in the places provided. The implement must be empty and rotated to its lowest position when using the support. Remove and store support, immediately after use, in the place provided. If no support is provided on the machine, and work is required under a raised linkage, block up the linkage with an external support capable of holding up the linkage according to local or national requirements.

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

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

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

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

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

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

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

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

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

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

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

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

Never place gasoline or diesel fuel in an open pan.

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

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.

Check tires only when the machine is empty and tires are cool to avoid under inflation. Do not use reworked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.

Stand to one side when changing inflation of tires.

Never inflate tires with flammable gases. Explosion and personal injury could result.

When servicing tires block the machine in front and back of wheels. After jacking up, place blocking under machine to protect from falling according to local or national requirements.

Deflate tires before removing objects from the tread.

Never cut or weld on the rim of an inflated tire. Inflate a spare tire only enough to keep rim parts in place - a fully inflated tire might fly apart when it is not installed on a machine.

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.

Always block all wheels front and back before bleeding or disconnecting any brake system lines and cylinders. See Operation and Maintenance Instruction Manual.

SAFETY RULES

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.

When work is required under or between components, block with an external support capable of holding the components in place 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 machine.

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

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 60407026 available from Fiat-Allis.

This manual may not be reprinted or reproduced, either in whole or in part, without written permission of Fiat-Allis.

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 INFORMATION

1.1 SCOPE OF MANUAL

1.1.1
COVERAGE. This Service Manual describes the operation, maintenance, and overhaul procedures for the TT 2221-1 power shift transmission.

1.1.2
Figure 1 and 3 are representative of the model configuration covered in this manual. The various features available for this model is discussed, and the function and operation of the hydraulic system and torque paths are explained. Wear limits information, parts inspection procedures, and torque specifications also are included.

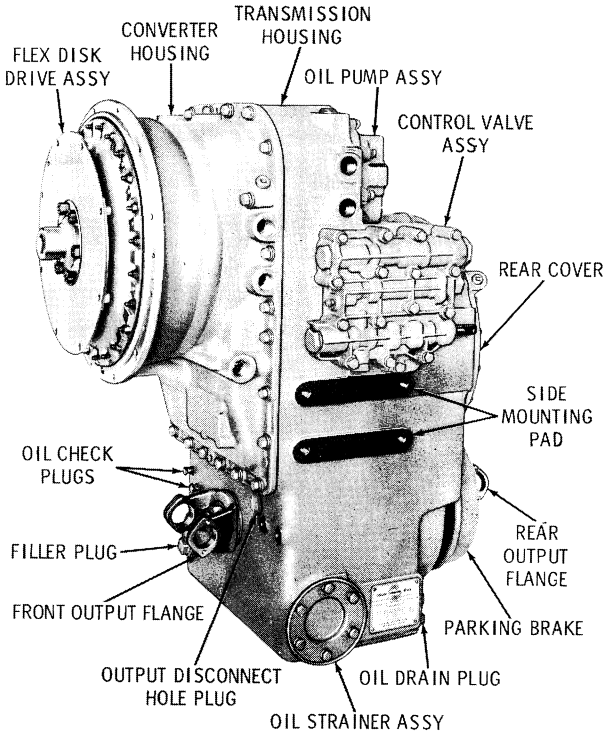
NOTE: Do not confuse references made to the front and rear of the transmission with the way the transmission sets in the loader. For clarification purposes use the following definitions:

Front = Converter end
Rear = Parking brake end
Left = Control valve side

1.2 ORDERING PARTS

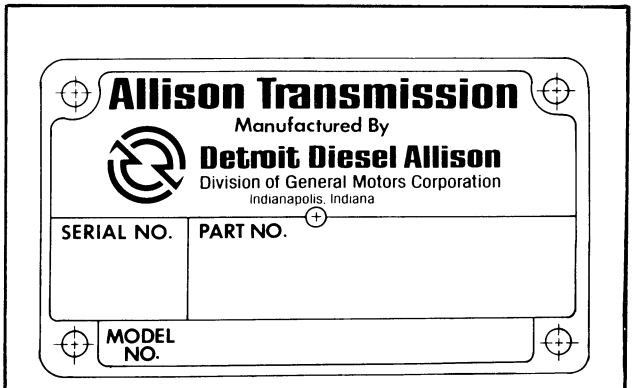
1.2.1
TRANSMISSION NAME PLATE. The nameplate (Fig. 2), located on the lower left side of the transmission housing, has the serial number, assembly part number, and the model number assigned to define a specific configuration. Because of the differences in models, options, and component arrangement be sure to include all three numbers (and metal-stamped letters if present) when ordering parts or requesting service information.

Also give the Loader Model and serial number when ordering parts.



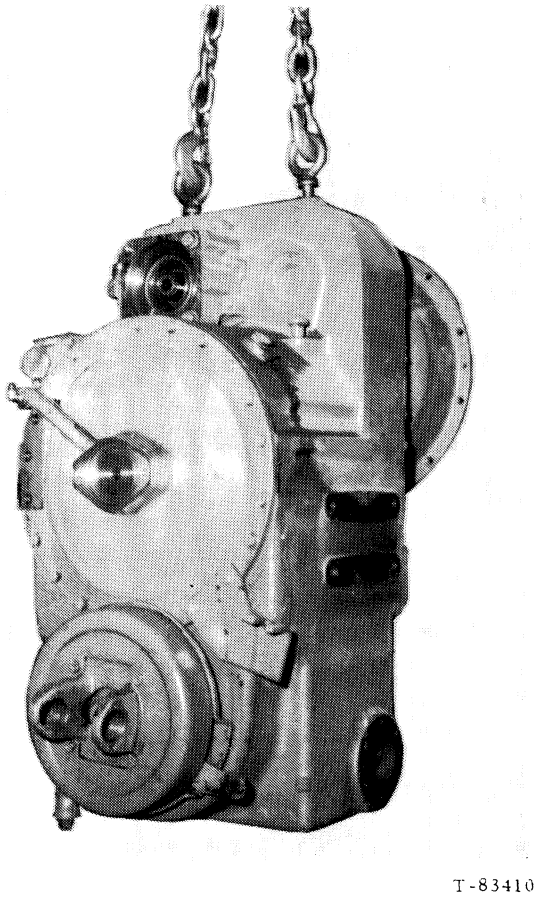
T-76691

FIG. 1 MODEL TT 2221-1



T-76692

FIG. 2 TRANSMISSION NAME PLATE



T-83410

FIG. 3 TRANSMISSION - Right Side

1.3 DESIGN FEATURES

1.3.1
MOUNTING, INPUT DRIVE (FIG.3A). The transmission is direct mounted. The transmission is coupled to the engine through a modified SAE 3 mounting face on torque converter housing (43), which is bolted to the engine flywheel housing. Flex disk drive assembly (1) bolts to the engine flywheel.

1.3.2
TWIN-TURBINE TORQUE CONVERTER (FIG. 3A), Each turbine is connected to its own output gear set. First turbine (7) provides high torque at low speed; second turbine (6) provides higher speed with less torque. There are four elements in the twin-turbine torque converter - pump (9), first turbine (7), second turbine (6), and stator (8).

1.3.3
First-turbine drive gear (15) driven gear (39) and freewheel clutch (40) connect the first turbine to the range gears and clutches. Second turbine drive gear (42) and driven gear (41) connect second turbine (6) to the range gears and clutches. The first-turbine gear set provides a reduction in speed with an increase in torque delivered to the range gearing. The second-turbine gear set provides an increase in speed with a reduction in torque delivered to the range gearing.

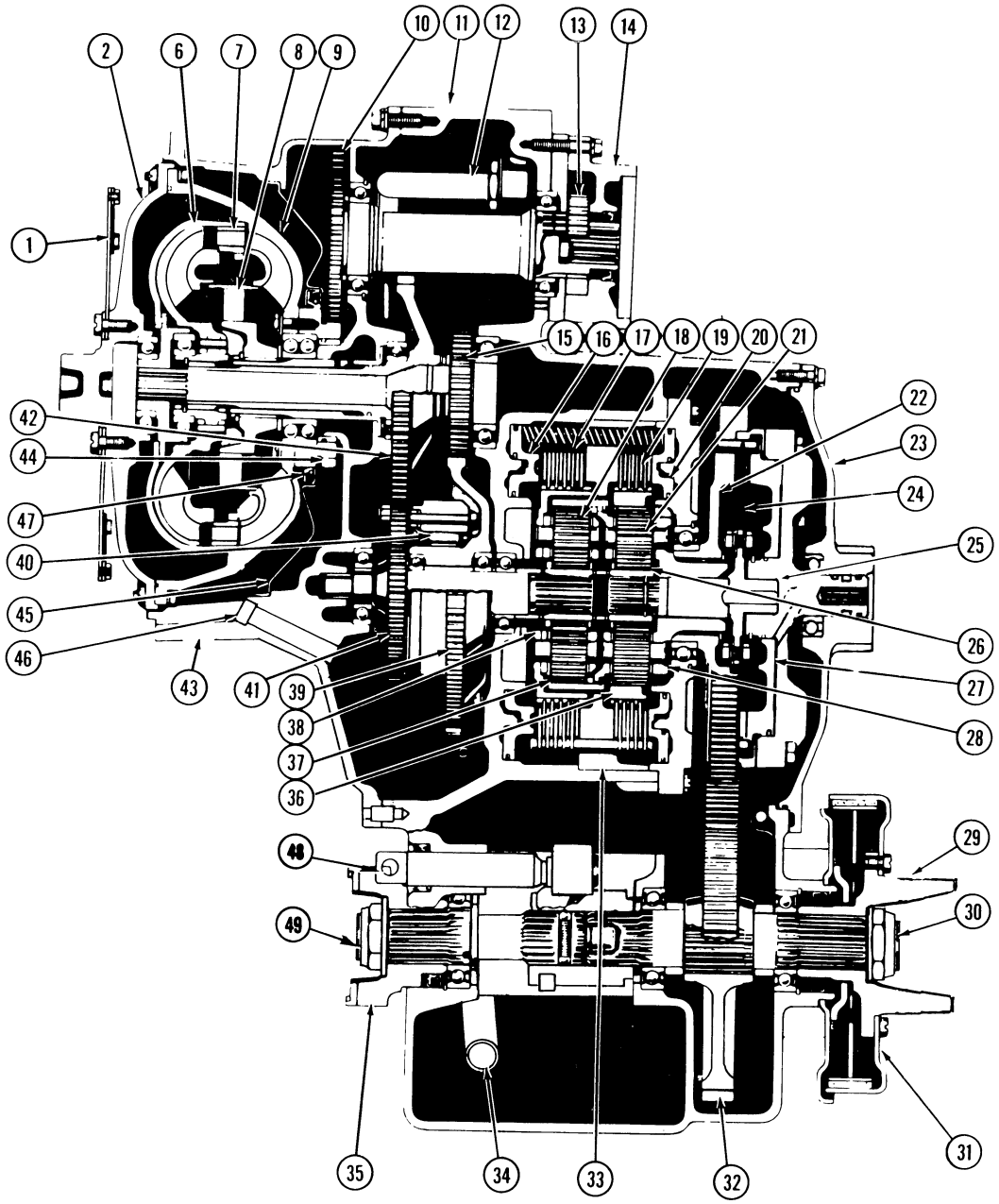
1.3.4
When torque demand is high, the freewheel clutch is engaged and the first turbine, assisted by the second turbine, drives the range gears. When the speed of the vehicle increases, torque demand decreases. When this occurs, the second turbine assumes the entire load and the freewheel clutch disengages. The transition from first turbine to second turbine (high torque to high speed) is automatic, being determined by speed and load conditions.

1.3.5
RANGE GEARING, CLUTCHES (FIG.3A). The transmission has two planetary range gear sets and three clutches. The reverse-range planetary gear set consists of ring gear (37), carrier assembly (38), and sun gear (26) (integral with low-range sun gear). The reverse-range gear set is controlled by reverse-range clutch (17).

1.3.6
The low-range planetary gear set consists of ring gear (36), carrier assembly (28), and sun gear (26) (integral with reverse-range sun gear). The low-range gear set is controlled by low-range clutch (19).

1.3.7
Torque is supplied to the reverse-and low-range planetary gear sets by the shaft of the second-turbine driven gear, which drives the reverse-and-low-range sun gear. High-range clutch (24) when engaged, gives direct drive from the turbine driven gears to transfer drive gear (22). Each of the three clutches is applied separately. Two forward gears (LF and HF) and reverse (R) are derived from the range gearing and clutches. All three clutches are multiplate, hydraulically applied, and spring released.

1.3.8
TRANSFER GEARS. The transmission output consists of transfer gears (22) and (32) which drive any one of three output shaft configurations - front and rear output, front disconnect output, and rear output. Constant-mesh, spur-type transfer gears are used in-line to provide a 19-inch (482.6mm) vertical drop from the input shaft to the output shaft.



T-76693

FIG. 3A TT 2221-1 (Cross Section)

LEGEND FOR FIG. 3A

1. Flex disk drive assembly
2. Torque converter cover
6. Second turbine
7. First turbine
8. Torque converter stator
9. Torque converter pump
10. Accessory driven gear
11. Transmission housing
12. Oil suction tube
13. Oil pump
14. Accessory pump mounting pad
15. First tubrine drive gear
16. Reverse-range clutch piston
17. Reverse-range clutch
18. Reverse-range planetary pinion
19. Low-range clutch
20. Low-range piston
21. Low-range planetary pinion
22. Transfer drive gear
23. Transmission rear cover
24. High-range clutch
25. High-range clutch hub
26. Reverse and low-range sun gear
27. High-range piston
28. Low-range planetary carrier assembly
29. Output flange
30. Rear output shaft
31. Parking brake
32. Transfer driven gear
33. Reverse and low-range clutch anchor
34. Oil suction tube
35. Output flange
36. Low-range ring gear
37. Reverse-range ring gear
38. Reverse-range planetary carrier assy.
39. First turbine driven gear
40. Freewheel clutch
41. Second turbine driven gear
42. Second turbine drive gear
43. Torque converter housing
44. Accessory drive gear
45. Converter diaphragm
46. Plug
47. Oil seal
48. Disconnect shifter fork
49. Front output shaft

1.3.9
OUTPUT SHAFT (Fig. 3A) The transmission may be equipped with any one of two output shaft configurations, two-piece shaft (30 and 49), and rear output shaft (30).

1.3.10
The two-piece shaft and disconnect coupling allow front output shaft (49) to be disconnected from the drive line while drive at rear output shaft (30) is maintained. The rear output shaft is the same as that used for the two-piece configuration except that the front output and disconnect components are not included.

1.3.11
OIL PUMP (Fig. 3A) A positive displacement, gear type oil pump (13) furnishes the oil flow and pressure necessary for hydraulic operation, lubrication, and cooling of the transmission components. Rotation of the pump is in a clockwise direction (viewed from rear) and is portional to the speed of the engine. A mounting pad (14) is provided at the rear of the oil pump to accommodate an implement pump.

1.3.12
CONTROL VALVE BODY ASSEMBLY (Fig. 55) Control valve body assembly (5) is mounted on the left side of the transmission housing (Fig. 1). The significant components contained within the valve body are the main pressure regulator valve (8), trimmer plug (16), range selector valve (27), and a clutch cutoff valve (20).

1.3.13
The clutch cut-off is air actuated (by air over hydraulic brakes). When the loader brakes are applied, the valve releases the transmission drive clutch. Thus, when the loader is brought to a stop by the brakes, the power-driven pumps may be controlled by applying the accelerator pedal without having to shift to neutral.

1.3.14
Linkage connects the range selector valve to the operator's manual controls. A brake pressure line connects the clutch cutoff valve to the loader's brake system.

1.3.15
PARKING BRAKE (Fig. 3A) A 10 x 1.5 inch (254.0 x 38.1 mm) expanding shoe type parking brake (31) is available. The brake is mechanical, and manually operated.

1.3.16
HOUSING (Fig. 1). The torque converter housing is cast aluminum, and the transmission housing is cast iron. The front cover is cast iron. The front converter housing, bolts

to the engine flywheel. The lower part of the transmission housing serves as an oil sump. Openings in the transmission housing provide for installation of external piping, oil check plugs, breather, drain plug, oil filler tube and oil strainer.

1.3.17
OIL FILTER, COOLER. A full-flow oil filter and oil cooler are connected to the transmission. Refer to Fig. 10 for the points at which these items are attached.

1.4 OPERATING INSTRUCTIONS

1.4.1
RELATED TO LOADER. For information on controls and linkage, refer to the Operator's Manual.

1.4.2
RANGE SELECTION. Position the range selector control in the neutral position while starting the engine or at any time the loader is standing unattended.

1.4.3
When a shift is made from neutral to any driving range, the engine should be at idle speed. Any shift to a higher speed range, in the same direction, can be made at full throttle, under load. Downshift to the next lower speed range may be made at full throttle, under load, providing the loader is not exceeding the maximum speed attainable in the lower range.

1.4.4
CHANGING DIRECTION OF TRAVEL. Directional shifts can be made under full-power and /or full-speed conditions in the working ranges (LF to LR and LR to LF). Shifts from reverse should be made to LF drive range-not HF. Direct shifts from LR to HF will adversely affect clutch service life.

1.4.5
CLUTCH CUT-OFF CONTROL. When the transmission is equipped with the clutch cut-off control, the driving clutch is completely released whenever the loader brakes are applied. Hydraulic pressure applies the brakes and air actuates the clutch cut-off.

1.4.6
AXLE DISCONNECT (Optional Equipment). The transmissions front output may be disconnected by actuating the control which moves the disconnect coupling (at the front of the transmission drop box) forward. Rearward movement connects the front and rear output shafts through the splines of the coupling. Two spring-loaded ball detents retain the coupling in either position. The control should never be shifted while the loader is moving.

1.4.7
TEMPERATURES, PRESSURE. The transmission is equipped with a temperature gauge. The sending unit is mounted in the converter-out oil stream (Fig. 10). Temperature should never be permitted to exceed 250°F. (121°C) Extended, severe operating conditions may cause the temperature to reach this maximum. If so, the transmission should be shifted to neutral and the engine should be operated at approximately 1000 to 1500 rpm for several minutes until the normal temperature (180° to 220°F)(82° to 104°C) is restored. If the temperature reaches maximum (250°F)(121°C) during normal operation of the transmission, stop the engine and locate the trouble. Refer to the Trouble-Shooting Chart.

1.4.8
The clutch (main) pressure gauge is connected to the control valve body assembly (Fig. 10). The pressure shown is that which is effective in the operating range clutch. Shifting or use of the clutch cutoff will cause fluctuations in the pressure indicated. If abnormal pressures are evident, refer to the Trouble-Shooting Chart.

1.5 SPECIFICATIONS, DATA

1.5.1
The following table of specifications and data is applicable to the TT-2221-1 model transmission.

SPECIFICATIONS AND DATA

ITEM	DESCRIPTION
Transmission type	Torque converter and planetary gear
Rating:	
Input speed	3000rpm (max)
Input torque	310 lbs. ft. (42.8 kg m)
Input horsepower	177 hp.

SPECIFICATIONS AND DATA (Continued)

Rotation, viewed from input end
- Input - Clockwise
- Output (forward operation) - Clockwise
- Output (reverse operation) - Counterclockwise

Gear ranges, selector positions - Low-Reverse (LR), Neutral (N), Low-Forward (LF), High-Forward (HF).

Weight, dry (approx.):
- Direct Mount — 2221 - 780 lbs. (354 kg)

Torque Converter - 2 stage, 4 element, twin-turbine

*Torque multiplication ratios:
- TT 2221-1 - TT 240 - 5.0:1

Gearing - Constant mesh, straight spur, planetary type

*Gear ratios - 2nd turbine ratio, 0.83 : 1
- Transfer gear set ratios: LF - 0.846:1
- Low range-standard - 2.66:1
- High range HF - 0.70:1
- Reverse LF - 1.96:1
- Low range-high speed LF - 2.03:1

Clutch data:
- Type - Multidisk, hydraulic-actuated, spring released, oil-cooled; automatically compensates for wear
- Material - External-tanged reaction plates-polished steel
  Internal-splined friction plates-sintered bronze on steel or resin-graphite on steel

Parking brake:
- Size and type - 10" x 1-1/2", (254.0 x 38.1mm) expanding shoe, mechanical-applied
- Rating, (run-in and burnished) - 30,000 lb in. (346 kgm) at 1400 lb (635.0 kg) apply force

Oil system:
- Oil pump - Input driven, positive displacement, 2 spur gears
- Sump - Single, integral

Oil type and viscosity - Oil must meet one of the following:
(a) Type C-3 Transmission fluid (oil)
(b) Engine Oil TO-2 Qualified meeting Type C-3 specifications

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

NOTE: Below -13°C (10°F) auxiliary preheat is required to raise the sump temperature to at least -13°C (10°F) -- or -- operate transmission in neutral for a minimum of 20 minutes before engaging forward or reverse.

Oil capacity (less external circuits) - Initial fill -- 8-1/2 US gal. (32.2 lts)
Oil filter - Remote mounted
Converter-out oil temperature - 250°F max. (121°C)

*To obtain overall transmission torque ratios, multiply the applicable torque converter ratio times the gear ratio.

(Continued)

Oil system (Continued)

Main pressure, at full throttle	165 to 195 psi (11.60 to 13.71 kg/cm^2)
Lubrication pressure, at full throttle	15 to 30 psi (1.05 to 2.10 kg/cm^2)
Converter-out pressure, at full throttle stall	40 psi (min.) (2.81 kg/cm^2)
Converter-out pressure, at full throttle, no-load	65 psi (max.) (4.56 kg/cm^2)
Control valve body assembly:	
Clutch cutoff	Air actuated

TOPIC 2 DESCRIPTION AND OPERATION

2.1 SCOPE OF TOPIC 2

2.1.1
This section describes the functions of the transmission components. The hydraulic systems are explained and schematically illustrated. The transmission torque paths are also explained for each gear range.

2.2 TWIN-TURBINE TORQUE CONVERTER

2.2.1
CONVERTER CONSTRUCTION (FIG. 3A). The torque converter consists of pump (9), first turbine (7), second turbine (6), and stator (8). Pump (9) is the driving member and is driven at engine output speed. First turbine (7) and second turbine (6) are driven members, connected by transfer gears (15), (39), (41), and (42) to the transmission range gearing. Stator (8) is the reaction member.

2.2.2
CONVERTER OPERATION (FIG. 3A). During operation, the first and second turbines function jointly or separately, depending upon the load demand and speed of the loader. The first-turbine gear train consists of gears (15) and (39). The second-turbine gear train consists of gears (41 and 45). The turbines are able to function jointly or separately by means of a freewheel clutch (40). At high load demand and low speed, the freewheel clutch is engaged, permitting both turbines to drive, and providing maximum input torque to the range gearing. As the loader speed increases and load demand decreases, the second-turbine speed, as it approaches the first-turbine speed, provides all of the torque. The first turbine then freewheels. Upon an increase in load demand and the resulting decrease in vehicle speed, the freewheel clutch automatically re-engages, permitting both the first turbine and second turbine to again provide the necessary torque multiplication.

2.3 LOW- REVERSE - RANGE GEARING AND CLUTCHES

2.3.1
Two planetary gear sets are used in the transmission gear train. One transmits low-speed forward and the other transmits reverse drive. The planetary gear sets are interconnected through integral sun gears (26) (Fig. 3A) and reverse-range ring gear (37) which is splined to low-range planetary carrier assembly (28).

2.3.2
The reverse-range planetary carrier assembly (41) (Fig. 3A) has four pinions. Low-range planetary carrier assembly (28) has four pinions. The four-pinion, low-range planetary provides a standard low-range ratio. Reverse-and-low-range sun gear (26) is driving member for both planetary gear sets. In the reverse-range planetary, carrier assembly (38) is the reaction member and ring gear (37) is the driven member. In the low-range planetary, ring gear (36) is the reaction member and carrier assembly (28) is the driven member.

2.3.3
Reverse-range clutch (17) (Fig. 3A) has five external-tanged reaction plates and five internal-splined friction plates. The reaction plates engage the anchor pins in reverse-and-low-range clutch anchor (33). The friction plates engage the splined hub of the reverse-range planetary carrier. Low-range clutch (19) has four internal-splined friction plates and four external-tanged reaction plates. The friction plates engage the splines of low-range ring gear (36) and the reaction plates engage the anchor pins in reverse-and-low range clutch anchor (33). Engagement of the reverse-range clutch holds the reverse-range carrier stationary, and engagement of the low-range clutch holds the low-range ring gear stationary.

2.4 HIGH RANGE CLUTCH

2.4.1
High-range drive is obtained through the high-range clutch-no planetary gearing is involved. High-range clutch (24) (Fig. 3A consists of two friction plates and one external-tanged reaction plate. The friction plates are bolted to high-range clutch hub (25) which is driven by reverse and low-range sun gear (26). The external tangs on the reaction plate engage the drive pins in transfer drive gear (22).

2.4.2
Thus, when the high-range clutch is applied, the transfer drive gear is locked to the reverse and low-range sun gear. This causes the transfer drive gear to rotate at a 1 to 1 ratio.

2.5 TRANSFER GEARS, OUTPUT SHAFTS

2.5.1
TRANSFER GEARS. The transfer gears consist of two spur gears which are in constant mesh. Transfer drive gear (22) Fig. 3A, is splined to the hub of low-range planetary carrier assembly (28). Transfer driven gear (32) is located directly below the drive gear and is splined to output shaft (30).

2.5.2
TWO-PIECE SHAFT, REAR AXLE DISCONNECT - The two-piece shaft configuration allows output shaft to be disconnected from drive line. The front disconnect consists mainly of disconnect coupling which is manually shifted by disconnect shifter fork (48) and shaft. In the engaged position, torque from output shaft (30) is transmitted through the coupling splines to the front output shaft. In the disengaged position the coupling rides on the rear splines of the front output and torque to the front output is interrupted.

2.5.3
REAR OUTPUT SHAFT. Output shaft Fig. 87 (23) provides torque to the rear output only. The shifter shaft hole is closed by shifter shaft orifice plug (28).

2.6 HYDRAULIC PUMP DRIVE PAD

2.6.1
HYDRAULIC PUMP DRIVE PAD. The hydraulic pump drive pad, located on the rear face of oil pump body (10) Fig. 116A is a four bolt configuration. Accessory driven gear (2) Fig. 62 is engine driven through accessory drive gear (19) Fig. 58 at ratios of 0.91 to 1. Regardless of the range selector position, the shaft rotation is clockwise as viewed from the rear.

2.7 OIL PUMP

2.7.1
Oil pump assembly (2) Fig. 116A consists mainly of two spur gears (5 and 7); body assembly (9) and cover (3). The oil pump assembly furnishes the entire oil flow and pressure for all transmission operations. The pump is driven by accessory drive gear (19) Fig. 58 and rotates any time the engine rotates. The transmission oil is drawn, through oil strainer (22), into the lower end of suction tube (2) which directs it to the pump assembly. The oil is then directed, under pressure, through passages in the transmission housing to the control valve assembly and other locations for lubrication and cooling.

2.8 CONTROL VALVE BODY ASSEMBLY

2.8.1
CONTROL VALVE BODY (Fig. 54). The control valve body contains a manual-operated range selector valve (27) for reverse, neutral, low or high-range operation, plus main pressure regulator valve (8), and clutch cutoff valve (20).

2.8.2
MAIN-PRESSURE REGULATOR, SELECTOR VALVES (Fig. 54) Main pressure regulator valve components and trimmer valve components are contained in the upper bore of the body; clutch cutoff valve components in the middle bore; and the selector valve components in the lower bore. The main pressure regulator valve group includes items (6, 7, 8, 13, and 14). The selector valve group contains items (26 through 33).

2.8.3
Main pressure regulator valve (8) is spring loaded and regulates the pressure for all hydraulic functions. The selector valve is a spool type valve which is manually moved lengthwise to the various range positions. Spring loaded detent balls (28) position the valve in each range.

2.8.4
CLUTCH CUTOFF VALVE (Fig. 54) Clutch cutoff valve (20) is located between the main pressure regulator valve and selector valve (27). It is spool type valve which is moved rearward by spring (19) pressure and forward by plug (21) when brake air pressure acts on the plug.

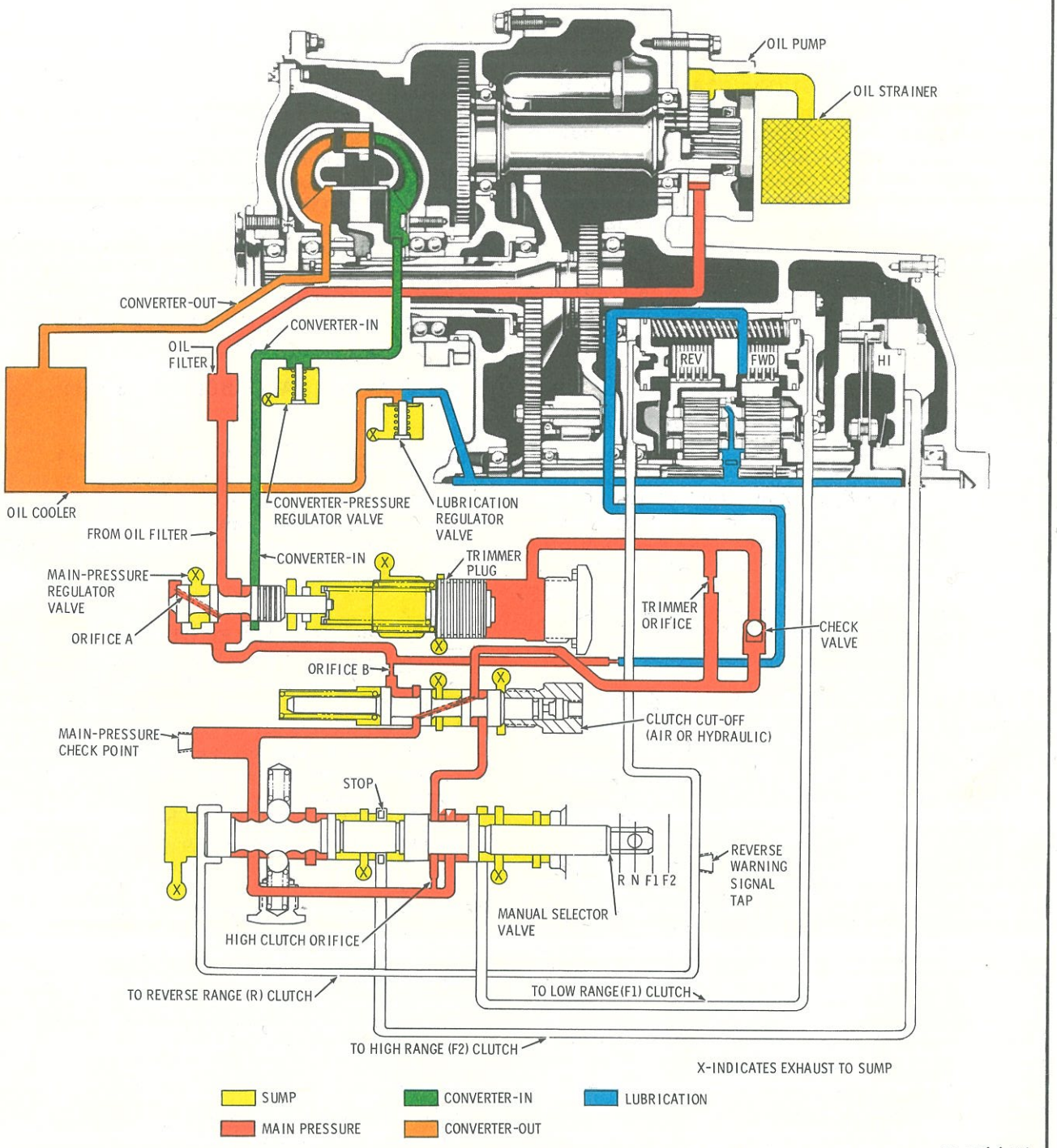


FIG. 4 HYDRAULIC SYSTEM - SCHEMATIC VIEW

2.8.5
During normal operation, valve (20) is rearward. This allows main pressure to flow to the selector valve and trimmer plug (17). When loader brakes are applied, valve (20) moves against spring (19). This interrupts the flow of main pressure to the selector valve and exhausts clutch apply pressure, releasing the applied clutch.

2.9 PARKING BRAKE

2.9.1
An expanding shoe-type brake may be mounted at the lower-rear output location on the transmission housing. Brake back plate (1) (Fig. 124) is bolted to the transmission housing, and brake drum (6) is bolted to an output flange. The brake is manually operated.

2.10 HOUSINGS, COVERS

2.10.1
TORQUE CONVERTER HOUSING. Torque converter housing (32) (Fig. 62) is cast aluminum. It covers the large front opening of the transmission housing, and it supports and encloses the torque converter components. It is the front support member for the accessory driven gears and the converter driven gears. The front of converter housing bolts to the engine flywheel housing.

2.10.2 TRANSMISSION HOUSING. Transmission housing (1) Fig. 80, is cast iron and is the main structural member of the transmission assembly. It supports and encloses the rear ends of the accessory driven gears and converter driven gears, the range gearing and clutches. It also supports and encloses the output transfer gears and output shaft. It provides an external mounting surface for the transmission oil pump and accessory pump. It includes various oil passages within the casting for oil circuits.

2.10.3
The lower section of the housing provides a sump for the oil necessary for operation, lubrication, cooling, and control functions. Flat mounting surfaces with four tapped holes in each are provided at each side of the housing.

2.11 HYDRAULIC SYSTEM

2.11.1
SYSTEM FUNCTIONS. The hydraulic system generates, directs, and controls the pressure and flow of the hydraulic fluid with in the transmission. The hydraulic fluid is power-transmitting medium in the torque converter. Its flow lubricates and cools the transmission components, its pressure applies the clutches and its velocity drives the converter turbines.

2.11.2
OIL PUMP, FILTER CIRCUIT. Oil is drawn from the transmission sump, through a wire-mesh strainer, into the oil pump. The pump delivers its entire output to a full-flow oil filter. The oil filter is mounted external of the transmission. From the filter, the entire oil supply is returned to the transmission and control valve assembly.

2.11.3
MAIN PRESSURE REGULATOR VALVE CONVERTER-IN CIRCUIT. At the control valve assembly, oil from the oil filter enters the valve body, and flows around the main pressure regulator valve. The oil also flows through a diagonal passage (orifice A) to the left end of the valve. The resultant pressure at the left end of the valve pushes the valve rightward against a spring until the oil pressure is balanced by spring force.

2.11.4
The rightward movement of the valve against the spring exposes the port to converter-in circuit. Oil in excess of that required to maintain main pressure is allowed to escape into the converter-in circuit. Under certain conditions, the converter-in circuit can be charged with more oil than can be exhausted by the converter pressure regulator valve. When this is the case, the main-pressure regulator valve moves farther to the right and allows oil to flow directly into the exhaust port at the left end of the valve. This flow occurs between the two short lands at the left end of the regulator valve.

2.11.5
Oil flowing into the converter-in circuit is directed to the torque converter. A pressure regulator valve in the circuit limits converter-in pressure to 80 psi (5.6 kg/cm^2).

2.11.6
TORQUE CONVERTER. The torque converter is continuously filled with oil during transmission operation. Rotation of the converter pump imparts energy to the oil which, in turn, drives the turbines. The oil then flows between the stator vanes which redirects it to the pump..

2.11.7
CONVERTER-OUT, COOLER LUBRICATION CIRCUIT (FIG. 4). Oil flowing out of the torque converter is directed into the oil cooler. The oil cooler, like the oil filter, is loader mounted. The oil cooler is a heat exchanger in which the oil flows through water-or air-cooled passages.

2.11.8
From the cooler, oil flows to the lubrication circuit for distribution to the transmission components. All oil in excess of that required to maintain lubrication pressure is exhausted to sump through the lubrication regulator valve.

2.11.9
CLUTCH CUTOFF VALVE CIRCUIT FIG. 4.
Main pressure oil supplied from the left end of the main-pressure regulator valve, flows through orifice B to the clutch cutoff valve bore and then to the manual selector valve. From the selector valve the flow is directed back through the clutch cutoff valve bore to the trimmer. The orifice functions in connection with the trimmer.

2.11.10
The clutch cutoff valve is normally in the position shown and functions only when the vehicle brakes are applied. A spring holds the valve rightward, allowing main pressure to flow through the valve bore to the manual selector valve.

2.11.11
Air pressure acts directly against a plug which moves the clutch cutoff valve leftward during brake application. When leftward against its spring, the clutch cutoff valve interrupts the flow of main pressure oil to the manual selector valve. In this position, the oil in the trimmer circuit is retained and the charged clutch is allowed to exhaust sump through the port shown at the top center of the valve. Thus, when the loader brakes are applied, the driving clutch is released.

2.11.12
MANUAL SELECTOR VALVE CIRCUIT FIG. 4
Main-pressure oil from the clutch cutoff valve flows into the manual selector valve bore and surrounds the valve in the area of the detents notches. Main oil then flows, regardless of valve position, to another surrounding area toward the right end of the valve. Here it is available for low range, high range, and operation of the trimmer.

2.11.13
Three clutch apply lines leave the bottom of the selector valve bore. From left to right these are reverse range (LR), high range (HF), and low range (LF). In neutral all three clutch lines are exhausted. Moving the selector valve one notch rightward will charge the low-range line and thus apply the clutch. This condition provides low-range operation.

2.11.14
Moving the selector valve a second notch rightward will close off oil to the low-range line and allow it to exhaust. At the same time, oil will charge the high-range line, thus apply the clutch. This condition provides high-range operation. When the selector valve is in the high-range position, oil to fill the high-range clutch must pass through both orifice B and the high-range clutch orifice. The high-range clutch orifice being smaller than orifice B restricts the volume of oil which can flow through in a given time. As a result, the high-range clutch fills at a slower rate and thus provides smoother engagement.

2.11.15
Moving the selector valve one notch leftward of neutral will charge the reverse line and thus apply the clutch. This condition provides reverse operation.

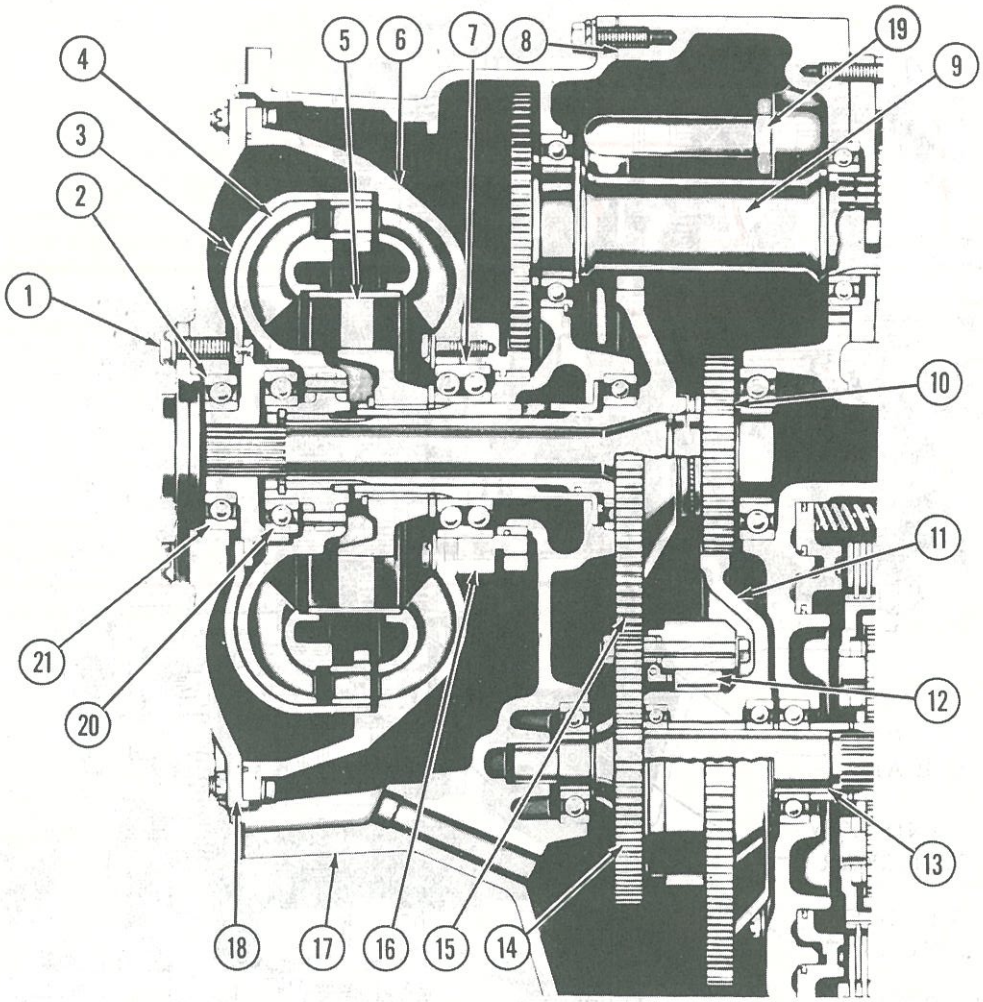
2.11.16
TRIMMER CIRCUIT (FIG. 4). The trimmer circuit works in conjunction with orifice B and the high-range orifice. The trimmer regulates clutch apply pressure during initial stages of clutch engagement, and the orifices provide a specific flow at a given pressure. The combination of the trimmer and orifices provide the final pressure and flow pattern to engage the clutches in the desired manner.

2.11.17
Normally, full main pressure holds the trimmer plug leftward against its spring and a shoulder in the valve body bore. This compresses the main-pressure regulator valve spring which causes main pressure to be regulated at maximum psi.

2.11.18
When any shift is made, oil is required to charge the oncoming clutch. This oil must flow through orifice B, directly below the main-pressure regulator valve. The restriction of the oil flow through the orifice causes pressure below the orifice to be reduced. This reduction in pressure allows the trimmer plug to move rightward. Force against the main-pressure regulator valve spring is reduced and main pressure is reduced.

2.11.19
When the clutch being charged is full, flow through the orifice stops and pressure below the orifice rises until it equals main pressure. This increased pressure acts against the right end of the trimmer plug, pushing the trimmer plug leftward. This compresses the main-pressure regulator valve spring and raises main pressure. As main pressure rises, the trimmer plug moves farther leftward until, finally, main pressure is restored to maximum.

2.11.20
The check valve and orifice in parallel branches of the line connecting the selector valve bore to the trimmer plug bore insure rapid movement of the trimmer plug toward the right (check valve opens) and slower return of the trimmer plug leftward (check valve closes, orifice restricts flow). Main pressure is rapidly reduced but slowly restored.



T-76695

FIG. 5 TORQUE CONVERTER AND CONVERTER GEARING - CROSS SECTION

1. Flex disk mounting capscrews
2. First-turbine support bearing
3. First-turbine assembly
4. Second-turbine assembly
5. Stator
6. Converter pump assembly
7. Converter pump bearing
8. Transmission housing
9. Accessory driven gear
10. First-turbine drive gear
11. First-turbine driven gear
12. Over-running (freewheel) clutch
13. Range gear input shaft
14. Second-turbine driven gear
15. Second-turbine drive gear
16. Input accessory drive gear
17. Torque converter housing
18. Converter drive cover
19. Oil suction tube
20. Second-turbine support bearing

2.12 TRANSMISSION TORQUE PATHS

2.12.1
COMPONENT FUNCTIONS. The torque converter, driven by the engine, directs torque through the first and/or second turbine to the second-turbine driven gear shaft. The shaft, splined to the reverse-and-low-range sun gear, drives the range planetaries and the high-range clutch hub. Hydraulic-actuated clutches, when applied, cause reactions within the involved range components. The interaction within the planetaries or application of the high-range clutch determines the gear ratio and direction of torque imparted to transfer gears. Thus, the torque path changes for each operating condition. Therefore, a knowledge of how these components direct the power flow through the transmission is necessary for proper diagnosis of transmission trouble. An understanding of the accessory gearing and converter-driven PTO is also helpful when the vehicle includes equipment driven by the transmission PTO components.

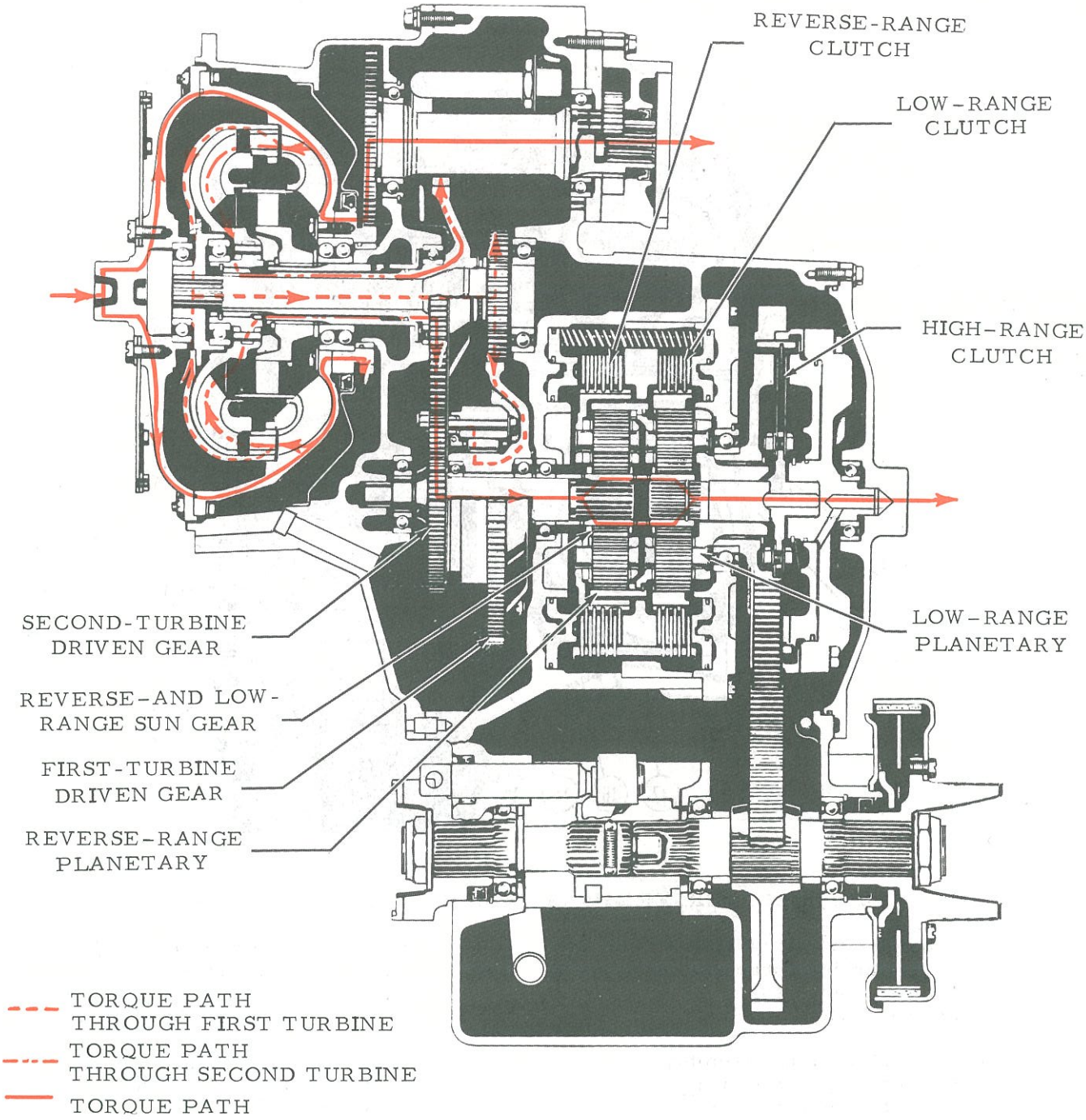
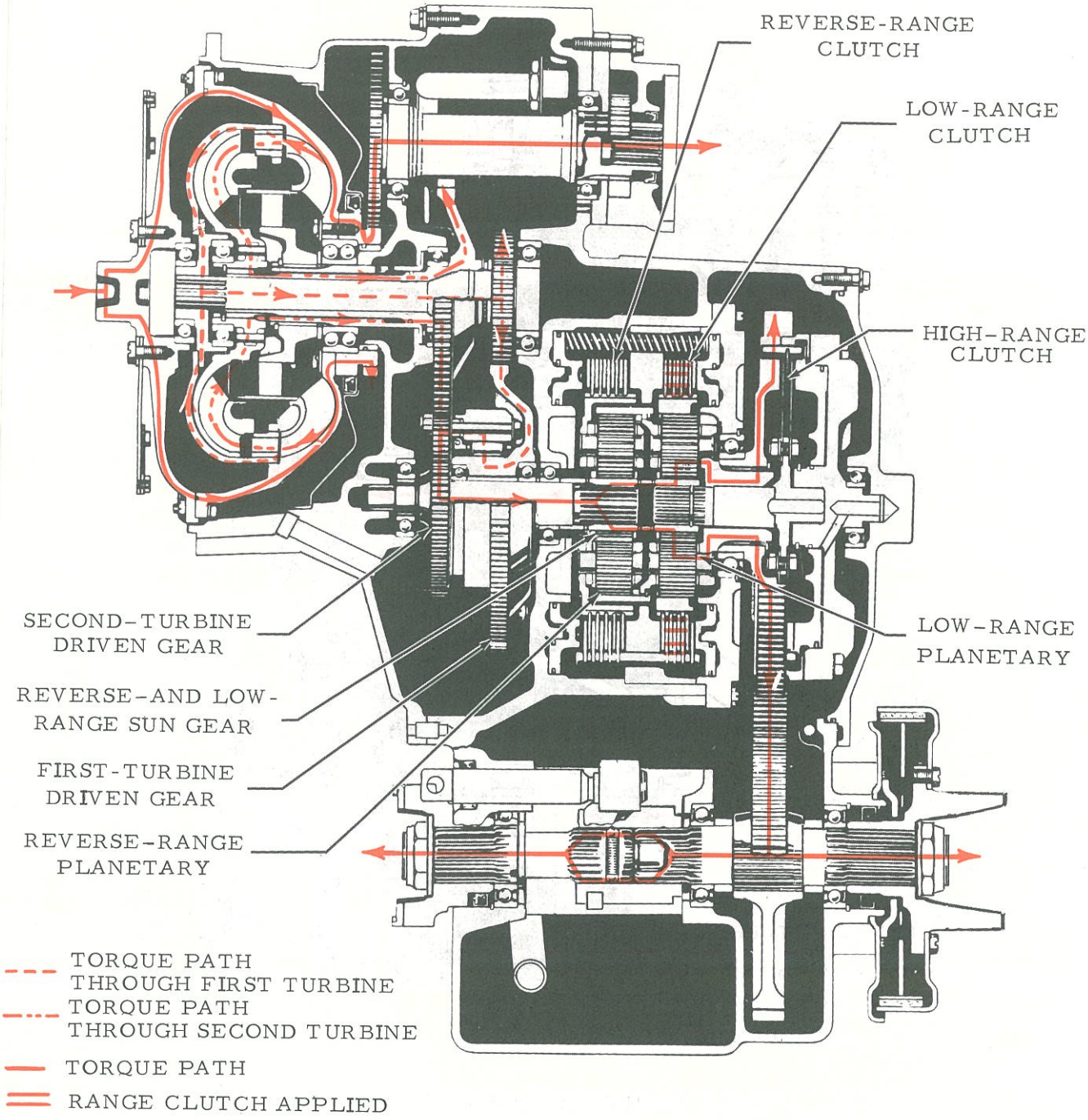


FIG. 6 NEUTRAL TORQUE PATH
(Typical)

2.12.2
CROSS-SECTION ILLUSTRATIONS. Figure 5 is a cross-section view of the twin-turbine torque converter. Figures 6 through 9 illustrate the paths through which the power flows from the engine to the transmission outputs.

2.12.3
Because the driving turbine is automatically determined by the load and speed requirement imposed by the loader, the torque path through the converter is not necessarily confined to a specific operating range. Thus, both paths are shown- a dotted line indicates the first-turbine torque path and a broken line indicates the second-turbine torque path. Engagement of the range clutches is indicated by horizontal bars across the clutch plates.

2.12.4
TORQUE CONVERTER, FREEWHEEL CLUTCH (FIG. 5). Power is transmitted from the engine to torque converter pump assembly (6) by a flex disk drive. From the pump, power must be transmitted hydraulically to either first-turbine assembly (3) or second-turbine assembly (4), or to both under certain operating conditions.



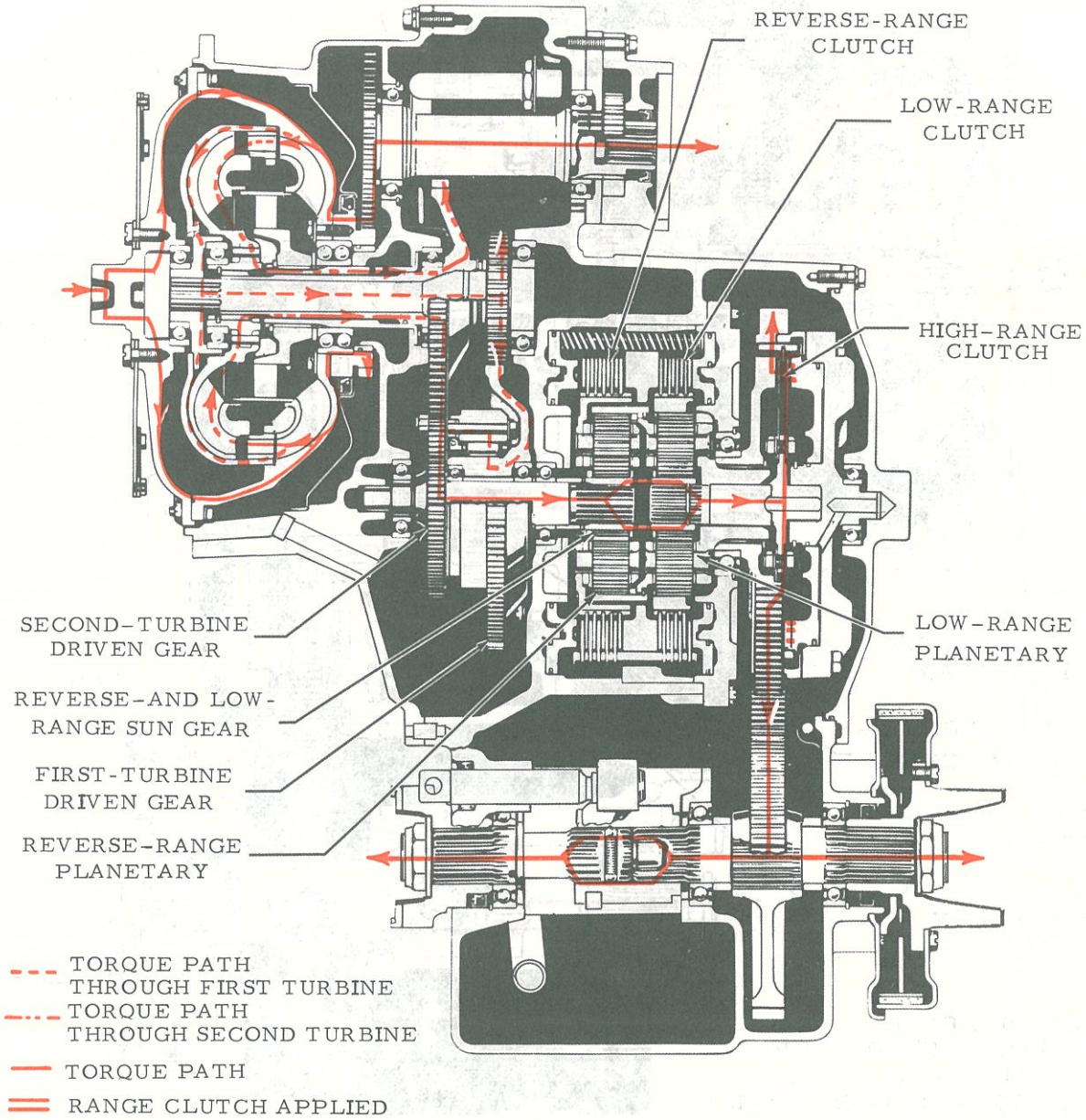
T-76693

FIG. 7 LOW RANGE - TORQUE PATH
(Typical)

2.12.5
Speed and load determine whether the torque flows through the first - and second-turbine assemblies (3) and (4),or only through the second-turbine assembly (4). At high-load demand and low speed, freewheel clutch (12) is engaged and first-turbine assembly (3) acts as the driving member. As speed increases and load demand decreases, freewheel clutch (12) disengages and second-turbine assembly (4) becomes the primary driving member. Thus, first-turbine operation is related to higher torque, and second-turbine operation to higher speed. The transition from the torque phase to the speed phase is entirely automatic, governed by the load and speed of the vechicle.

2.13 CONVERTER GEARING TO REVERSE -AND - LOW-RANGE SUN GEAR -- TORQUE PATH

2.13.1
FIRST TURBINE (FIG. 5). Torque from converter pump assembly (6) is transmitted hydraulically to first-turbine assembly (3). The first turbine is splined to first-turbine drive gear (10) which meshes with first-turbine



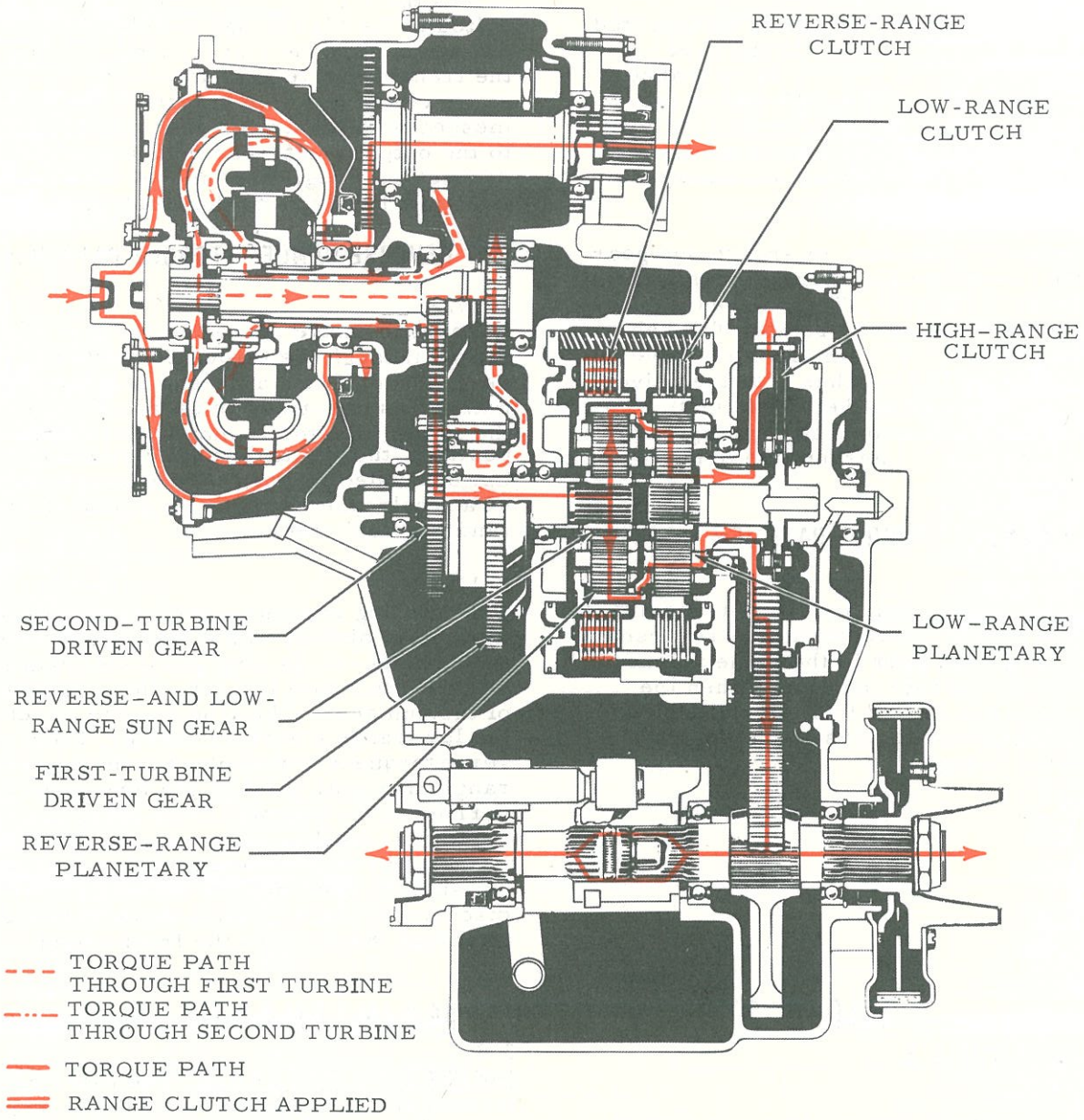
T-76693

FIG. 8 HIGH RANGE TORQUE PATH
(Typical)

driven gear (11). The first-turbine driven gear is connected by freewheel clutch (12) to second-turbine driven gear (14). The second-turbine driven gear is integral with range gear input shaft (13). The reverse-and-low-range sun gear is splined onto the shaft end. Thus, all these components rotate when the loader is operating in a high-load, low-speed condition. The hydraulic action in the converter and the interconnection of the turbine-driven gears (first and second) permit the second turbine to assist the first until the freewheel clutch disengages.

2.13.2

SECOND TURBINE (FIG. 5). When the output speed of the converter increases, the load is assumed by second-turbine assembly (4), and when it attains sufficient speed, freewheel clutch (12) will disengage. This allows first-turbine assembly (3) to rotate freely, and no drive is contributed by the first turbine. Second-turbine assembly (4) is splined to the hollow shaft of second-turbine drive gear (15). The drive gear meshes with second-turbine driven gear (14) integral with range gear input shaft (13) which is splined with the reverse-and-low-range sun gear. Thus, all these components rotate when the loader is operating in a low-load, high-speed condition.



T-76693

FIG. 9 REVERSE RANGE - TORQUE PATH (Typical)

2.14 NEUTRAL AND POWER TAKEOFF TORQUE PATH (Fig. 6)

2.14.1
When the range selector is in neutral position, power is transmitted through the torque converter to the reverse-and-low-range sun gear. No range clutches are engaged. Thus, rotation of the sun gear causes the planetary pinions to rotate freely, and no power flow occurs in the range gearing.

2.14.2
Torque from the engine flows through the torque converter pump to the input accessory drive gear. Rotation of the input accessory drive gear drives the engine-driven PTO through the accessory driven gear. If the transmission is equipped with an implement pump drive, rotation of the input accessory drive gear also drives the accessory drive gear and shaft assembly. The gearing for the implement pump drive is located directly behind (relative to illustration) the engine-driven PTO gearing.

2.15 LOW RANGE -- TORQUE PATH (Fig. 7)

2.15.1
In low-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2.13. When the range selector is moved from neutral to low range (LF) the low-range clutch engages and holds the low-range ring gear stationary.

2.15.2
The rotating reverse-and-low-range sun gear drives the low-range planetary pinions within the stationary ring gear. This causes the low-range planetary carrier to rotate. The hub of the carrier is splined to the transfer drive gear. The drive gear meshes with the driven gear which is splined to the output shaft. The manually operated disconnect coupling, when moved forward, will interrupt the drive to the front output.

2.16 HIGH RANGE -- TORQUE PATH (Fig. 8)

2.16.1
In high-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2.13. When the range selector is moved from low range (LF), the low-range clutch releases and the high-range clutch engages.

2.16.2
The rotating reverse-and-low-range sun gear drives the high-range clutch hub which is bolted to the high-range clutch friction plates. Engagement of the high-range clutch locks the transfer drive gear to the rotating high-range clutch hub. The transfer drive gear meshes with the driven gear which is splined to the output shaft. The manual-operated disconnect coupling, when moved forward, will interrupt the drive to the front output.

2.17 REVERSE RANGE -- TORQUE PATH (Fig. 9)

2.17.1
In reverse-range operation, torque is transmitted through the torque converter to the reverse-and-low-range sun gear in the same manner as described in paragraph 2.13. When the range selector is moved to reverse-range position, the forward-range clutches (LF and HF) are exhausted and the reverse-range clutch engages and holds the reverse-range planetary hub (and carrier) stationary.

2.17.2
The rotating reverse-and-low-range sun gear drives the pinions which also are in mesh with the reverse-range ring gear. This causes the ring gear to rotate in a direction opposite to that of the sun gear. The ring gear is attached to the low-range planetary carrier. Thus, the reverse torque is transmitted from the reverse range ring gear through the low-range planetary carrier to the transfer drive gear. The transfer drive gear meshes with the driven gear which in turn drives the transfer drive gear and output shaft in reverse. The manually operated disconnect coupling, when moved forward, will interrupt the drive to the front output.

TOPIC 3 PREVENTIVE MAINTENANCE

3.1 SCOPE OF TOPIC 3

3.1.1
This section outlines the routine and periodic procedures required to maintain the transmission in good operating condition. Included are instructions for care of the oil system, minor adjustments of the transmission and control linkages, tests to determine condition, instructions for extended storage, and trouble-shooting, in handy chart form.

3.2 PERIODIC INSPECTIONS, CLEANING

⚠ WARNING

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

3.2.1
INSPECTING EXTERIOR. The exterior of the transmission should be cleaned and inspected at regular intervals. The severity of service and operating environment will determine the frequency of such procedures. The transmission should be inspected for loose bolts, oil leaks, linkage troubles, and bent or damaged oil lines, Oil leaks that cannot be stopped by tightening the parts require immediate attention. Linkage must be kept clean,adjusted and well lubricated.

⚠ 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 200 kPa (30 psi) according to local or national requirements.

3.2.2
CLEANING BREATHER. The prevalence of dust and dirt will determine the frequency at which the breather requires cleaning. Clean the area around the breather stem before removing the breather. Wash the breather thoroughly by agitating it in cleaning solvent. Dry it thoroughly with compressed air after cleaning. Always use a wrench of the proper size to remove or replace the breather. Pliers or a pipe wrench will crush or damage it and produce metal chips which could enter the transmission.

3.2.3
OIL CONTAMINATION. At each oil change examine the oil which is drained, for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during operation of the transmission. However, if there is evidence of water, check the cooler (heat exchanger) for leakage between the water and oil areas. Oil in the water side of the cooler (or in the radiator) is another sign of leakage. This, however, may indicate leakage from the engine oil system. Any accumulation of sludge or soft dirt in the sump should be removed with flushing oil.

3.2.4
It is normal to have some metal particles in the oil. These are usually trapped by the oil filter and the magnetic drain plug. However if the transmission has failed, there may be metal particles lodged throughout the system, especially in the oil cooler. These particles, if not removed, could lead to a premature failure of the replacement transmission. Before installing a new or rebuilt transmission, clean all internal and external circuits, oil cooler, filter, and all other areas where the particles may lodge.

3.2.5
Because of the many passages in the oil cooler (heat exchanger), repeated cleaning and flushing may not remove all the particles from that circuit. If there is doubt as to whether the system is clean, an auxiliary filter can be installed between the oil cooler and the transmission to trap any particles that may dislodge after loader is back in operation.

3.2.6
The auxiliary filter should be a Filter Assembly, P/N 73074445 (or equivalent) 40 micron filter. After the filter is installed, the oil cooler circuit pressure differential must not exceed 40 psi (276 kPa) at operating temperature and at full throttle stall.

3.2.7
Auxiliary filter installation can be temporary or permanent. If temporary, use at least 500 hours, changing filter after first 50 hours of operation. If permanent, change filter after first 50 hours of operation and at regular change intervals thereafter.

3.2.8
If engine coolant containing ethylene glycol leaks into the transmission oil system, immediate action must be taken to prevent malfunction and possible serious damage. The transmission must be completely disassembled, inspected and cleaned. All internal splined clutch plates must be replaced. All traces of the coolant, and varnish deposits resulting from coolant contamination must be removed.

3.2.9
A Gly-Tek test kit to detect glycol in transmission oil can be obtained through parts system.

NOTE: Some transmission oils will give a positive indication because of additives in the oil. When test results are questionable, test a clean (unused) sample of the same type or brand to confirm results.

3.3 CHECKING OIL LEVEL

3.3.1
COLD CHECK. With the transmission dipstick, check the oil level before starting the engine. It is safe to start the engine if the oil is in the range on the engine stopped side of the dipstick. If the oil level is not within this range, add oil.

IMPORTANT: The above method is only a precautionary method prior to starting a cold loader. After the transmission fluid reaches operating temperature a further fluid check must be made using method in 3.3.2. Always recheck fluid using method described in 3.3.2.

3.3.2
HOT CHECK. With the oil at normal operating temperature, engine operating at low idle, transmission in neutral, and parking brake set, check the oil level. The oil must be within the operating range on the engine running side of the dipstick. Add specified oil to bring level within operating range.

3.4 MAINTENANCE INTERVALS

3.4.1
FREQUENCY. The severity of service and the environment in which the transmission

Product: Fiatallis FR10/FR12 Transmission Wheel Loader Service Manual
Full Download: https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/

operators will determine the frequency of some maintenance operations. Under very dusty or dirty operating conditions the transmission oil should be changed more often. Oil should be changed immediately if it has been subjected to overheating-indicated by discoloration and a strong odor. The breather will require more frequent cleaning when dirt and dust conditions are severe.

3.4.2
OIL AND FILTER CHANGE. Initial filter change is at 50 hours on new units or after repairs to system components; thereafter change filter at each 500 hours operation. Change oil after each 1000 hours operation. For severe service, refer to 3.4.1. Refer also to 3.2 before changing oil. Do not operate a transmission which is filled with preservative oil except for minimum necessary time and distance.

3.5 CHANGING OIL, FILTER

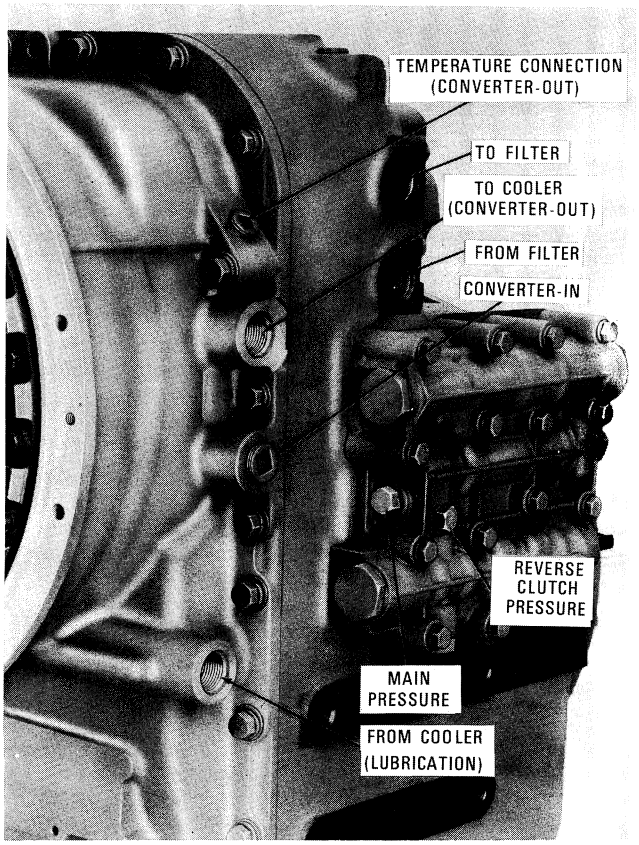
3.5.1
DRAINING OIL. Transmission should be at operating temperature (180°F)(82°C)when the oil is changed. Remove drain plug at lower-left rear of transmission housing (Fig. 1). Remove the oil filter element from the remote-mount filter. (Refer to Operators Manual). Remove and clean the oil strainer assembly (fig. 19). Let the oil drain 30 minutes if time permits. Replace the oil strainer, gasket and oil drain plug. Install a new oil filter element. (Refer to Operator's Manual).

3.5.2
REFILLING OIL SYSTEM. Add 7.5 US gallons (28 lts.) or 6.25 Imperial gallons) of specified transmission fluid after an oil change. Then conduct the cold check as described in paragraph 3.3.1, adding oil as necessary to establish the correct oil level for start up.

3.5.3
OIL SYSTEM CAPACITY. Approx. 8.5 US gallons (32 lts.) or 7 Imperial gallons) for an initial fill or after a complete overhaul. This amount does not include the oil necessary to fill the external filter and cooler circuits. Thus, the refill amount is less than the initial fill because some oil remains in the external circuits and transmission cavities.

3.6 PRESSURES, TEMPERATURES

Figure 10 illustrates the points where the transmission temperature and pressure may be measured. The loader is equipped with a temperature gauge and a pressure gauge. The temperature gauge registers the converter-out (to cooler) temperature, and the pressure gauge registers main (clutch) pressure. Clutch pressure during normal operation in any gear or in neutral is approximately equal to main pressure and may be regarded as main pressure. However, while the clutch cutoff control is being used, clutch pressure may fall to



T-77026

FIG. 10 PRESSURE AND TEMPERATURE CHECK POINTS

practically zero -- this does not indicate that main pressure has decreased. Therefore, when checking main pressure, do not actuate either of these controls.

3.7 LINKAGE CHECKS, ADJUSTMENTS

3.7.1
SELECTOR LINKAGE. (See Operator's Manual) The selector linkage must be adjusted so that the operator's control and selector valve are both in desired range at the same time. Make initial adjustment in neutral. Then shift through all range positions to make sure that the selector valve is in full detent position in each range. Linkage must be kept clean, adjusted and well lubricated. Bent or damaged linkage must be repaired or replaced.

3.7.2
FRONT OUTPUT DISCONNECT. There are two points of adjustment for the front output disconnect. The shifter shaft must be adjusted first, and then adjust the linkage. Push the shifter shaft inward (toward the rear) to its engaged position. A spring-loaded detent will indicate positive engagement. Adjust the shifter shaft by rotating it until the center of the clevis pin hole is approximately 3.8" (96.5mm) ahead of the linkage support bracket mounting pad faces.

Sample of manual. Download All 112 pages at:
https://www.arepairmanual.com/downloads/fiatallis-fr10-fr12-transmission-wheel-loader-service-manual/